ATTACHMENT 5

Kibby Wind Power Project

Kibby, Skinner and Chain of Pond
Townships
Franklin County

Volume IV:
Land Use Regulation Commission
Supporting Documentation

Appendix 7-K Through Appendix 9-E

April 2007

Submitted by:

TransCanada
In business to deliver

APPENDIX 9-E

VISUAL ASSESSMENT

KIBBY WIND PROJECT

Visual Impact Assessment

April 2007

Jean E. Vissering Landscape Architecture

KIBBY WIND POWER PROJECT

VISUAL IMPACT ASSESSMENT

Abstract: The following report examines the aesthetic impacts of the proposed Kibby Wind Power Project. The project would consist of 44 turbines located along the Kibby Range and portions of the Kibby Mountain ridge. Based on the criteria contained within the Maine Comprehensive Land Use Plan, and on standard visual impact assessment criteria, the proposed project would not result in undue adverse aesthetic impacts within the surrounding landscape. The project ridges are difficult to see generally, and are not distinctive in form or important focal points. They are not located near any designated recreational uses of either high sensitivity or of state or national significance. The proposed project would be over 15 miles away from the closest point of the Appalachian Trail. The project size is modest, occupying only two named ridges with numerous undeveloped ridges remaining around the project including the northernmost summit of Kibby Mountain itself.

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PART I: INTRODUCTION

A. Purpose of Report

This report examines the aesthetic impacts of the proposed Kibby Wind Power Project. It describes the characteristics of the proposed project including turbines, roads, and transmission lines, and how they may affect the surrounding area generally and public scenic and recreational resources within a 15-20 mile radius of the proposed project in particular. Impacts to private residences and camps are discussed generally, though as a rule access to private property for purposes of analysis is not feasible.

The proposed Kibby Wind Power Project falls within the unincorporated territories of Maine and must be reviewed by the Maine Land Use Regulation Commission (LURC). Portions of this project would occupy areas currently within the General Management (M-GN) and Mountain Area Protection Zone (P-MA). The latter includes all areas over 2700 feet (823 meters (m)) in elevation. The aesthetic effects of rezoning these portions of the Mountain to Planned Development (D-PD) are discussed.

The methodologies used in the aesthetic impact assessment are outlined below and the assessment and conclusions discussed in detail in Part II of the report. This report is accompanied by several Appendices including the following:

- Resumes of Jean Vissering of Jean Vissering Landscape Architecture; David Healey, GIS Mapping Specialist with Stone Environmental; and James Zack of XtraSpatial Productions who prepared the accompanying photo simulations.
- Project Map
- 20-Mile Radius Viewshed Map
- 15-Mile Radius Viewshed Map
- Photo Simulations
    - Sarampus Falls Rest Area
    - Jim Pond
    - Route 27 Near Vine Road
    - Kibby Mountain Fire Tower (2)
    - Porter Nideau Road on Eustis Ridge
    - Avery Peak (Appalachian Trail)

B. Author Background and Qualifications

Jean Vissering is principal landscape architect with Jean Vissering Landscape Architecture in Montpelier, Vermont. Her educational background includes both undergraduate and graduate degrees in landscape architecture. Her practice focuses on visual impact assessment, visual resource planning, community planning and design, and residential design.

Visual assessment and planning projects include housing subdivisions, ski areas, transmission lines, and communication towers, and have often been on behalf of Towns, Regional Planning Commissions and citizen organizations. She became

involved in wind energy issues in 2002 when she helped facilitate discussions with numerous stakeholders in Vermont in a series of meeting sponsored by the Vermont Public Service Department. She wrote *Wind Energy and Vermont's Scenic Landscape* outlining areas of consensus regarding the design and siting of wind energy projects in Vermont (available on line at the Vermont PSD website). Since then she has spoken around the country on the issue, and has provided informal and formal assessments for several wind projects including the Deerfield Wind project in southern Vermont on behalf of PPM and Vermont Environmental Research Associates, and for the Appalachian Trail Conservancy concerning the proposed Redington Wind Project in Maine. She has also worked on behalf of Towns and Regional Planning Commissions to provide independent evaluations of proposed wind projects and to ensure a thorough review. She is currently a member of a National Academy of Science committee examining the impacts of wind energy projects with a focus on the Mid-Atlantic states.

From 1982 until 1997 she taught at the University of Vermont including both undergraduate and graduate courses in visual resource planning, landscape design and park and recreation design. Prior to that and beginning in 1976, she worked with the Vermont Department of Forests, Parks and Recreation as a park planner, state lands planner, and reviewing projects for aesthetic impacts under Vermont's Land Use Law known as Act 250.

C. Aesthetic Assessment Methodology

Two methodological approaches have been used in assessing the aesthetic impacts of the proposed project. First, in evaluating proposed projects under its jurisdiction, the LURC refers both to the Maine Land Use Standards and Comprehensive Land Use Plan (CLUP) and to the Land Use Regulation Law, Subchapter III Land Use Standards. The underlying standard for review is as follows:

> *Adequate provision has been made for fitting the proposal into the existing natural environment in order to assure there will be no undue adverse effect on existing uses, scenic character, and natural and historic resources in the area likely to be affected by the proposal. (LURC rules Section: 10.24 General Criteria for Approval of Permit Applications)*

Subchapter III Land Use Standards for LURC review of development projects includes the following under E. Scenic Character and Historic Features.

1. *Scenic Character*
    a. *The design of a proposed development shall take into account the scenic character of the surrounding area. Structures shall be located, designed and landscaped to reasonably minimize their visual impact on the surrounding areas, particularly when viewed from existing roadways or shorelines,*
    b. *To the extent practicable, proposed structures and other visually intrusive development shall be placed in locations least likely to block or interrupt scenic views as seen from traveled ways, water bodies, or public property.*

c. *If a site includes a ridge elevated above surrounding areas, the design of the development shall preserve the natural character of the ridgeline.* (LURC Rules Section 10.25.E.1 Scenic Character, Natural and Historic Features)

Other goals and policies contained in the CLUP are discussed including particular scenic resources identified in the Plan. The Plan provides no specific guidance for evaluating or siting wind energy projects. The unique aspects of wind energy projects and their relationship to the surrounding landscape generally and to scenic resources in particular have been addressed in detail using the methodology described below.

The steps taken in preparing the visual assessment are based upon extensive field inventory work including visiting significant public use and recreation areas (e.g., driving along roads, canoeing lakes and ponds, hiking trails, and visiting village centers and historic sites), along with photographic and written documentation of views and their visual characteristics. Visual inventory work was conducted primarily during leaf-off conditions.

In October 2006 TransCanada hosted an informal public meeting in the Stratton Town Hall. Members of the public were invited to view information about the project and to talk informally with project representatives. The meeting was well attended by 40 people. Many offered suggestions about areas from where they though the project would be visible, indicated areas they cared about and thoughts about the project in general. These comments were very helpful in determining areas from which simulation photographs should be provided and where detailed field inventory should be conducted.

This report is organized as follows:

A. Project Description: A discussion of the project elements and their visual characteristics including (see Appendix A Project Map)

1. Turbine Design: height, color, form
2. Turbine Location: miles of ridgeline, cleared areas
3. Turbine Lighting
4. Meteorological Towers
5. Access Roads
6. Power Lines: on-site and off-site collector and transmission lines
7. Substation
8. Operations and Maintenance Building and Laydown Areas

B. Project Site Characteristics

C. Regional Landscape Character: A discussion of the visual attributes and scenic, natural and historic resources of the surrounding landscape within a 15-mile radius of the project.

D. Visibility of the Proposed Project from Public Use Areas within the Region: A summary of the places from which the project would be visible. These are summarized in the Table of Views, Appendix B. The following information found in the Appendices provides useful reference.

- **Viewshed Maps**: These computer-generated maps indicate *potential* visibility of the turbines based upon topographic interference. The viewshed maps highlight open areas including lakes and ponds, open meadows, and wetlands where visibility is more likely (tan). Visibility within forested areas (shown in dark green) is expected to be minimal, though this may be influenced by forest harvesting practices. Two viewshed maps show the 15-mile study area in detail and a wider 20-mile area. Actual visibility in all areas must be field verified. The viewshed map does show with reasonable certainty areas from which the project would not be visible. The viewshed assumes all forested areas to have trees averaging (40 feet 12 m) in height. (see Appendix A which includes a 15-mile Viewshed Map; and a 20-Mile Viewshed Map. Details about how the viewshed maps were constructed are also provided in Appendix A)
- **Photographic Documentation**: photographs of the project site and from many viewpoints are included in the report and in Appendix C. Photographs used in this report were taken either by Jean Vissering or by TRC staff members as noted. All photographs of the project site were taken with the equivalent of a 50 millimeter (mm) lens, which most closely reflects what the human eye sees. Some photographs illustrating other views vary in focal length. GPS points were recorded for each viewpoint.
- **Simulation Photographs**[1]: Simulation photographs were prepared for the following locations (Appendix D): Kibby Mountain Fire Tower (2); Sarampus Falls Rest Area on Route 27; Route 27 near Vine Road; Porter-Nideau Road on Eustis Ridge; and Avery Peak on the Bigelow Range on the Appalachian Trail. The simulation locations were selected based on public comments and to present a range of different settings and distances. The simulations show turbines, clearings, meteorological towers, and roads where they would be visible. (See Appendix D for a discussion of how the simulations were created.)

E. Sensitivity of Viewpoints

Some viewpoints have greater sensitivity to aesthetic impacts than others due to factors such as the expected experience level (e.g., a natural landscape without motorized vehicles or equipment), the distance from the project, the duration of view, the scenic quality of the view, and the expressed public value in either local, state or national planning or other documents. This section identifies certain

[1] A note about nomenclature: Landscape Architects generally use the term "photographic simulation" to referring to a photograph on which images of turbines or other proposed development are superimposed to "simulate" how the project will appear from particular viewpoints. Computer specialists are now using the term "photomontage" to refer to the layering of other images onto a photograph, while "simulation" refers to a virtual landscape image created using digital elevation modeling and enhancing it with digitally created images of trees, buildings, roads, etc. to mimic existing conditions. The latter have not been used in this report.

viewpoints within the study area that warrant greater analysis due to their relative sensitivity to aesthetic impacts.

F. Assessment of Visual Impacts

The assessment of visual impacts examines the **degree** to which characteristics of the proposed project may affect the overall experience of the landscape within the region as a whole or degrade views from highly sensitive viewpoints.

G. Compliance with LURC Standards and Determination of Undue Adverse Impacts

H. Conclusions

Appendices

A. Project and Viewshed Maps
B. Table of Views
C. Photographs
D. Simulations
E. Resumes

15-MILE STUDY AREA

The focus of our analysis was an area roughly 15 miles in radius around the proposed project. Often a 10-mile radius is considered sufficient since at that distance the turbines appear very small and normally occupy a very small portion of the view. It is within 10 miles that visual impacts of wind energy projects are more likely to be significant. However, due to the geography of this area and the scenic resources that occur in the 10-15 mile radius around the project, we included all resources within this larger study area in our analysis. In a few cases scenic resources up to 20 miles away were also considered.

A Note About Project Names

The Kibby Wind Power Project occupies two complex horizontal ridges depicted on maps generally as Kibby Mountain and Kibby Range. These two project areas are referred to generally in this report at **Kibby Mountain** or **A Series** which occupies the northern area and includes 19 turbines. The northernmost and highest peak of Kibby Mountain, the site of a small fire tower and forest wardens trail, would not be developed. The 25 turbines on Kibby Range to the south are referred to as either **Kibby Range or B Series**. This ridge divides into two forks heading south toward Route 27 near Sarampus Falls and southeast in the direction of Antler Hill.

PART II: VISUAL IMPACT ASSESSMENT

A. Project Description

The Kibby Wind Power Project consists of 44 **turbines,**[2] of which 19 would be located along a ridge just south of the summit of Kibby Mountain (A Series), and 25 of which would be located on a divided ridge known as the Kibby Range (B Series). The turbines would be Vestas V-90 3 megawatt (MW) which are 263 feet (80 m) to the nacelle (hub) and a total of 410 feet (125 m) to the tip of the blades. The rotor diameter is 295 feet (90m). The turbines would be a white or off-white color. Each turbine site would consist of a .2 acre gravel pad with the turbine at the center. A larger 1 acre area will be cleared during construction but on portions of this area vegetation would be allowed to re-grow. There would also be 4 permanent **meteorological towers** which would be lattice structures at hub height (approximately 260 feet). They would be similar to the 3 existing meteorological towers that are 197 feet tall.

Some of the turbines would be lit at night. Current FAA guidelines recommend one red (L-864) nighttime strobe mounted on top of the nacelle of turbines at the beginning and end of each string and approximately every half mile in between. A preliminary FAA review of the project suggested that 7 out of 19 turbines may need to be lit in Series A and 18 out of 28 turbines lit in Series B. TransCanada will continue to work with FAA on refining the obstruction lighting to ensure that safety requirements are met with minimal lighting.

Existing logging roads provide excellent **access** to the site, including Spencer Bale Road, Hurricane Road, Wahl Road and two unnamed roads. The project will require 17.3 miles of new access roads. These have been sited to avoid steep grades and associated regrading. **Access roads** would be 20 to 25 feet wide while **summit roads** between turbines would require a temporary width of 32 feet, a portion of which would be allowed to revegetate following project construction. Approximately 13.8 miles of road would be above 2700 feet (823 m).

Power will run underground from the turbine to **collector lines** running along the summit roads. Above-ground collector lines would run between turbines on Kibby Mountain, then cross the valley over Kibby Stream and Wahl Road to a substation on the northeast flank of the Kibby Range near Wahl Road. Collector lines would also run between turbines on Kibby Range (B Series), then through an existing clear cut and down the mountain to the Kibby Substation. The 34.5 kilovolt (kV) collector lines would be mounted on 60-foot poles. These lines require a cleared width of 60 feet but would be located in existing cleared areas where possible.

The **Kibby Substation** would consist of a 215-foot by 415-foot fenced area accessible off Wahl Road. It would be screened from view using existing vegetation and indigenous evergreen plantings if needed. From the substation a **115kV transmission line** would extend approximately 27.7 miles to the Bigelow substation south of Stratton (see 20- Mile

[2] Project maps show 46 turbines, 2 of which would be eliminated after further site studies.

Viewshed Map, Appendix A). The lines would be carried on wooden H-frame structures ranging in height from 50 to 100 feet and requiring a 125-foot wide clearing. The line would follow portions of Wahl Road, then run west of Antler Hill, crossing Route 27 and the North Branch of the Dead River just west of Vine Road, then along township lines continuing west of Reed Hill. It then angles southeast and crosses the South Branch of the Dead River and Route 16 about a mile west of Stratton. It continues along the flanks of Hedgehog Hill and crosses Route 16/27. At this point the line would parallel an existing 115kV transmission line (Boralex) and continue along side this existing line until it reaches the Bigelow substation. Crossing Route 16/27 and for another approximately 1200 feet, the transmission line will be within the Appalachian Trail corridor. The trail itself would pass through the existing Boralex right-of-way (now about 150 feet wide) which would be widened an additional 125 feet to accommodate the new transmission line..

A permanent **Service Building** with associated storage area would be constructed adjacent to the Kibby Substation. The building itself would be about 3600 square feet in size and occupy an area of about 0.1 acre.

During construction, additional cleared areas would be needed for **temporary storage** of parts and equipment. These would be located in areas that have recently been cleared for forest management on the site and/or in the vicinity of the intersection of Gold Brook Road and Route 27.

B. Project Site Characteristics

The project ridges are relatively horizontal in form with small undulations. The northernmost ridge lies approximately 0.6 mile south of the summit of Kibby Mountain, the highest point along the ridge (elevation 3638 feet) and the location of a fire tower. The flanks of Kibby Mountain have been and continue to be actively logged below 2700 feet, though much of this higher elevation area has been historically logged. A major secondary forestry management road, Spencer Bale Road traverses the southern end of Kibby Mountain and provides access to the site.

Kibby Range is a long slightly undulating ridge that divides into two forks to the south and southeast. The highest point is at the northern end of the range at 3286 feet (1002m). While small saddle areas dip below 2700 feet (823m), most of the ridgeline is between 2800 feet (854m) and 3000 feet (915m) in elevation. The western fork or prong extends farthest south and is visible from Route 27 by the Sarampus Falls Rest Area. The ridge has been heavily logged and logging roads currently surround almost the entire ridge. Gold Brook Road runs along the west side of both Kibby Range and Kibby Mountain. A secondary forest management road, Wahl Road, circles the northern, eastern and part of the southern flanks of Kibby Range.

Figure 1. Kibby Mountain (A Series) from Wahl Road.
This is one of the few vantage points where the entire range is visible in close proximity.

Figure 2. Kibby Range (B Series) from Spencer Bale Road

C. Character of the Region

The project is located in the Boundary Mountains which extend southwesterly to northeasterly from New Hampshire to Attean Pond along the border between Maine and Quebec, Canada. These mountains are part of the Appalachian Mountains, but separated from the ridges to the southeast over which the Appalachian Trail runs (sometimes referred to as the "Longfellows") by the Dead River valley. Within the 15-mile study area there are no mountains over 4000 feet in elevation, but 17 named mountains over 3000 feet (see chart of Maine's highest peaks, Figure 4)[3]. The valleys in between are characterized by numerous streams, wetlands, lakes and ponds. The area has a long history of logging activities as noted on a series of historical plaques at the Sarampus Falls Rest Area on Route 27. Route 27 is the only State Route within the 15-mile radius, with the exception of a small portion of Route 16 south of Stratton. Both these roads are in the deeper valleys formed by the North and South Branches of the Dead River. In the wider plains around Stratton, the Dead River takes a meandering course and empties into Flagstaff Lake. To the south of Flagstaff Lake the Bigelow Mountain Range rises steeply and its jagged peaks form a strong and compelling focal point within the area.

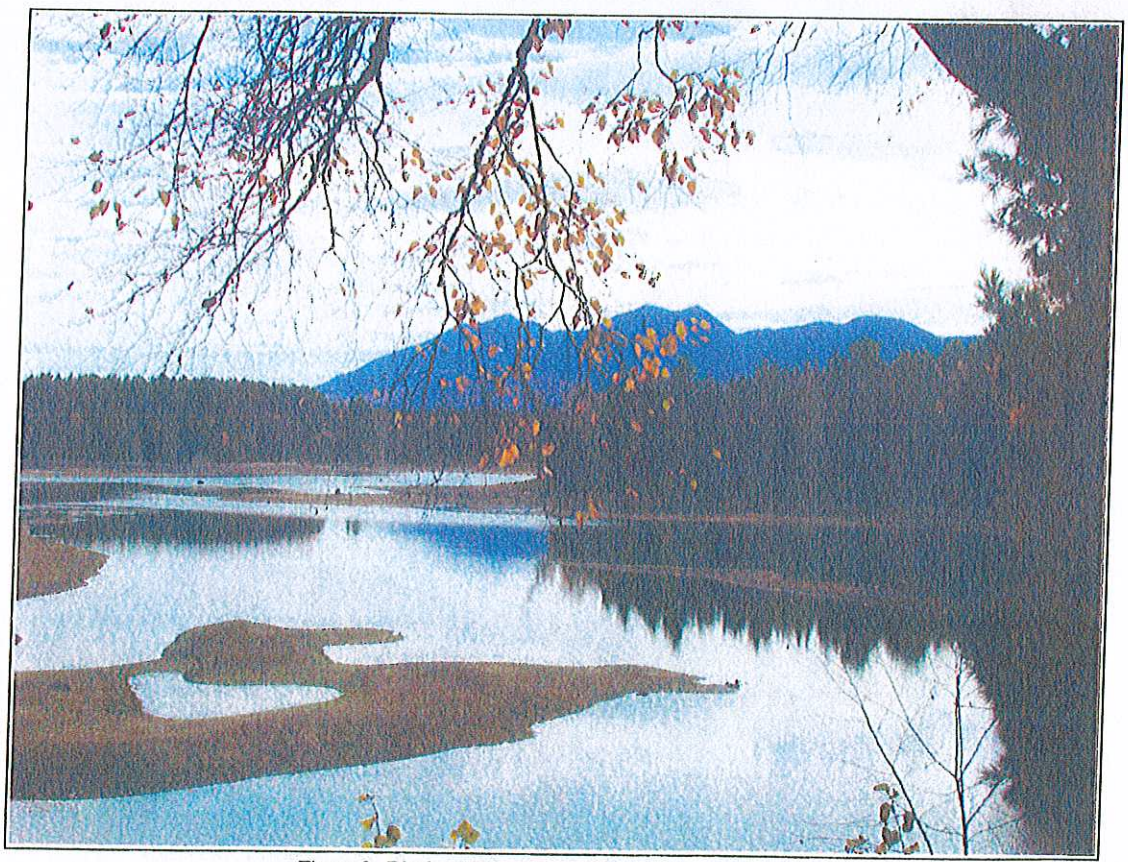

Figure 3. Bigelow Range from Cathedral Pines Rest Area

[3] Within a 20-mile radius there are three peaks that are over 4000 feet in elevation: West Peak (4150'), Avery Peak (4088') and Bigelow Mountain (4150').

A network of gravel roads run around the various Boundary Mountains. For the most part, these are private roads and used primarily by logging trucks but also by recreationalists including hunters, fishermen, snowmobilers, ATV users, and hikers. Some of the more heavily traveled roads include Gold Brook Road (also known as Beaudry Road) which runs along the west side of the project ridge and Spencer Road (also called Appleton or Hardscrabble Road) which runs north of Kibby Mountain all the way to Route 201 to the east. Other well used gravel roads include King and Bartlett Road, Tim Pond Road, Flagstaff Road and Eustis Ridge Road. While these roads are passable most of the year, high clearance vehicles are recommended and care must be taken to avoid logging trucks. For most other roads high clearance vehicles are a necessity.

There are five private sporting camps accommodating visitors in the area, Kibby Camps on Spectacle Pond, King and Bartlett Camp on King and Bartlett Lake, Tim Pond Camps, Tea Pond Camps, and the Megantic Club on Big Island Pond (private, members only).

Significant lakes and ponds within the area include Flagstaff Lake; Jim Pond; several ponds within Chain of Ponds including Natanis Pond, Long Pond Bag Pond, and Lower Pond; Tim Pond; Spencer Lake; Crosby Pond, Baker Pond, Spring Lake, Holeb Pond, Attean Pond and Big Island Pond. There are also numerous streams that are valued for fishing and provide scenic views from roadsides. The Maine Forest Service provides campsites along many lakes, ponds and popular rivers for boating. Most are primitive with no facilities.

The Appalachian Trail is outside the study area, but portions within the Bigelow Range are within 20 miles of the proposed project. Cranberry Peak within the Bigelow Range is a relatively popular hiking destination and at the edge of the study area. Within the study area there are numerous peaks, several of which have fire towers on top and many of which are accessible by informal trails or logging roads. (See Figure 4, Mountains within the 15-Mile Study Area).

Figure 4: Mountains Within 15-Mile Study Area[4]	**Height***
Snow Mountain	3960
East Kennebago Mountain	3791
Kibby Mountain	3638
Boil Mountain	3601
Tumbledown Mountain	3542
Caribou Mountain	3375
Pisgah Mountain	3355
Kibby Range	3286
Spencer Bale Mountain	3285
Sisk	3270
Smart Mountain	3245
Cranberry Peak	3213
Bag Pond Mountain	3173
Number 5 Mountain	3168
Three Slide Mountain	3112
Peaked Mountain	3037
Round Mountain	3027
* Data from Maine's Highest Summits at americasroof.com and from peakbaggers.com	

Stratton is the largest village within the study area (population 700) and is about 15 miles from the project. Its setting on the shore of Flagstaff Lake and the dramatic views of the Bigelows are a draw for tourists along with access to Sugarloaf ski area and to extensive areas for hunting, fishing, snowmobiling, and hiking in the area. Eustis is a smaller hamlet to the north and Coburn Gore is at the Canadian Border. There are a number of former settlements, now consisting of a few camps at most, such as Lowelltown, Skinner, and Keough along the Montreal Maine Railroad Line.

[4] This includes only named mountains. There are many unnamed mountains within the study area as well.

D. Visibility of the Proposed Project Within the Region

In general, views of the proposed project would be relatively limited due to intervening ridges and forest cover. Nevertheless, every wind project will be visible from some locations. This section describes the locations from which there would be views of the proposed project and the general characteristics of these views (see also Table of Views, Appendix B). Photographs and simulations from selected viewpoints are in Appendices C and D. An analysis of the significance of the views and the visual impacts of the proposed project on these views is discussed in sections E, F, G, and H following this section.

Descriptions of viewpoints are organized by distance from the project (nearest to farthest). The distance from the proposed project (closest turbine) is indicated in parentheses next to the viewpoint location title. The maximum number of turbines which could be visible within the area is also noted[5]. In many cases not all turbines would be seen from any one viewpoint but different turbines may be viewed as one moves (e.g. paddles) around the area (e.g. pond).

Note: Viewpoint Numbers in **bold type** are linked with the Viewshed Maps (Appendix A) and photo illustrations (Appendix C).

Areas with no visibility of the project

There would be no visibility of the project from Meyer's Beach on Flagstaff Lake, from Spencer Lake, Attean Pond, Holeb Pond, Holeb Falls or the Moose River, Fish Pond, Enchanted Pond, Pierce Pond, Whipple Pond, Moore Pond, Bail Pond Bog Pond, Tobey Ponds, Boulder Pond, Egg Pond, Rock Pond, Iron Pond, Twin Island Pond, Trout Pond, Big and Little Indian Ponds, Shaw and Lower Shaw Ponds, Tea Pond, Big and Little Island Ponds, L Pond, Beaver Pond, Long Pond, Secret Pond, Little Kennebago Lake, and Stratton Brook Pond. There would also be no visibility from ponds: Shallow, Chase, Butler, Wing, Beattie, Barrett, Everett, Chittenden, Bear, Long (King and Bartlett TWP), Little King, Rock, Iron, Prick, and Joe Pokum Ponds

There would also be no visibility of the project along Spencer Road, or from the summits of King Mountain or Peaked Mountain.

Viewpoints within ½ mile of the project

Views within a half mile are considered to be **foreground** views. In these locations details can be perceived such as the texture of leaves on a tree, and objects appear larger and more

[5] Visibility was determined using viewshed analysis. This analysis counts any visibility of a turbine, even the tip of a blade so that estimated numbers that are visible are likely to be exaggerated in terms of the overall visual impact. See Appendix D for a detailed description of how numbers of turbines visible was determined.

prominently. There are no significant viewpoints within a half mile. Hunters, snowmobilers and loggers use existing logging roads and the forests generally within this distance, but there are no camps, public roads, or designated recreation areas. Spencer Bale Road (1) is within this distance and would provide access to the project. (See Figures 1 and 2, and Appendix C.)

Viewpoints within 1 mile

Viewpoints between a half mile and up to 5 miles are considered to be middleground views. Given the size of wind turbines, one could argue that foreground views be extended to a mile away.

- Kibby Mountain Fire Tower (0.6 mile) (Simulation) (Viewpoint 2)

The Kibby Mountain fire tower is accessible off Gold Brook Road from a logging road that would provide access to the northern portion of the proposed project. A 3-mile trail leads to a 15-foot raised platform which provides 360° views. Both the Kibby Mountain and Kibby Range portions of the proposed project would be seen from the fire tower at distances ranging from just under a mile away and extending to about 7 miles away to the south. There would be unobstructed views to a full panorama of other mountains in the surroundings including Spencer Bale, Tumbledown, Three Slide, Peaked, Caribou, Megantic in Canada, Sisk, Snow, Bag, and Round. In the distance the Bigelows are visible along with Flagstaff Lake, and the Sugarloaf-Saddleback Range.[6] (See Appendix C, Photos of Project Site and Surroundings) There is one private camp that shares its access with a portion of the fire warden's trail[7]. The proposed project would not be visible from the camp.

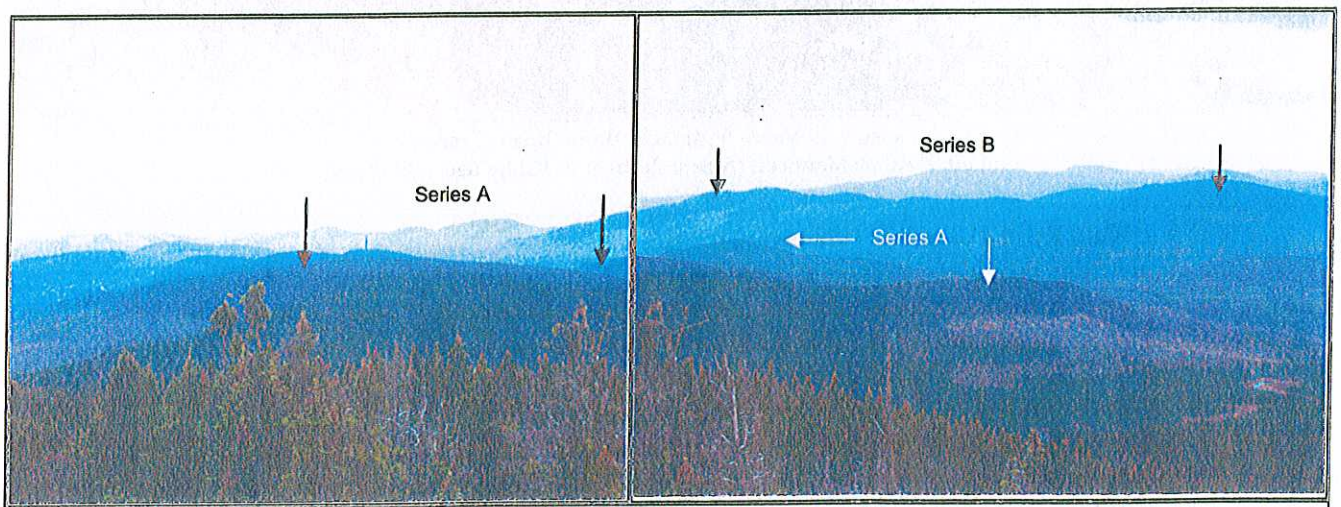

Figure 5. View from Kibby Mountain Fire Tower to A and B Series (.6 mile)
Left: southern ridges of Kibby Mountain (met tower in center); Right:: Kibby Mountain ridges (closer) and Kibby Range behind[8]

[6] A local motel owner who caters to hikers estimated that about 150 hikers ascend Kibby Mountain during the summer and about a dozen others during other times of year.
[7] Camp owner provided permission to visit the camp.
[8] These two photos do not match perfectly. A pole on the south side of the fire tower makes it difficult to take a pan of the two portions of the project area.

- Gold Brook Road (0.8 mile) (Viewpoints 2 and 3)

Gold Brook Road (also known as Beaudry Road) is a major logging road running west of the project site. It is also used by recreationalists for access into the backcountry for hunting, fishing, snowmobiling, ATV users, and hiking. Gold Brook Road continues along the west side of the project ridges for about 15 miles. There are several viewpoints which are documented on the Viewshed Maps and illustrated below and in Appendices A and C. From the 12 mile marker and along Spencer Road (running east-west north of the project) there are no views of the project ridges. The project ridges can not be seen from any points along Spencer Road which extends about 20 miles where it joins Route 201. This stretch is very scenic with far less vegetative disturbance than along Gold Brook Road. There are no private camps along Gold Brook Road. There is one forest campsite which would not have views of the proposed project.

Figure 6. Views from Gold Brook Road (2 miles)
Left to Kibby Mountain (A Series); Right to Kibby Range (B Series)

- Wahl Road (0.8 mile) (Viewpoints 3a-f)

Wahl Road provides access to logging trucks and others around nearly the entire Kibby Range (B Series). There would be a few viewpoints of the project site, the substation and transmission lines along this road. One branch of the road leads to an area between the two forks of Kibby Range and would serve as an access road to the project. There are views south toward the Bigelow Range, Flagstaff Lake and the Sugarloaf to Saddleback range. The immediate foreground however has been recently logged and logging operations appear to be ongoing all along Wahl Road. There are no camps along Wahl Road.

Viewpoints within 5 Miles

Areas within 5 miles are considered to be middleground views. At this range in very clear conditions the form of individual trees can be perceived but not the details such as

leaves or bark. In clear weather conditions vegetated areas may be perceived in warmer color ranges including shades of green, yellow, or red rather than the blue or purple range that is characteristic of distant views (beyond 5 miles). Within the middleground range, objects or groups of objects such as proposed wind turbines would be visible but part of a larger landscape setting including, for example, landforms, water features and vegetation patterns.

- Route 27 (1.5 miles) (Simulation) (Viewpoints 5 and 6)

The proposed project would be visible in only a few locations along Route 27: by Sarampus Falls and a few locations to the south at distances ranging from 1.3 miles to 3 miles away. Route 27 is a Maine Scenic Byway and also known as The Arnold Trail in reference to Benedict Arnold's voyage up the Dead River in his attempt to defeat British Troops in Canada during the Revolutionary War. Numerous views of mountain summits alternate with dense forests, wetlands and ponds along Route 27 as it twists and turns along the North Branch of the Dead River. In all but a few of these views, mountain summits other than Kibby are seen.

There are two rest areas along Route 27 at Sarampus Falls and on Natanis Pond. Both provide scenic settings and Sarampus Falls has picnic tables and historic plaques about the history of logging in the areas. A small part of the project (6-11 turbines) would be seen from the Sarampus Falls Rest Area. The project would not be visible from the Natanis Pond Overlook Rest Area. There are several other quick glimpses of the project south of Sarampus Falls including an area near Vine Road (simulation). Only a few of the B Series turbines can be seen within these views.

Figure 7. Views from Route 27 (1.2-3 miles)
Left is to Sarampus Falls; Right is about 3 miles south near Vine Road. Both views are of portions of Kibby Range (B Series)

- Chain of Ponds: Natanis, Long, Bag and Lower Ponds (1.9 miles) (Viewpoint 7)

The northern end of Chain of Ponds and the northeastern shore are within Maine Public Reserve Lands. There are lovely views from Natanis Point looking down the lake

toward the Bigelow Range. From a private campground at Natanis Point blades of 3 turbines may be visible. Area recreational opportunities include a 4-mile paddle along Chain of Ponds. Views of up to 15 turbines are possible from the western edges of Bag and Lower Ponds. There are some primitive campsites on the shore from which visibility of the project is unlikely. Canoeists are cautioned that despite the beauty of paddling along these ponds, the presence of Route 27 and its abundant logging trucks makes it quite noisy at times[9].

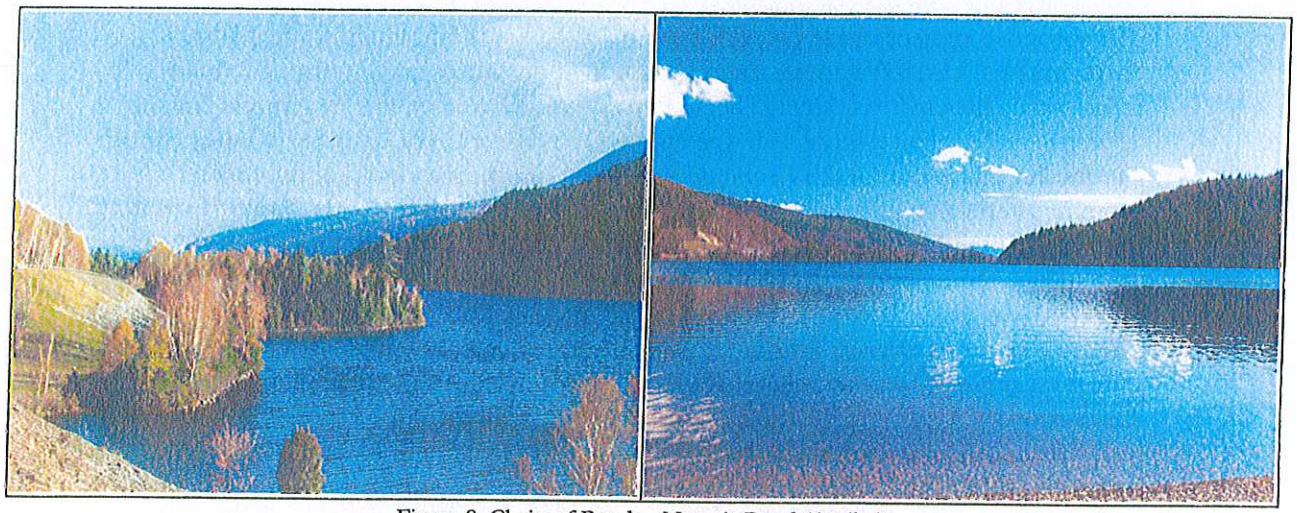

Figure 8. Chain of Ponds - Natanis Pond (6 miles)
Left is from the scenic overlook; Right from the Campground beach. The only views would be of the tips of three turbine blades from the view at right.

- Spectacle Pond (3 miles)

This small pond known as the location of Kibby Camps has been used for a number of recreational activities including Campfire Club of America, Ducks Unlimited, and Unity College. Viewshed maps indicate potential visibility of up to 13 turbines, but trees surrounding the pond may substantially block views.

- Round Mountain Pond (4 miles)

There are several camps on this small pond. About 13 turbines would potentially be visible from the western end of Round Mountain Pond.

- Jim Pond (5.1 miles) (Simulation) (Viewpoint 9)

Jim Pond is one of the more accessible ponds to the general public with a boat launch on the western shore suitable for motor boats and a smaller launch at the southeastern end accessible by canoes and kayaks. A portion of Kibby Range (B Series) is seen to the northwest between Antler Hill and other unnamed foreground hills. Portions of up to 24 turbines may be visible as one moves around the lake. Most views would include only a few turbines. The turbines would be visible from several camps on the pond. Antler Hill, Shallow Pond Mountain, Chase Pond Mountain, and another unnamed hill are

[9] From the following website: outdoors.mainetoday.com/paddlingtrips

prominent foreground features looking west and north from Jim Pond. Round Mountain and Snow Mountain can be seen to the west. Antler Hill blocks views of A Series on Kibby Mountain. The turbines would not be visible from the boat launch, camping area or the western shore.

Figure 9. Jim Pond (4.5 miles)
A portion of the Kibby Range (B Series) is seen between foreground hills.

- Other small Ponds

There are other small ponds within the 5 mile radius that may have views of the turbines. Douglas Pond, Hurricane Pond, Blakeslee Lake, Little Jim Pond, Chase Pond, and Blanchard Pond have potential for views of up to 13 turbines.

Viewpoints from 5-10 Miles

These are considered to be distant views and the project ridges are most likely to appear bluish in color. Beyond 8 miles the turbines, though visible, become more difficult to see except in clear conditions and generally occupy a small part of overall views.

- Snow Mountain (6.5 miles)

Snow Mountain is one of the higher and more prominent peaks in the area. There is a trail to the summit off Route 27 that is accessible to the general public and private access

from the Megantic Club. There is a fire tower at the top, although the top cabin recently fell off. Nevertheless, one can see views of the surrounding area including the Kibby ranges from the summit without climbing the tower.

- King and Bartlett Lake (8 miles) (Viewpoint 10)

A few of the A Series turbines are likely to be visible from the eastern portions of King and Bartlett Pond. They would not be visible from the camp area itself. Foreground ridges including King and Bartlett Mountain block a significant portion of the project from the lake.

- Eustis Ridge: Porter Nideau Road (9 miles) (Simulation) (Viewpoints 11a/b)

Eustis Ridge Road heads west from Route 27 leading to residential areas along the south side of the ridge, and to a small picnic area in a grove of maples overlooking Flagstaff Lake, the Bigelow Range, and portions of the Sugarloaf-Saddleback range. There would be no views of the Kibby Wind Power Project from the picnic area. Porter-Nideau Road branches off to the north side of Eustis Ridge. There are two areas with foreground meadows from which there would be views of the project. Only the Kibby Range (B Series) turbines would be visible from the road, but residents may be able to see A Series turbines as well (up to 44 turbines).

Figure 10. Porter Nideau Road on Eustis Ridge (9 miles)
View to Kibby Range with Antler Hill in Middleground right.

- Flagstaff Lake (9 miles) (Viewpoint 13)

Flagstaff Lake is very popular for boating, camping and swimming. It offers stunning views to the Bigelow Range just to the south. Portions of Flagstaff Lake are within 10 miles of the proposed project. Views of some of the turbines are likely from some open water areas along the southern and eastern portions of the lake.

Figure 11. Flagstaff Lake South Shore (12 miles)
Kibby Ranges can be seen behind trees on this portion of the lake. This area is part of the Bigelow Preserve.

- Flagstaff Road Causeway (10 miles) (Viewpoint 12)

This is a well used road especially in summer as it provides access to Meyer's Beach on Flagstaff Lake. The short causeway provides beautiful views looking south over the Dead River to the Bigelow Range. To the north the Kibby Range (Series B) is visible. Portions of Kibby Mountain (A Series) turbines may be seen but are generally blocked by intervening topography. (Note: this road is sometimes referred to as Cemetery Road.)

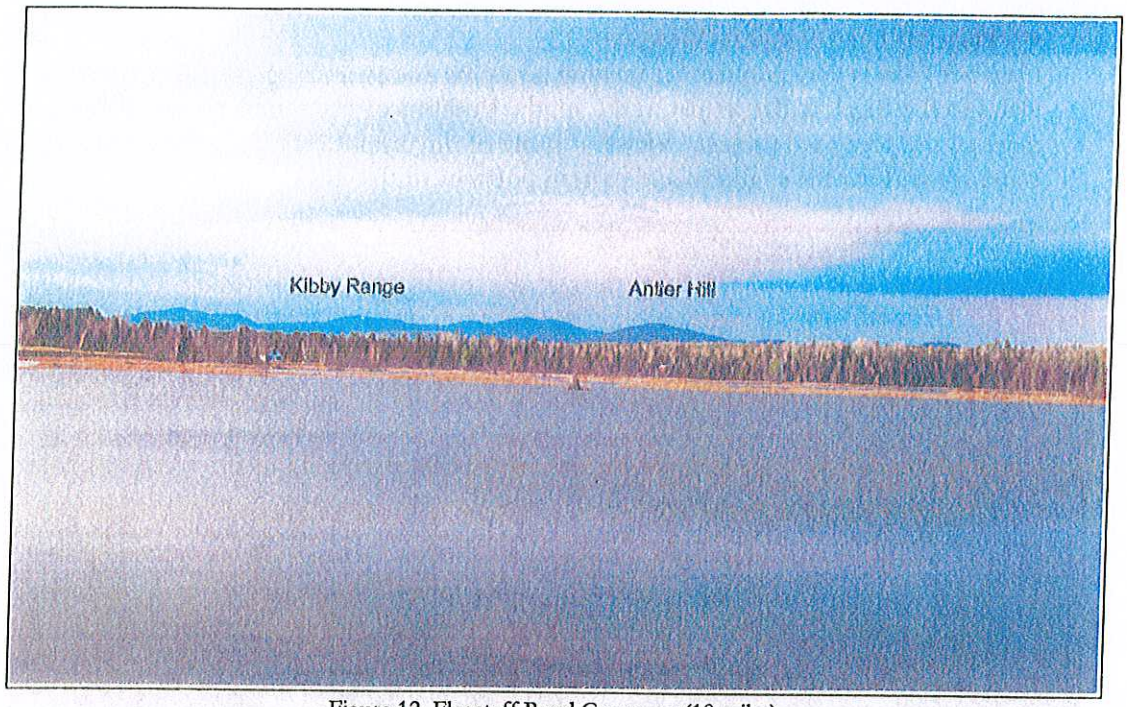

Figure 12. Flagstaff Road Causeway (10 miles)
Kibby Range (B Series) is seen in distance with Antler Hill in Middlground (middle right).

- Crosby Pond, Coburn Gore (10 miles)

About 5 of the A Series turbines may be visible from this pond.

Viewpoints from 10-15 Miles

At these distances the turbines would appear tiny and would occupy only very small portions of views.

- Flagstaff Lake (10-15 miles+) (Viewpoint 13)

Within the portions of Flagstaff Lake at these distances visibility is most likely from the eastern and southern portions of the "new lake." From many locations the project is blocked by trees along the shoreline. From a few locations the mountain ridges can be seen just over the trees. The project would not be visible from Meyer's Beach or from most campsites along the shoreline.

- Tim Pond (11 miles) (14)

Viewshed analysis indicated potential visibility of 24 B Series turbines from the southern and middle portions of the pond. The pond is surrounded by trees which are likely to prevent visibility from most of the pond.

- Flagstaff Mountain Road (11.3 miles) (Viewpoint 15)

Along the flanks of Flagstaff Mountain there is an open overlook providing a 180° view across Flagstaff Lake, the Sugarloaf-Saddleback Range, and up to the Kibby Range. The

B Series turbines would be visible from this location, especially during leaf-off conditions. Intervening trees are likely to prevent views of most A Series turbines.

- Cranberry Peak (15 miles) (Viewpoint 16)

Cranberry Peak provides a relatively easy climb close to Stratton and offers beautiful views over Flagstaff Lake. The proposed project would be visible along with numerous other mountains in the Boundary range and the nearby Longfellow or Sugarbush-Saddleback range.

- Spring Lake (15 miles)

A small area on the eastern end of Spring Lake appears to have some potential for visibility of the project.

Viewpoints 15-20 Miles

These areas are technically outside of the study area due to the significant distance from the proposed project. However we assessed a few of the more sensitive viewpoints within this radius. The proposed project would be seen in the background and occupy a very small portion of overall views.

- Flagstaff Lake (15-20 miles+) (Viewpoint 13b)

There is potential visibility of the proposed project along the eastern arm of Flagstaff Lake. The ridges are visible from Safford Brook campsite (20 miles) in the Bigelow Preserve. The campsite is used for canoe camping and by hikers in the Bigelow Range.

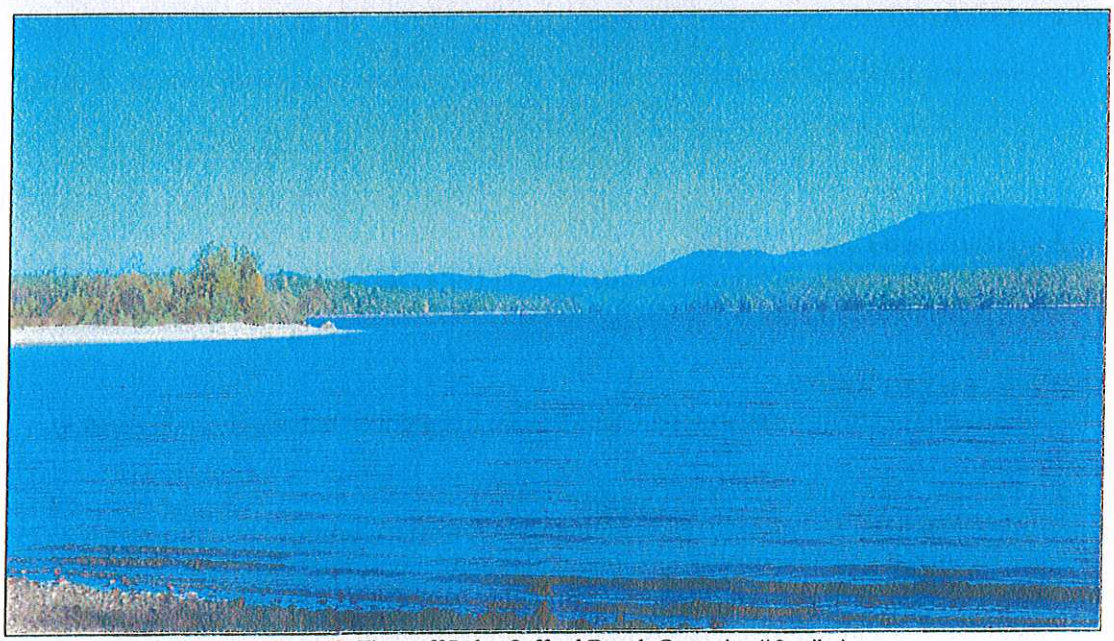

Figure 13. Flagstaff Lake, Safford Brook Campsite (18 miles)

- Avery Peak, West Peak and The Horns in the Bigelow Range (15.7 miles) (Simulation) (Viewpoint 17)

The project would be visible from open ridge areas along the Bigelow Range. The Kibby mountain ranges are seen as part of a wide panorama of mountain peaks throughout the region, and with a backdrop of other mountains behind. Crocker, Sugarloaf, Redington and other peaks in the Longfellow would be seen in closer proximity.

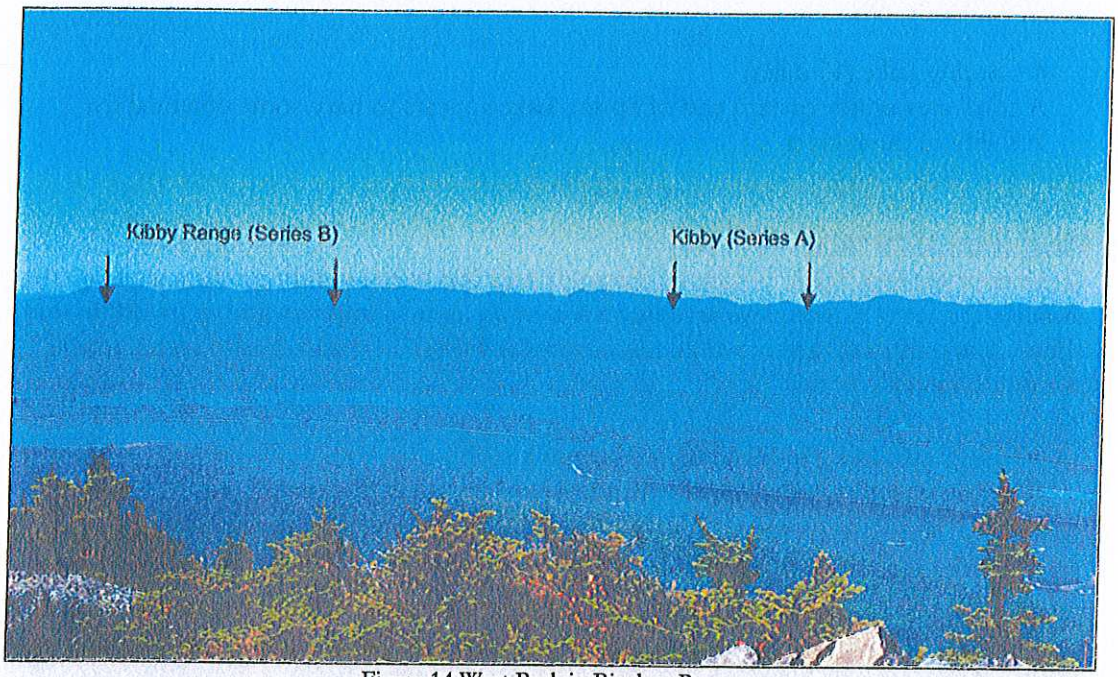

Figure 14 West Peak in Bigelow Range
Kibby Range is to the left; Kibby Mountain middle right. More distant mountains are seen beyond. Flagstaff Lake is in the foreground.

- Kennebago Lake (17 miles)

Our viewshed analysis indicates potential visibility of a few turbines from a very small area on Kennebago Lake.

Viewpoints Over 20 miles

The following sites are included as scenic viewpoints, but are well outside the study area.

- Crocker Mountain (21 miles) (Viewpoint 18)

Crocker Mountain is the closest peak along the AT west of Route 16/27. There is a small viewpoint on the southeast side of Crocker where portions of the two project ridges are visible. The Bigelow Range dominates the foreground, and is seen at about 7 miles away. Cranberry Peak partially blocks views of the Kibby ridges which are seen in the far background along with other mountains.

- Jackman Rest Area Route 201 (21 miles) (Viewpoint 19)

A rest area just south of Jackman provides a scenic overlook of Wood and Attean Ponds in the foreground. Portions of the Kibby ranges can be seen in the background but numerous intervening mountains make them difficult to see.

E. Sensitivity of the Viewpoints

Even when there is high visibility throughout a region (which is not the case here), this does not necessarily mean that there will be undue adverse visual impacts. The relative sensitivity of viewing areas is important to determine and is the first step in analyzing potential impacts. This section identifies particular areas and scenic resources that are likely to have greater sensitivity and may require a more detailed analysis.

In general, all public use areas including roads, recreation areas, historic or cultural resources, town or village centers, and natural or wilderness areas are considered to be potentially sensitive. However certain factors such as the proximity to the project, the expectations of users for a natural or non-motorized experienced, or the public recognition of the value of the resource may make some sites more sensitive to aesthetic impacts than others. Sensitivity does not necessarily imply that development should be prohibited. Rather it is necessary to examine carefully the degree of sensitivity of the resources involved on the project site and from viewpoints, and the degree to which these resources would be degraded, and negatively influence the experience of users.

Several factors affecting the sensitivity of views are addressed below. Characteristics of the proposed project which may influence the experience of sensitive sites area follow.

- **Viewer Expectations/Experience Level**

Sensitivity levels tend to be linked to viewer expectations and the level of concern for scenic quality. The US Forest Service's Visual Management System identifies sensitivity levels by the importance of the travel route (national vs. local) and by the degree of concern for scenic qualities of the users. There is also a continuum of experience levels from primitive and non-mechanized recreational pursuits to highly developed and fully mechanized recreational pursuits. Of concern within the study area would be the following types of recreation areas.

  - <u>Major Travel Routes</u>

Major travel routes include Routes 27 and 16. Route 27 is listed as one of Maine's Scenic Byways.[10] There would be very few views from either of these

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[10] Maine's website identifying Scenic Byways (http://www.maine.gov/mdot/projects-grant-applications/scenic_byways.php) provides the following description of Route 27: State Route 27 in the Carrabassett River Valley lies in the western mountains of Maine. It is a principal corridor connecting the State of Maine with the Canadian Province of Quebec. The Appalachian Trail crosses the southern portion of this state-designated Scenic Byway. The area has outstanding scenic quality, which the byway brings to users with a number of scenic turnouts, which also provide access to the Carrabassett River for recreational uses. The area is a year-round recreational destination, as well as a major tourist route.

routes. The closest occur on Route 27 and are generally quick glimpses encompassing only a few of the turbines. The only other roadway with significant views of the project is Gold Brook Road which is a private road predominantly used by logging vehicles and views generally include considerable logging activity and debris. There would be no views from Spencer Road, one of the more scenic stretches of backcountry roads within the area.

o Hiking Trails

The major and most significant hiking trail in the area is the Appalachian Trail (AT). The project is about 15.7 miles from the AT at its closest point. From the Bigelow peaks the project would be seen with a backdrop of mountains behind, making the turbines less visible (see Simulation, Appendix D). Other scenic viewpoints along the AT such as Saddleback Junior or Mount Abraham are 25 of more miles away. The foreground ridges, including Redington, Black Nubble and Crocker are prominent within these views, while the Boundary Mountains generally appear blue in color and at a great distance. The AT will cross the project transmission line corridor but in the immediate context of Route 27 and the adjacent Boralex transmission line.

Other hiking trails in the area include Cranberry Peak which is also very far away (15 miles). Few other mountains receive frequent use, but Tumbledown Mountain and Kibby Mountain provide relatively easy climbs with fire towers providing good views at the top. The project would be visible from the fire towers on Tumbledown Mountain and Kibby Mountain. Though not a major hiking destination, the Kibby summit viewpoint should be considered a sensitive viewing area due to proximity to the proposed project (less than a mile away). Despite the clearcutting and logging roads visible from the summit fire tower, it provides a panorama of views of peaks and ridges. Snow Mountain is another nearby hike with a similar number of users.

o Parks/Recreation Areas

There are no state parks or national parks in the 15-mile study area, but there are numerous Maine forest campsites located primarily around lakes and ponds as well as boat access areas. Few of these would have views of the proposed project. Two exceptions would be possible views from a campsite on Holeb Pond near Turner Brook at a distance of about 13 miles and a campsite on Flagstaff Lake by Safford Brook about 18 miles from the proposed project.

There are two private campgrounds within the study area, Cathedral Pines in Eustis and another at Natanis Point at the north end of Chain of Ponds. There would be no visibility from the Cathedral Pines campground or beach area. The tops of a few turbines would be visible from the Natanis Point campground.

There are also three Maine Reserve parcels managed by the State Bureau of Parks and Lands within the study area. The largest includes the Bigelow Range

and portions of the shoreline of Flagstaff Lake. Flagstaff Lake is a valued recreational resource and has several primitive campsites along the shoreline. There would be little visibility of the project from these campsites except from those in the eastern arm of the lake (see discussion above). The northern end of Chain of Ponds around Natanis Pond and the northeastern shore of Long Pond are also within the Maine Reserve lands. The project would not be visible from the reserve lands along the eastern shore of Chain of Ponds.
A third area of Reserve Lands is located around Holeb Pond and the Moose River. There would be no visibility from these areas except a small area on the northern end of Holeb Pond east of Turner Brook (see above).

Other noted recreation areas include canoe routes along the North Branch of the Dead River from which the turbines could be visible from a few areas looking upstream. There would also be no visibility near Grand Falls, from Long Falls Dam area, or from the Dead River between with a possible exception of a small area south of Halfway Brook.

Views from portions of the lakes and ponds adjacent to three sporting camps are likely. As many as 12 turbines may be visible from Spectacle Pond, 16 turbines from King and Bartlett Lake (but not from the camp itself) and 24 turbines from the southern end of Tim Pond. There would be no views from Big Island Pond.

o Scenic Areas

Noted scenic areas within the study area include Sarampus Falls, Grand Falls, and Holeb Falls. The tops of about six turbines would be visible from the Sarampus Falls Rest Area and from the grassy area near the falls, but the project would not be visible from Grand Falls, Long Falls or Holeb Falls.

o Waterbodies

This region abounds in lakes, ponds, and streams. Several are noted in the CLUP as having high recreational and scenic value (see Figure 15). Flagstaff Lake is the largest lake within the study area and undoubtedly a significant regional focal point. The distinctive Bigelow range to the south greatly enhances views from the lake as well as views around the region. The Kibby ranges are not particularly visible or noticeable from the lake and are seen at a considerable distance (about 15 miles).
Other important water bodies in the area include Jim Pond from which up to 24 turbines along the Kibby Range (B Series) could be visible (simulation) at a distance of about 5 miles. From most locations only 8-10 turbines would be visible at a time. This pond has public access and several private camps.
Chain of Ponds and especially Natanis Pond are very visible from Route 27 and are also considered to be high value recreational resources. The project would not be visible from Route 27 in views over Natanis Pond. The project would be most visible from the southern ponds, Bag and Lower from which up to 15 turbines may be visible from the eastern edges.
The project would be visible from portions of King and Bartlett Lake. The surrounding land is privately owned and accessible primarily to guests.

The project would be visible from a tiny portion of Holeb Pond on the northern shore, but would not be visible from Attean, Wood or Little Big Wood Ponds to the north, nor from Spencer Lake, Fish Pond or Enchanted Pond.

- Wilderness/Natural Areas

No designated wilderness areas occur within the study area.

- Historic Sites

Within the study area there are numerous old settlements, logging camps, and a few old farmsteads which are noted as historic sites. Nearly all are in forested settings and none of the sites are known to have potential views of the proposed project.

- **Designations of Local, State, or National Landscape Significance**

When a resource is identified in local, regional or state planning documents it implies increasingly broad public consensus as to the value and importance of the resource. Several sources were used in determining whether or not resources or local, state or national significance exist within the study area. The Comprehensive Land Use Plan (CLUP) of the Maine Land Use Regulation Commission identifies notable resources, and areas. Also the State of Maine Bureau of Parks and Lands lists parks, historic sites, trails and other areas of state wide importance. The Maine Department of Environmental Protection (DEP) has developed rules with respect to aesthetic impacts (Chapter 315: Assessing and Mitigating Impacts to Existing Scenic and Aesthetic Uses) and lists types of resources which should be protected. A search of Stratton and Flagstaff Lake region websites also reveals local resources that are of importance.

Within the study region the CLUP identifies two "major public lands within the jurisdiction used for recreational purposes" (Table 1, page 63). One is the federally owned Appalachian Trail a national park and national scenic trail which is mentioned numerous times in the CLUP and in the DEP rules on scenic resource protection. Although it is not within the 15-mile study area, the Appalachian Trail is within the larger region, and is the only resource of national significance. A second resource of state-wide significance noted in the CLUP is the Bigelow Preserve. Portions of the Bigelow Preserve along Flagstaff Lake are within the study area. Cranberry Peak is at the edge of the study area at 15 miles. The more prominent peaks are further: The Horns (16.5 miles away), West Peak (17.5 miles away) and Avery Peak (18 miles away). Crocker Mountain, the closest mountain along the AT west of Route 27/16 is about 21 miles away. The simulation from Avery Peak (Appendix D) shows that from the Bigelow Peaks the project is seen with a backdrop of more distant mountains which would further diminish its visibility. At these distances, it would be seen as a very small portion of a wide panorama of mountains, hills, and lakes.

In the Appendices, CLUP also lists lakes and ponds of value along with a scenic character rating. The following table lists lakes and ponds within the study area according to the management class. CLUP rates Scenic Character as outstanding (O),

significant (S) or unrated (-). We have included notes as to project visibility[11] and approximate distances from the proposed project where there is a potential for visibility.

Figure 15: Lakes and Ponds within 25 miles of the Proposed Kibby Wind Power Project					
Lake or Pond	**Township**	**Size (acres)**	**Visibility***	**Scenic Rating****	**Distance From Project* (miles)**
Management Class 1:High Value, Least Accessible, Undeveloped Lakes					
Enchanted Pond	Upper Enchanted	330	NV	O	
Jones Pond	Wyman	36	NV	-	
The Horn's Pond	Wyman	10	NV	O	
Dixon Pond	Pierce Pond	17	NV	-	
Little Enchanted Pond	Little Enchanted	35	NV	-	
Loon Pond	Attean	55	NV	-	
Tobey Pond #1	T05 R07 BKP WKR	35	NV	O	
Management Class 2: Especially High Value, Accessible, Undeveloped Lakes					
Attean Pond	Attean	2745	NV	O	
Chain of Ponds	Chain of Ponds	700	V	O	2
Crosby Pond	Coburn Gore	150	V	O	9
Flagstaff Lake	Dead River	20,300	V	S	9
Jim Pond	Jim Pond	320	V	O	4
Pierce Pond	Pierce Pond	1650	NV	O	
Spencer Lake	Hobbstown	1819	NV	O	
Tim Pond	Tim Pond	320	LV	O	11
Management Class 3: Potentially Suitable for Development					
Horseshoe Pond	Coburn Gore	37	V	-	9
Mud Pond	Jim Pond	14	NV	-	
Management Class 4: High Value Developed Lakes					
Arnold Pond	Coburn Gore	148	V	O	10
Holeb Pond	Holeb	1055	LV	O	13
Big Kennebago Lake	Davis	1700	LV	O	16
Management Class 5: Lakes Approaching Heavily Developed Status[12]					
Lower Enchanted Pond	Lower Enchanted	20	NV	-	
Northwest Pond	Massachusetts Gore	45	NV	-	
Shaw Pond	T03 R04 BKN WKR	45	NV	-	
Management Class 6: Remote Ponds					
Benjamin Pond	Attean	121	NV	-	
Boulder Pond	T05 R07 BKN WKR	30	NV	-	
Cedar Pond	Holeb	5	NV	-	
Clear Pond	Lowelltown	21	NV	-	
Clearwater Pond	Attean	34	NV	-	
Dixon Pond	Pierce Pond	17	NV	-	
Little Enchanted	Upper Enchanted	35	NV	-	
Gordon Pond	Upper Enchanted	28	NV	-	
Hall Pond	T05 R07 BKN	42	NV	-	

[11] Visibility indicates that the project or portions of the project would be visible from more than a very small area of the lake or pond. In most cases only a small portion of the proposed project would be visible. Distance is only listed for those locations from which the project may be visible.

[12] Management Class 5 also includes heavily developed lakes. None are in the study area.

Helen Pond	Peirce Pond	15	NV	-	
High Pond	Pierce Pond	7	NV	-	
Horseshoe Pond	Attean	50	NV	-	
Long Bog	Holeb	19	NV		
Long Pond	Attean	37	NV	-	
Loon Pond	Attean	37	NV	-	
Lost Pond	Attean	5	NV	-	
McKenney Pond	Upper Enchanted	9	NV	-	
Round Pond	Appleton	5	NV	-	
Tobey Pond #1	T05 R07 BKN	35	NV	-	
Tobey Pond #2	T05 R07 BKN	32	NV	-	
Tobey Pond #3	T05 R07 BKN	14	NV	-	
Unnamed Pond	Attean	12	NV	-	
Unnamed Pond	Attean	5	NV	-	
Unnamed Pond	Holeb	2	NV	-	
* Visibility: NV= no visibility; LV= limited visibility; and V= visibility					
** O=Outstanding; S= Significant; - = Unrated					

- **Number of Users**

To some degree the number of users affects the degree of sensitivity of a scenic or recreational resource. The study area is most heavily used for hunting, fishing, and snowmobiling. Camping, boating are also common, followed by hiking. Internet searches[13] for area outdoor activities direct those searching for hiking and canoeing to the Bigelow Range, Flagstaff Lake, and Chain of Ponds. Among hikers Kibby Mountain and Snow Mountain are less used.

- **Existing Development Context**

In evaluating sensitivity, the existing character of the surrounding area is important to assess. Generally a less disturbed landscape is more sensitive to human alternations than one which is already developed or altered. Although the Kibby ridges as well as the surrounding area have been heavily logged and are surrounded by numerous logging roads, there are few other permanent structures. From most viewpoints in the immediate vicinity (within 3 miles) the landscape appears to be a working landscape into which the introduction of wind turbines would seem reasonably compatible. Nevertheless, the wind turbines would result in contrast with the predominant elements in the landscape: evolving forest and roads. Wind turbines are large, white vertical elements which would appear different from existing landscape elements. From views further way (4-8 miles) the turbines would be most often seen from either roadways or ponds. In these settings cars, trucks and/or motorboats may be present along with camps. The turbines would occupy a smaller part of the overall views (where they are visible at all) but nevertheless would be elements that contrast with the surrounding green hills and other natural elements that tend to dominate views from many public use areas in the region. The vegetative management patterns become less distinct to the untrained eye at greater distances. At greater distances (over 8 miles), the turbines would become harder to see except in clear weather conditions, though they would be identifiable as distinctly human-made elements.

[13] Sites: Outdoors.mainetoday.com; trails.com

From few areas within the surrounding context is one far from evidence of timber harvesting. The predominance of a working landscape throughout the project study area suggests that the context is not one where an entirely undisturbed landscape setting is a predominant expectation.

- **Proximity to the project**

Proximity influences the prominence of a wind project in several respects. The turbines would appear larger in closer proximity and would occupy a larger part of the overall view. In some locations it may be possible to see project details such as roads and clearings. At very close range, sounds from the turbines may be audible, but this is not expected to affect any sensitive viewing areas near the Kibby Project. As noted above, the locations from which the project would be observed at close range tend to be those that are heavily logged with abundant evidence of associated logging equipment in the landscape. There are no sensitive viewing areas within the foreground (1/2 mile). The summit fire tower of Kibby Mountain is the closest viewing area at 0.6 mile away at the closest point and extending to 6.5 miles away at the farthest point (simulation).

Other relatively proximate viewpoints of the proposed project include Chain of Ponds (2-6 miles), Sarampus Falls (2 miles), and Jim Pond (5 miles).

- **Exposure or Duration of View**

Generally a quick glimpse of a project is less significant than seeing a project over an extended time or distance. From roads in the area the project would be seen only for short durations. It would be most prominent along Gold Brook Road where the two ridges come in and out of view on several occasions as one drives between Route 27 and Mile 10. Views of potentially longer duration would occur on Jim Pond while paddling along the western shoreline. Intermittent views are possible from small portions of Chain of Ponds. Similarly there would be potential views of long duration along some portions of Flagstaff Lake though from a very long distance. The direction, means and location of travel (motorized vs. non-motorized craft) on these lakes and ponds varies so exact durations of view and the degree to which it might interfere with particular activities is difficult to predict.

Project Related Factors

- **Scale of project**

Scale is a relative concept and must always be judged in relation to the surroundings of an object or group of objects. Scale refers to both the vertical height of the proposed project, as well as to the horizontal area it occupies. While the turbines themselves are extremely large, their size is difficult to distinguish from the smaller turbines such as those at Searsburg in Vermont unless they are seen side by side. The height of the turbines generally is problematic only when they overwhelm the size of the mountain or landform itself. On these large mountains of Maine the turbines appear relatively small. Perhaps more relevant is the overall area the project would occupy within views and the extent to which they dominate critical views (the

latter question is addressed further in the following section on visual impacts). Because the Kibby project is located on two ridges in a very complex system of numerous hills and mountains, it is difficult to see the entire project from most locations. Equally important in the perception of the scale of the project, is that it would be surrounded by numerous other undeveloped mountain peaks and ridges. From vantage points like Jim Pond, Chain of Ponds and Route 27 only a few of the turbines are seen at any one time. From all viewpoints numerous other undeveloped mountains and hills would dominate views. Views from these vantage points would remain predominantly natural. Even from the summit of Kibby Mountain and the fire tower the turbines would occupy a narrow arc of the view with the remaining views of undeveloped ridgelines. From this vantage point the turbines are seen below the viewer and with a background of distant mountains further reducing their apparent scale.

The turbines would occupy a larger portion of the view from Eustis Ridge but they would be seen at a considerable distance (8 miles away). The 24 B Series turbines would be the most noticeable from this vantage point while the A Series turbines are even farther at 13 miles away and are largely hidden by intervening hills.
From Flagstaff Lake it is the views to the south of the Bigelow Range that are dominant and seen at only 5 miles away whereas the Kibby Wind Power Project would be over 10 miles away and occupy only a small part of the overall views. From the Bigelow Mountains themselves the project is well over 15 miles away and the turbines are seen with a backdrop of more distant mountains which considerably reduces its scale and visibility.

- **Lighting**

Some of the turbines are expected to be lit at night with a slowly pulsing red light mounted on top of the nacelle. A recent FAA review suggested that a maximum of 25 of the 44 turbines would be lit. On very clear nights these lights may be visible from at least 10 miles, though they would be tiny and difficult to see from these distances. Red lights will result in less contrast with the dark night sky than white lights but would introduce an element that is not currently part of this landscape. The greatest impacts from night lighting would be to camps on ponds in close proximity and with views of the project. From Jim Pond, for example, lights may be visible on clear nights. The lights would not be visible from the two private campgrounds on Natanis Pond and Cathedral Pines, and are unlikely to be visible from most of the primitive campsites around lakes and ponds in the region. The lights would also be visible from a few homes along Porter-Nideau Road on clear nights.

- **Views of Roads and Power Lines and Other Project Infrastructure**

Views of other project infrastructure may exacerbate visual impacts by increasing visual clutter or perceived project scale. Some views will be inevitable from high elevation viewing areas, but if they are common or from highly sensitive viewing areas, or if large areas of project infrastructure are visible, the visual integrity of the mountain summits may be unduly compromised. In general there would be few off-site views of roads and power lines or power line clearing of the Kibby Wind Project.

Roads have been sited to avoid steeper slopes which would require greater cut and fill and removal of vegetation, and therefore avoid the potential for off-site visibility. Both the 34.5kV collection system and the 115kV transmission line are well sited to minimize views from sensitive off-site locations.

In general, the transmission corridor is designed to run along the grade or to be hidden behind other hills. Road crossings would be one of the few points of visibility, and selective clearing along with planted vegetation would help reduce its visibility of both the poles and the line clearing.

One of the more sensitive viewing locations would be from the trails on the Bigelow Range from which small portions of the transmission line corridor may be visible, but they will not be very noticeable. At a minimum of 2.5 miles away from the AT, the transmission line poles are not likely to be visible from ridgetop portions of the Trail. The poles would temporarily be visible from the AT near the Route 16/27 road crossing. The line will parallel an existing 115kV transmission line in this location adding an additional 125 feet to the existing 150-foot wide corridor clearing. Existing plantings help screen the existing Boralex transmission corridor and poles and similar plantings will be installed to screen the proposed transmission corridor.

Selective clearing practices along with new plantings will minimize visibility of the transmission line corridor and poles at road crossings including Route 16/27, Route 16 west of Stratton, and Route 27 north of Stratton. These settings are presently densely forested so that views of the poles would be minimal. Poles are also set back from each crossing a minimum of 100 feet, and in most cases much further. The Kibby Substation will be well screened from view with existing and if necessary, planted vegetation.

Roads are most likely to be visible from the Kibby Mountain fire tower, especially those in A Series. Some of these roads would be on the south side of the ridge and, therefore, not visible. A few sections of B Series roads and some openings may be visible from the Kibby Mountain fire tower. Some of the collector lines would be visible as well but most would be blocked by intervening topography. Views from Snow Mountain may include some road clearing along the western prong of the B Series, but the power line cut should be minimally visible. Some visibility of roads is possible along Gold Brook Road, but these should be minor and no more visible than existing logging roads in the area. No project infrastructure other than turbines would be visible from Chain of Ponds or Sarampus Falls. From Vine Road it is possible that some clearing around one turbine may be visible. From Jim Pond neither the roads nor the power line cut should be visible. No infrastructure should be visible from more distant viewing locations such as Eustis Ridge or Flagstaff Lake.

F. Assessment of Visual Impacts

This section provides an evaluation of whether the views of the project described above would result in undue visual impacts. In other words, would the project significantly degrade

important views throughout the region; or would it degrade particular scenic resources of statewide or national importance? Assessment focuses on the viewpoints that appear to be the most sensitive as well as the collective impacts throughout the region. Given the analysis above, the most significant resources within the study area are the lakes and ponds, especially those identified in the Maine CLUP as Management Class 2 and noted as "high value, accessible, undeveloped lakes." (See Figure 15) Class 1 lakes are significant as well but their inaccessibility makes the views less likely to be seen by recreationalists and there would be little visibility of the project from these lakes. Both the relatively undeveloped nature of the Class 2 lakes and ponds along with their accessibility makes them potentially more sensitive to the presence of a wind project in the view. Thus the analysis focuses on the aesthetic impacts to **Chain of Ponds, Jim Pond, Flagstaff Lake, Crosby Pond and Tim Pond.** Attean Pond, Pierce Pond, and Spencer Pond are also within the study area but would have no views of the proposed project. We also examine other viewpoints including Porter Nideau Road on Eustis Ridge, Kibby Mountain fire tower, Route 27, the Bigelow Range, and Cranberry Mountain though these viewpoints are considered less sensitive due to either very limited views, limited use, or to the considerable distance from the proposed project. Also discussed is the perception of remoteness around the project site. Finally, the overall impacts of the views of the project throughout the area are assessed.

The following standards, often used in evaluating the significance of aesthetic impacts and provide additional perspective as to how this particular project would affect views from the sensitive viewpoints described above.

- **Scenic Quality**

  Certain landscapes are recognized as having particular qualities that contribute to high scenic quality. Generally these qualities relate to landscape diversity and involve combinations of landforms with distinct shapes, rocky summits in combination with diverse vegetative patterns or unique water features. Often such landscapes are seen in photographs of the region, and the Bigelow Range especially in combination with Flagstaff Lake is a perfect example. Similarly the Appalachian Trail is recognized for its scenic attributes including numerous high-elevation open ridges with dramatic views. While the landscape around Kibby Mountain is certainly scenic in many respects, there is nothing distinct about this landscape that raises it into the category of having outstanding scenic beauty. Indeed, moderate scenic quality is actually preferred for wind projects rather than degraded landscapes where such projects may exacerbate visual clutter[14] (see below).

- **Intactness**

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[14] This is the author's opinion based upon observations of many wind projects. The repetition of like elements that are characteristic of wind projects is an aspect that may increase their visual appeal for many people. Repetition provides a sense of order which is an essential element of scenic quality in combination with diversity. When wind projects are sited in areas of good wind so that there is a visual connection between the site and the structures (moving blades) the sense of order is further enhanced. Often moderately scenic landscapes have an inherent simplicity or order. Numerous contrasting or disparate elements (e.g. cell towers, ski slopes, buildings, or wind turbines) when combined together may exacerbate visual clutter and landscape degradation.

Intactness refers to the degree to which the landscape retains either natural qualities or qualities inherent in pre-industrial agricultural or other types of cultural landscapes. From most foreground areas (within roughly a mile) logging activities dominate views, and include roads, machinery, piles of logs, and slash. From Route 27 which is protected by a vegetative buffer, logging activates are less obvious and to the average observer these ridges appear to be uniformly forested and therefore relatively intact. Most lakes and ponds are similarly protected by forested buffers, and the Class 2 lakes and ponds noted above are also relatively undeveloped with only a few camps around the shorelines. Thus, while the overall landscape may be considerably modified, the public value of leaving buffers around scenic resources such as lakes and ponds suggests that due consideration be given to the views from these areas.[15] Nevertheless, one is never far from evidence of logging activity in this landscape. This is characteristic of a working landscape where there is a close connection between resource (wind) and harvest (turbine). Within the study area there are no landscapes where explicit public values are expressed for retaining an experience of being in a wild and undisturbed landscape. Even the Sarampus Falls Picnic Area on Route 27 provides information about the strong historical connections between humans and the land.

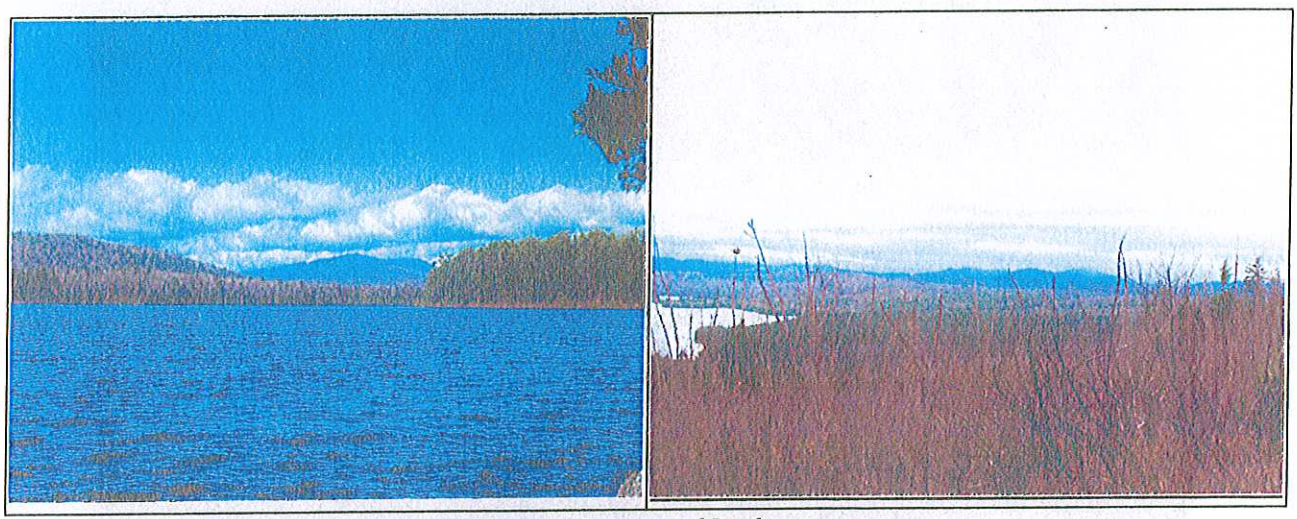


Figure 16. Logging and Landscape

From vantage points like Jim Pond (left) the harvesting practices on Kibby Range are noticeable but subtle due to the distance and buffers around the lake. In other areas such as the overlook on Flagstaff Mountain Road (right) foreground logging open up views, but forest practices on very distant mountains, like Kibby Range seen to the right behind Antler Hill cannot be perceived.

- **Focal Point**

  Distinct focal points often enhance scenic values. As noted many times earlier, the Bigelow Range forms the dominant focal point in this region and it is visually enhanced by the contrasting flat, watery landscape of Flagstaff Lake area often seen in the foreground. This is the iconic image of the Stratton/Eustis area. The so-called "Longfellows" (Crocker/Sugarloaf to Saddleback) are also a visually distinct

[15] It should be noted that vegetative buffers around lakes and ponds are intended for water quality protection as much as for scenic protection.

mountain chain the rises like a wall to the south. The prominent "Nubbles" contrast in form with surrounding more rolling mountains. The scree slopes on Crocker and Redington are also distinctive. Sugarloaf and Saddleback are also prominent and from a few locations their ski slopes are visible also drawing attention. No such distinguishing shapes or features distinguish the Kibby ranges. Many people, even locals have trouble picking them out in the landscape.

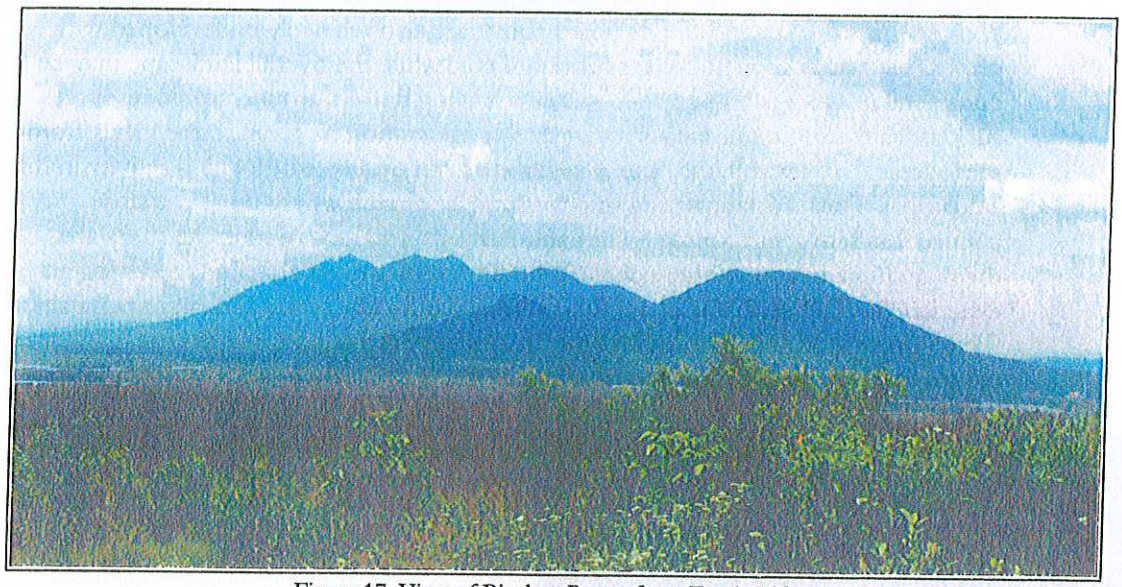


Figure 17. View of Bigelow Range from Eustis Ridge

Figure 18. View of the Eastern End of the Sugarloaf-Saddleback Range ("Longfellows")

- **Uniqueness**

  All landscapes are distinct in some way, but as noted above the Kibby ranges have no particularly distinct features. They are not the tallest mountains in the areas, nor are they known as important hiking destinations. The numerous lovely lakes, ponds, streams and wetlands in the surrounding area are important resources, but they are not unique.

  There are a few trails in the study area, but none are notable with the exception of the hikes in the Bigelows. These hikes however, are at a significant distance from the proposed project. There are informal trails and fire towers throughout the area that provide access to mountain summits and views above the trees.

- **Degree of Contrast**

  The concept of degree of contrast has been widely used in evaluating visual impacts, but it is a much more difficult test for wind turbines. There is no question that tall white wind turbines would contrast with their surroundings. They can't be screened and FAA strongly prefers white turbines. Ironically, it is contrast that contributes to scenic beauty in both natural and cultural landscapes (e.g. the dramatically steep Bigelows rising above placid Flagstaff Lake, the spire of classic white churches set on a town green, or vertical lighthouses on Maine's shorelines). It may even be this contrast that makes many people find wind energy projects attractive. White is a generally more attractive color than industrial gray (cell towers) and combined with the repetition of like elements and their logical link to a particular resource (wind) made observable with the turning blades, there may be both a contrast and a connection that works[16]. Nevertheless, even attractive elements are not appropriate everywhere, especially on sites with valued or identified scenic resources, or locations that are prominent within sensitive views.

  The Kibby Wind Power Project turbines would appear as contrasting elements in many views. At close range, the context of a working forest would reduce the contrast. From greater distances as viewed from lakes, ponds, and Route 27, the project would contrast with its surroundings, but in combination with the reasonable scale (few turbines seen at any one time) and the abundance of other hills and mountains that dominate all views, the project should fit reasonably well into most views around the area

- **Degree of Prominence of the Proposed Project**

  Degree of prominence is the extent to which the project would be seen throughout the region and the degree to which it stands out in particularly sensitive views. When a project becomes a strong focal point that conflicts with other important regional focal points, this may raise issues of undue prominence. Proximity to the project, number of turbines in the view, the duration of views, and the sensitivity of the viewing location or expectations of the viewer all play a role. As a rule, the Kibby

[16] Paul Gipe discusses the idea of the link between perceived utility and aesthetic preferences. See for example, Pasqualetti, M.J., P. Gipe, and R.W. Righter, eds. 2002. Wind Power in View: Energy Landscapes in a Crowded World. San Diego: Academic Press.

Wind Power Project would be seen very intermittently throughout the region. Its general prominence from sensitive viewing areas would be relatively low as follows:

- Chain of Ponds

Several factors reduce the prominence of the project from Chain of Ponds. Foreground ridges tend to block most views so that only the tops of about 5 turbines are seen from most locations. The lower end has the greatest exposure to views of the B Series turbines, but foreground trees would block most views. Route 27 runs along the east side of the lakes and its noise and visual presence diminish the sense of remoteness of paddling on the lake. From the road, however, Chain of Ponds contributes greatly to the visual experience of driving and no turbines would be seen in views of the Ponds.

- Jim Pond (Simulation)

From Jim Pond the project would be relatively prominent due to a combination of the extent of the lake from which the project would be visible, its relative proximity (4-5 miles) and its relatively undeveloped setting. Nevertheless, only 24 turbines along the eastern prong of B Series would be visible, and from most viewpoints only 8-10 are likely to be in the view at any one time. The view occupies a relatively small portion of the overall views around the pond which includes several foreground hills, wetlands to the northeast and views toward Round and Bag Pond Mountains. The project would not be visible from the two campsites on the Pond.

- Flagstaff Lake

As the largest and most heavily used lake in the region, Flagstaff Lake is an important regional resource. Several factors reduce the impacts of the project. At over 10 miles away from the project the turbines would appear tiny and occupy a very small portion of the views around the lake. Most importantly, the stunning views of the Bigelow Mountains from Flagstaff Lake tend to draw observers' attention in that direction. By contrast the Kibby ranges are extremely difficult to either identify or to see due to trees along most of the shoreline. The project ridges are behind trees from most of the campsites within the Bigelow Preserve. The project would not be visible from Meyer's Beach, a popular destination, which faces south to the Bigelow range with no views of the proposed project. There is the potential for views of the entire project from the lake itself, but at such great distances, the project would be difficult to see and certainly not be a prominent feature. Although the shoreline itself is largely undeveloped, the village of Stratton is on the shore along with the very prominent Stratton Energy Center.

- Tim Pond

Tim Pond is over 10 miles away and surrounded by trees. Where views of the project are possible at all, they would occupy a small portion of the views around the pond.

- Crosby Pond

Crosby Pond in Coburn Gore would be about 10 miles away from the proposed project with potential visibility of only 6 turbines. Only a small portion of the turbines are likely to be visible due to intervening ridges.

- Porter-Nideau Road (Eustis Ridge) (Simulation)

A few residents along Porter-Nideau Road would have views of most of the Kibby Range turbines (B Series). At about 8 miles away these would be

noticeable but not dominant in views. Lights would be visible on clear nights. These impacts would affect relatively few homes, would occur at a considerable distance away, and would have little effect on important public views in this area.

- Kibby Mountain Fire Tower (Simulation)

Views from the fire tower on Kibby Mountain would include the full sweep of the proposed project though it occurs in a relatively narrow arc of the entire 360° panorama. This impact also does not seem unreasonable given the relatively low use of this mountain, and the extensive remaining views toward numerous undeveloped mountains within the panorama. Moreover, the viewer looks down on the project so that it is seen with a backdrop of other mountains which would diminish the prominence of the project. The project ridges do not appear as critical, distinct, or dominant landforms within the view. Roads and logging activities are presently easily visible within close proximity. This is not a trail[17] or overlook that is noted in public documents as having particular scenic or recreational value and it is a single point, not an extended stretch or series of valued mountain summits with proximate views of the proposed project.

- Route 27 (Simulation)

Route 27 is the major public transportation route through the project area and is noted for its scenic character. The proposed project would not degrade the scenic character of this road since it is only very infrequently seen, and when seen only a few of the turbines would be visible. Only a few turbines would be seen from the Sarampus Falls Rest Area and are unlikely to detract from the scenic waterfall that is the focal point at this location. It is entirely possible that for travelers along Route 27, the turbines would appear as an attraction. The Searsburg wind turbines were noted on area scenic driving tours, as have other projects in New York been identified on area websites as something for visitors to see. There would be two transmission line crossings of Route 27, neither of which would be particularly noticeable. The crossing areas of heavily wooded and not in areas where there are other scenic features.

- Bigelow Mountains (Simulation)

The spectacular and popular views from the Bigelow Mountains would not be degraded by the proposed project which is located between 15-18 miles away. The project would be seen with a backdrop of more distant mountains from this location further diminishing its prominence and making it very difficult to see except in clear weather conditions. It would occupy only a very small portion of the overall views from these mountain summits.

- **Contribution to Visual Clutter**

Visual Clutter results from the cumulative effect of discordant built elements that contrast with surrounding patterns or surrounding elements of form, line, color and texture. This would not be an issue with the proposed project since visibility of project infrastructure other than turbines is expected to be minimal. The relative simplicity of this landscape generally, along with the generally horizontal and

[17] The trail to Kibby Mountain is listed in the Appalachian Mountain Club's guidebook to the High Peaks region of Maine along with hikes up numerous other mountains in the area.

unspectacular ridges with uniform forest cover would further reduce any concerns with visual clutter. Wind projects often appear less cluttered than other forms of development due to the repetition of repeated simple forms, especially when there is no other existing site development such as cell tower or buildings. Project infrastructure is expected to be visible primarily from the Kibby Mountain fire tower. Roads are already part of the view from this perspective and the visibility of roads along the ridge would not result in excessive visual clutter. The transmission line will be visible briefly at road crossings. Existing woods at these areas will substantially screen the line from view. The views of the transmission line from the AT are in the context of an existing transmission line corridor and Route 27 and impacts are likely to be minimal.

- **Impacts to Wildlands**

During public meetings and field visits some people expressed concerns about introducing a wind energy project into an area where there is currently minimal development with the exception of logging roads and logging activities. The Boundary Mountains is an area that is viewed as still retaining a sense of wildness. The protection of wildlands is a subject worthy of consideration, but at present there are no designations which provide a meaningful basis for evaluating important wildland values or how they should be judged. Neither the project site, nor its surroundings have been designated as wildlands or roadless areas.

The project is unlikely to substantially diminish the sense of remoteness of the surrounding area. There is an impressive array of mountain ridges and hills surrounding the project in all directions. Some of the most scenic, most visually diverse, and least disturbed areas are north and east of the project site along Spencer Road. The project would not be seen from most of this area.

Additionally wind turbines are generally very quiet. Unlike housing developments, wind farms are seldom full of people, traffic, or activity.

- **Mitigation Potential**

Mitigation assumes that a reasonable site has been selected and that a reasonable fit can be achieved through project design or off-site compensations. The site for this project has been very well selected for minimal visual impacts in numerous respects. Other ridges were considered for development but rejected in order to retain a project of a reasonable scale in relation to its surroundings. The site was also selected for reasonably accessible terrain and minimal disturbance of areas over 2700 feet (823 m). The highest summit of Kibby Mountain would remain undeveloped. The Kibby ridges are not visual distinctive ridges within the region and the Kibby Mountain ridge (A Series) is very difficult to see from almost anywhere. The complex ridgelines and numerous intervening ridges mean that in most views only a few of the turbines can be seen. It also means that in nearly all views there are numerous other mountains that can be seen as well.

In addition roads and power lines have been well sited and designed to reduce visual impacts. Existing logging roads are used where possible. Generally roads have been placed on the western slopes to avoid visibility from sensitive viewing areas such as Jim Pond and Route 27. Power line corridors have been similarly sited so that existing topography screens the corridor from view. Where the transmission line corridor approaches the Appalachian Trail near Route 16/27, TransCanada will work with the National Park Service with regard to appropriate routing and design to address potential visual concerns. Screen plantings similar to those installed for the existing and adjacent Boralex transmission line have been proposed.

Benefits of the project would include an open access agreement that would allow recreational use of the property for hunting, snowmobiling and other recreational pursuits. While other mitigation measure will be considered as we continue to evaluate the proposed project, the project as currently designed fits very well with relatively few adverse impacts and none that could be considered undue.

G. Rezoning Criteria and Land Use Review Standards for Determining Acceptable vs. Undue Aesthetic Impacts

The analysis above demonstrates that while the proposed Kibby Wind Power Project would affect views from a few locations, it by no means reaches a level of undue aesthetic impacts. No project can avoid visibility from some residences and some recreation areas. However, neither the ridges themselves nor the views of the project involve unique or highly significant scenic resources. The project would not detract from important regional focal points and would generally be a subordinate element in nearly all views around the area.

The LURC review process in this case must first determine that a zoning change for the project ridges is warranted. Portions of the proposed project would be located in areas currently zoned as General Management (M-GN) while areas over 2700 feet (823 m) in elevation are zoned as High Mountain Areas (P-MA). Regarding the P-MA areas, the CLUP notes the "fragile nature of these environments" (page 54) as well as the "mountains and the scenic, natural, recreational, economic and other values they possess are limited resources in Maine." Wind power unlike many forms of development must be located where wind resources are, and the high mountains of Maine offer some of the best sites within the northeastern United States. If we assume alternative, non-polluting power is essential, the goal is to find sites on which a project can be designed that would minimize impacts to fragile and unique resources. Many high elevation mountains will not be appropriate due to the particular resources involved such as overly steep terrain or unique scenic values. The site must also be able to accommodate associated infrastructure without resulting in high visibility of roads or power lines from off site scenic viewpoints.

From a visual point of view the Kibby Ranges are relatively indistinct horizontal ridges, difficult to see from most locations, and are relatively low in elevation in relation to many surrounding mountains in the region. Nor are they near the more scenic and popular recreational resources. The terrain allows roads to be designed at modest grades without requiring significant cut and fill. The highest summit in the range and the site of the Kibby Mountain fire tower would remain undisturbed while the lower elevation ridges to the south

would be developed. These ridges are lower than many surrounding mountains and considerably lower than the much more visually prominent mountains to the south such as the Bigelow Range, Black Nubble, Redington, Crocker, Sugarloaf to Saddleback mountains many of which are close to or over 4000 feet in elevation. Numerous mountains surrounding the Kibby ridges would not be developed and would continue to provide intact high elevation environments. Visually there is an inherent fit when wind energy projects are located on sites where there is an excellent wind resource, especially when the ridges involved are not visually distinctive in form or location, and are not unreasonably visible or prominent from surrounding sensitive use areas.

The general standard for approval of the proposed projects under LURC review is as follows:

> *Adequate provision has been made for fitting the proposal into the existing natural environment in order to assure there will be no undue adverse effect on existing uses, scenic character, and natural and historic resources in the area likely to be affected by the proposal. (LURC rules Section: 10.24 General Criteria for Approval of Permit Applications)*

Assessment:
The project is located within a scenic but not spectacular area that includes numerous mountain peaks, streams and ponds. Forest harvesting is an integral part of the landscape historically and today. While portions of the project are visible from many ponds in the area, views of turbines would not dominate the views in the region generally or from any particular viewing locations. From most viewpoints, only a few of the turbines would be visible. Neither the ridges themselves, nor views of the project ridges are unique or distinct.

Other more specific review criteria are:

2. *Scenic Character*
   a. *The design of a proposed development shall take into account the scenic character of the surrounding area. Structures shall be located, designed and landscaped to reasonably minimize their visual impact on the surrounding areas, particularly when viewed from existing roadways or shorelines,*
      Assessment:
      Siting is critical with wind energy projects and the proposed Kibby Wind Power Project is extremely well sited to minimize views from sensitive public viewing areas. The wind turbines cannot be hidden from view, but intervening hills, mountains and ridges minimize the numbers of turbines that can be seen from viewing areas, and in most cases block views entirely. Site terrain is generally moderate in slope so that roads and transmission lines can be constructed with minimal site alterations and with very little off-site visibility.

   b. *To the extent practicable, proposed structures and other visually intrusive development shall be placed in locations least likely to block or interrupt scenic views as seen from traveled ways, water bodies, or public property.*
      Assessment:

The project would not block or interrupt scenic views or be visually intrusive from any public viewing locations. Views from public roads are intermittent and infrequent. From areas accessible from hiking trails the project occupies a small portion or the overall views; and in most cases is seen at a considerable distance. From the shorelines and water bodies from which the project would be visible, it would not dominate views. Because the project is located along two ridgelines, and is surrounded by numerous other mountains and hills, it visibility is extremely limited and most often only portions of the project would be visible, if at all, especially from nearby viewing areas.

c. *If a site includes a ridge elevated above surrounding areas, the design of the development shall preserve the natural character of the ridgeline. (LURC Rules Section 10.25.E.1 Scenic Character, Natural and Historic Features)*
Assessment:
Viewed from offsite locations the wind turbines would be seen emerging from the forested ridgeline. One exception would be the Kibby Mountain fire tower from which the project would be seen below the viewer receding to the south. This would be the only vantage point from which project infrastructure including some roads and site clearing would be visible. Even from this vantage point, most of the ridge forest would remain intact. Existing logging roads and clear cuts are currently visible from this vantage point.

H. Conclusions

The Kibby Mountain Wind Project would not have undue adverse impacts on the scenic and natural beauty of the surrounding area. The project is very well sited and designed. No wind project can be hidden from view, but this project would result in no undue impacts to highly valued or unique scenic resources. The Boundary Mountains consist of abundant mountains, lakes and streams. It is a scenic but not spectacular landscape with none of the mountains exceeding 4000 (1220 m) feet and the project ridges not among the highest even within its surroundings. The summit of Kibby Mountain, the highest portion of the project ridges and the site of a fire tower overlook, would not be developed. The complex system of numerous mountains limits visibility from most viewpoints. The proposed project would be over 15 miles from the closest point along the Appalachian Trail. The spectacular Bigelow Mountains form the dominant focal point in the region and most views are oriented in that direction. The numerous lakes and ponds are the primary scenic resource surrounding the project site and visibility from these is limited. Where there are views they are generally of only a portion of the project. The proposed project would not be a dominant element in any views. Project infrastructure such as roads and transmission lines would be minimally visible off site.

APPENDIX A

VIEWSHED MAPS

- Project Map
- 15-Mile Radius Viewshed
- 20-Mile Radius Viewshed
- Viewshed Methodology

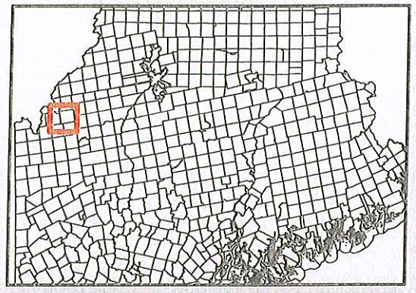
Map 1: Kibby Wind Power Project Detail

Kibby Township, Maine, USA

Legend

- Meteorological Towers
- Proposed Wind Turbines
- Report View Points
- Proposed 115 Kv Transmission Line
- Appalachian Trail
- Project Road/Trail
- Rivers and Streams
- Lakes and Ponds
- 500ft Contours
- 60ft Contours
- County Boundaries
- Town Boundaries

View Points Yellow = Has Simulation	
Point ID	Description
1	Spencer Bale Road
2	Kibby Mountain Fire Tower
3a-f	Goldbrook Road
4a-b	Wahl Road
5	Route 27
6	Sarampus Falls Picnic Area
7	Chain of Ponds
8	Spectacle Pond
9	Jim Pond
10	King and Bartlett Lake
11a-b	Eustis Ridge Porter Nideau Road
12	Flagstaff Road/Dead River Causeway
13a/b	Flagstaff Lake
14	Tim Pond
15	Flagstaff Mountain Road
16	Cranberry Peak
17	Bigelow Range / Appalachian Trail
18	Crocker Mountain
19	Jackman Rest Area



View Shed Analysis Technical Information	
Turbine Manufacturer	Vestas
Turbine Model	V90-3.0 MW
Turbine Height (tip of blade)	125 m / ~410 ft.
Vegetation Height Used	12.192 m / 40 ft.
Landcover Types Chosen As 'Forest' (for vegetation height increase)	upland coniferous forest, upland deciduous forest, upland scrub/shrub, estuarine shrub (E2SS), marine sand/mud shore (M2US), coniferous swamp (PFOcon), deciduous swamp (PFOdec), coniferous shrub swamp (PSScon), upland mixed forest
Date of Landcover Data	1997
Width of Road Buffer Applied Against Vegetation Increase	10.9728 m / 36 ft.
Width of River Buffer Applied Against Vegetation Increase	12.192 m / 40 ft.
Analysis Radius	20mi.
Earth Curvature Correction Used?	Yes
Viewshed Analysis Software	PC ArcInfo/Desktop 9.1
DEM Accuracy	1/3 Arc Second / 10m
DEM Source	http://seamless.usgs.gov
Data Sources	10m DEM: USGS; Turbine Locations and Project Specific Data: AMEC; All other data: Maine GIS (http://apollo.ogis.state.me.us/catalog/)
Unit Used For Calculations	Meters
Map Prepared By	STONE ENVIRONMENTAL INC

0 0.5 1 2 3 Miles

N W E S

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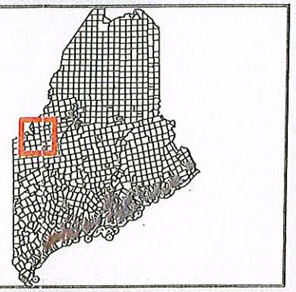
Map 2: Viewshed Analysis of Kibby Wind Turbines – 15 Mile Radius

Kibby Township, Maine, USA

Legend

- Meteorological Towers
- Proposed Wind Turbines
- Report View Points
- Proposed 115 Kv Transmission Line
- Appalachian Trail
- Project Road/Trail
- Rivers and Streams
- Lakes and Ponds
- County Boundaries
- Town Boundaries
- 1 - 18 Turbines Visible in Forest
- 19 - 34 Turbines Visible in Forest
- 35 - 51 Turbines Visible in Forest
- 1 - 18 Turbines Visible in Clearing
- 19 - 34 Turbines Visible in Clearing
- 35 - 51 Turbines Visible in Clearing

View Points	
Yellow = Has Simulation	
Point ID	Description
1	Spencer Bale Road
2	Kibby Mountain Fire Tower
3a-f	Goldbrook Road
4a-b	Wahl Road
5	Route 27
6	Sarampus Falls Picnic Area
7	Chain of Ponds
8	Spectacle Pond
9	Jim Pond
10	King and Bartlett Lake
11a-b	Eustis Ridge Porter Nideau Road
12	Flagstaff Road/Dead River Causeway
13a/b	Flagstaff Lake
14	Tim Pond
15	Flagstaff Mountain Road
16	Cranberry Peak
17	Bigelow Range / Appalachian Trail
18	Crocker Mountain
19	Jackman Rest Area

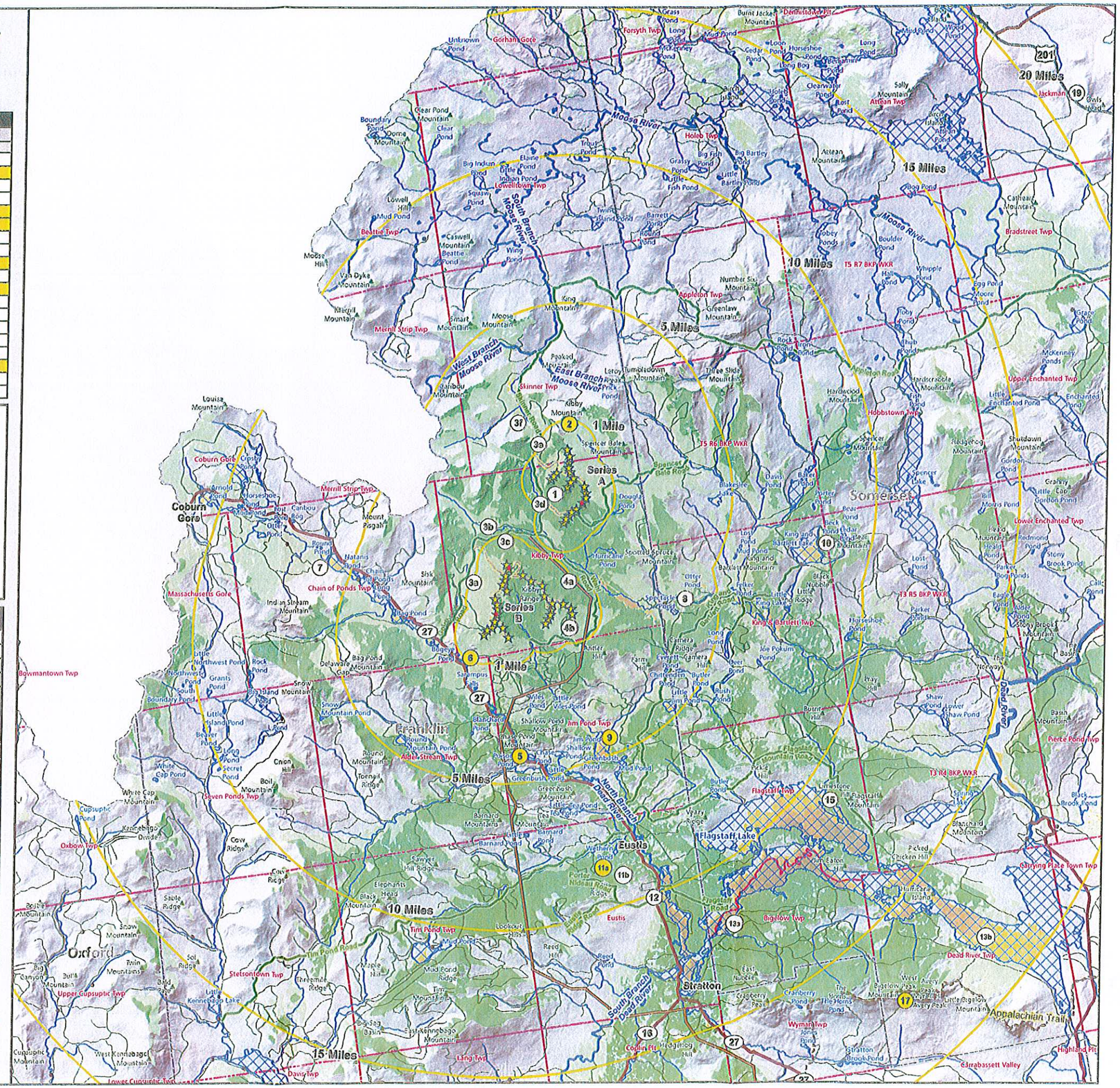


View Shed Analysis Technical Information	
Turbine Manufacturer	Vestas
Turbine Model	V90-3.0 MW
Turbine Height (tip of blade)	125 m / ~410 ft.
Vegetation Height Used	12.192 m / 40 ft.
Landcover Types Chosen As 'Forest' (for vegetation height increase)	upland coniferous forest, upland deciduous forest, upland scrub/shrub, estuarine shrub (E2SS), marine sand/mud shore (M2US), coniferous swamp (PFOcon), deciduous swamp (PFOdec), coniferous shrub swamp (PSScon), upland mixed forest
Date of Landcover Data	1997
Width of Road Buffer Applied Against Vegetation Increase	10.9728 m / 36 ft.
Width of River Buffer Applied Against Vegetation Increase	12.192 m / 40 ft.
Analysis Radius	20mi.
Earth Curvature Correction Used?	Yes
Viewshed Analysis Software	PC ArcInfo/Desktop 9.1
DEM Accuracy	1/3 Arc Second / 10m
DEM Source	http://seamless.usgs.gov
Data Sources	10m DEM: USGS; Turbine Locations and Project Specific Data: AMEC; All other data: Maine GIS (http://apollo.ogis.state.me.us/catalog/)
Unit Used For Calculations	Meters
Map Prepared By	STONE ENVIRONMENTAL INC

0 2.5 5 10 Miles

N W E S

O:\Proj-06\1826-G Kibby\Mtl\Wind\Port\Data\Maps\Documents\Kibby Base-Stone 11x17 v4 Map 2.mxd 2006/12/20 NEF/DJH



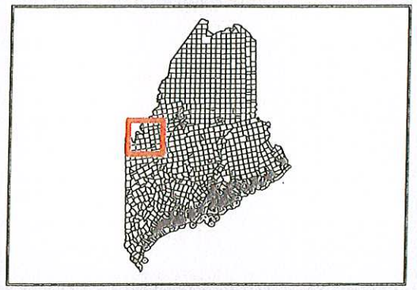
Map 3: Viewshed Analysis of Kibby Wind Turbines – 20 Mile Radius

Kibby Township, Maine, USA

Legend

- Proposed Wind Turbines
- Meteorological Towers
- Proposed 115 Kv Transmission Line
- Appalachian Trail
- Project Road/Trail
- Rivers and Streams
- Lakes and Ponds
- County Boundaries
- Town Boundaries
- Forested, Turbine Visible
- Non-Forested, Turbine Visible
- Forested, Turbine Not Visible
- Non-Forested, Turbine Not Visible

View Points	
Yellow = Has Simulation	
Point ID	Description
1	Spencer Bale Road
2	Kibby Mountain Fire Tower
3a-f	Goldbrook Road
4a-b	Wahl Road
5	Route 27
6	Sarampus Falls Picnic Area
7	Chain of Ponds
8	Spectacle Pond
9	Jim Pond
10	King and Bartlett Lake
11a-b	Eustis Ridge Porter Nideau Road
12	Flagstaff Road/Dead River Causeway
13a/b	Flagstaff Lake
14	Tim Pond
15	Flagstaff Mountain Road
16	Cranberry Peak
17	Bigelow Range / Appalachian Trail
18	Crocker Mountain
19	Jackman Rest Area



View Shed Analysis Technical Information	
Turbine Manufacturer	Vestas
Turbine Model	V90-3.0 MW
Turbine Height (tip of blade)	125 m / ~410 ft.
Vegetation Height Used	12.192 m / 40 ft.
Landcover Types Chosen As 'Forest' (for vegetation height increase)	upland coniferous forest, upland deciduous forest, upland scrub/shrub, estuarine shrub (E2SS), marine sand/mud shore (M2US), coniferous swamp (PFOcon), deciduous swamp (PFOdec), coniferous shrub swamp (PSScon), upland mixed forest
Date of Landcover Data	1997
Width of Road Buffer Applied Against Vegetation Increase	10.9728 m / 36 ft.
Width of River Buffer Applied Against Vegetation Increase	12.192 m / 40 ft.
Analysis Radius	20mi.
Earth Curvature Correction Used?	Yes
Viewshed Analysis Software	PC ArcInfo/Desktop 9.1
DEM Accuracy	1/3 Arc Second / 10m
DEM Source	http://seamless.usgs.gov
Data Sources	10m DEM: USGS; Turbine Locations and Project Specific Data: AMEC; All other data: Maine GIS (http://apollo.ogis.state.me.us/catalog/)
Unit Used For Calculations	Meters
Map Prepared By	STONE ENVIRONMENTAL INC

0 2.5 5 10 Miles

N W E S

O:\Proj-06\1825-G (KibbyMtWndPwrData\MapDocuments\Kibby Base-Stone 11x17 v4 Map 3.mxd 2006/12/20 NEF/DJH

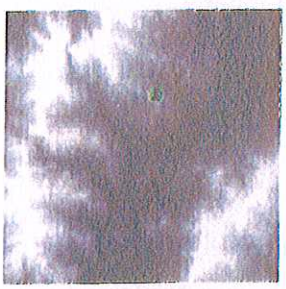
Appendix A: Methodology for Performing a viewshed analysis

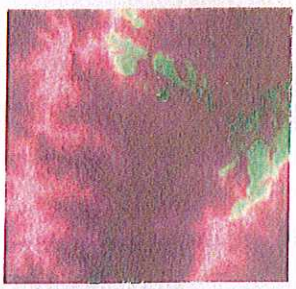
Viewshed identifies the cells in an input raster that can be seen from one or more observation points or lines. Each cell in the output raster receives a value that indicates how many observer points can be seen from each location. If you have only one observer point, each cell that can see that observer point is given a value of 1. All cells that cannot see the observer point are given a value of 0. The observer points feature class can contain points or lines. The nodes and vertices of lines will be used as observation points.

Why calculate viewshed?

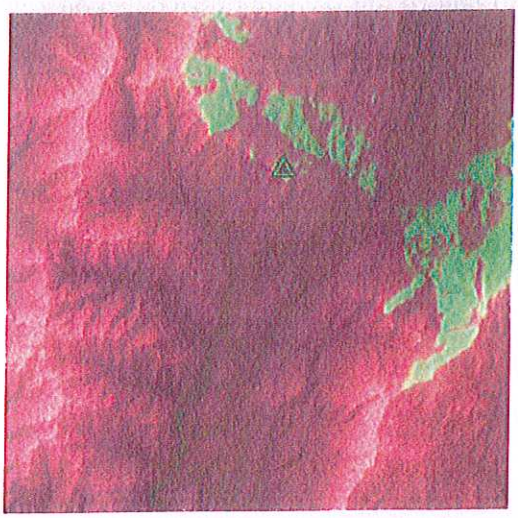
Viewshed is useful when you want to know how visible objects might be—for example, from which locations on the landscape will the water towers be visible if they are placed in this location? or What will the view be like from this road?

In the example below, the viewshed from an observation tower is identified. The elevation raster displays the height of the land (darker locations represent lower elevations), and the observation tower is marked as a green triangle. The height of the observation tower can be specified in the analysis. Cells in green are visible from the observation tower, and cells in red are not visible.





Displaying a hillshade underneath your elevation and the output from the Viewshed function is a useful technique for visualizing the relationship between visibility and terrain.

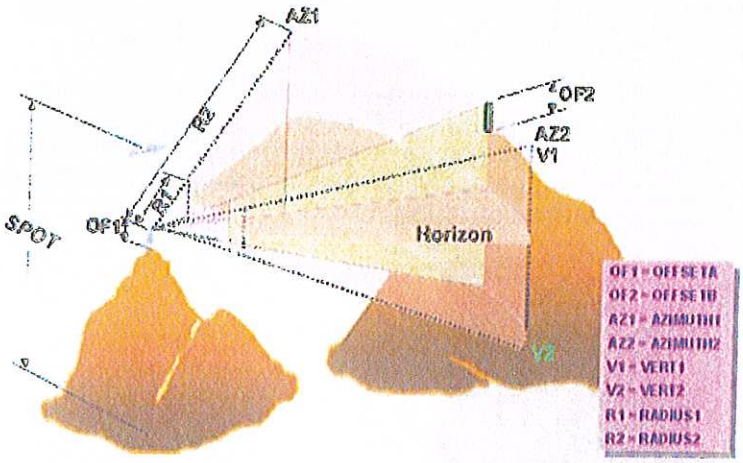


Not only can you determine which cells can be seen from the observation tower, if

you have several observation points, you can also determine which observers can see each observed location. Knowing which observer can see which locations can affect decision making. For example, in a visual quality study for siting a landfill, if it is determined that the proposed landfill can only be seen from dirt roads and not from the primary and secondary roads, it may be deemed a favorable location.

Controlling the viewshed

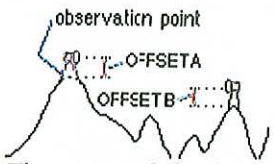
The image below graphically depicts how a viewshed is performed. The observation point is on the mountain top to the left (at OF1 in the image). The direction of the viewshed is within the cone looking to the right. You can control how much to offset the observation point (for example, the height of the tower), the direction to look, and how high and low to look from the horizon.



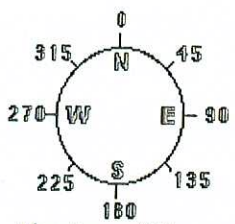
There are nine characteristics of the viewshed that you can control:

1. The surface elevations for the observation points (Spot)
2. The vertical distance in surface units to be added to the z-value of the observation points (OffsetA)

3. The vertical distance in surface units to add to the z-value of each cell as it is considered for visibility (OffsetB)

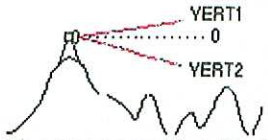


4. The start of the horizontal angle to limit the scan (Azimuth1)
5. The end of the horizontal angle to limit the scan (Azimuth2)

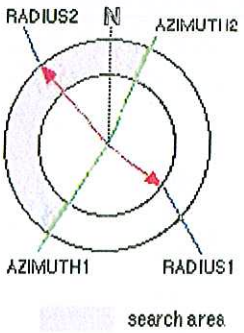


6. The top of the vertical angle to limit the scan (Vert1)

7. The bottom of the vertical angle to limit the scan (Vert2)



8. The inner radius that limits the search distance when identifying areas visible from each observation point (Radius1)
9. The outer radius that limits the search distance when identifying areas visible from each observation point (Radius2)



Source: ESRI, ArcGIS Help Files, "Performing a viewshed analysis, General concepts of spatial analyst tools", Version 9.1, 2005

APPENDIX B

TABLE OF VIEWS

APPENDIX B

Table of Views

KIBBY WIND PROJECT

Table of Views

The following table provides a summary of viewpoints of the proposed Kibby Wind Project. Photographs illustrating most locations are found in Appendix C. Viewpoints from which simulation photomontages were created are noted (see Appendix D) and calculated to the closest and the farthest turbine. Viewpoints are generally organized from closest to farthest away. Duration of view indicates an approximate distance of possible views along segments identified. The number of turbines indicates all potential turbines that can be seen along a segment of travel. Not all will necessarily be seen from individual points.

Viewpoint/ Photo #	Location	Distance To Nearest/Farthest Visible Turbine (miles)	Approximate Duration of View (miles)	Number of Turbines in View	Notes
1	Spenser Bale Road	.2/4	.5	15	Spenser Bale Road is a private logging road and would provide access to the proposed project. It runs along the southern end of the Series A ridge. Logging activities open up views to both the Kibby Range and to turbines along Kibby ridge (series A)
2 **Simulation**	Kibby Mountain Fire Tower	.6/7.1	Point	44	Seen as part of a 360° panorama within relatively narrow arc to south and southwest; project viewed below the observer and seen with backdrop of distant mountains; portions of roads and project site clearing will be visible.
3a-f	Gold Brook Road	.8/3.3	.5 Intermittently	27	This is one of the more heavily used private logging roads in the area. Project ridges are glimpsed intermittently and in some cases portions would be seen directly ahead in views.
4a/b	Wahl Road	1.1/4.7	.5 Intermittently	26	Turbines as well as the substation, collector lines and transmission line will be visible along Wahl Road. Currently there is extensive logging activity along this road.
5 **Simulation**	Route 27	1./6	.5 Intermittently	22	Visible from the vicinity of Vine Road and around Sarampus Falls Picnic Area; most views along Route 27 are of other area mountains. Possibility of views from Stratton village but intervening buildings and trees combined with the distance (10 miles) will make them extremely difficult to see.

6 **Simulation**	Sarampus Falls Picnic Area	1.4/1.9	Point	6	The turbines will be difficult to see from the picnic area but the tops of turbines will be visible from the grassy area near the River and Falls.
7	Chain of Ponds	1.9/3.8	1 mile Intermittently	15	Only three turbine blades will be visible from Natanis Pond, but more will be visible along the eastern sides at the lower end of the Chain of Ponds, especially from Lower Pond.
8	Spectacle Pond	3.6/6.1	2/3 of pond	12	Viewshed analysis indicates potential views of up to 12 turbines from the eastern side of the pond.
9 **Simulation**	Jim Pond	4/7.5	Most of Pond	24	The project would not be visible from the boat launch areas or campsites, but a portion of the Kibby Range (Series B) would be visible from camps around the pond and from the pond itself.
10	King and Bartlett Lake	7.5/9.7	Half of Pond	16	The project will be visible from the southeastern portions of the pond. It would not be visible from the camp area.
11a-b **Simulation**	Eustis Ridge Porter Nideau Road	9/15	.2	42	Project would be glimpsed from the road in two locations by open meadows but more visible to homes in the area.
12	Flagstaff Road/Dead River Causeway	9.9/15.1	.1	37	The causeway crosses the Dead River with lovely views looking south to the Bigelow Range; the Kibby Range (Series B) is visible to the northwest.
13a/b	Flagstaff Lake	10-20	Half the Pond	44	Larger trees along the shoreline block many views around the lake, but the project would be visible from some open water areas and from a few campsites such as Safford Brook,. Views around the lake tend to be focused on the dramatic Bigelow Range
14	Tim Pond	11/18	¼ of Pond	24	Project may be visible from the southern portions of Tim Pond
15	Flagstaff Mountain Road	11.3/15	.1	44	At the height of land on the flanks of Flagstaff Mountain there is a viewpoint overlooking Flagstaff Lake. The Kibby ranges are visible at the edge of the view.
16	Cranberry Peak	15/20	Point	44	A popular and relatively easy hike in the Bigelows with a broad panorama including the Kibby ranges.

17 **Simulation**	Bigelow Range/Appalachian Trail[1]	15.7/20	.5	44	The project ridges are seen in the background with a backdrop of more distant mountains so that the turbines would be difficult to see. Part of large panorama of views. Clearing for the transmission line as it crosses the Bigelow preserve may be visible from some vantage points on the Bigelow range.
18	Crocker Mountain	21/27	Point		Only a portion of the project ridges are seen from this viewpoint. The Bigelow Range is prominent in the foreground while the Kibby ranges are seen in the background along with other mountains.
19	Jackman Rest Area	21/27	Point		A relatively small portion of the Kibby range is visible from this point. Numerous intervening ridges and great distance would make the project difficult to see.

[1] The Appalachian Trail and the Jackman Rest Area are outside the 15-mile study area but are included here as significant viewpoints just beyond 20 miles of the nearest turbine. Data for numbers of turbines in the view is not available outside the 20-mile radius study area.

APPENDIX C

PHOTOGRAPHS

- Views of Project Site
- Views of Project Site from Surrounding Areas
- Views of Transmission Line Crossing Locations

APPENDIX C

Photographs of the Site and Surrounding Areas

VIEWS OF THE PROJECT SITE

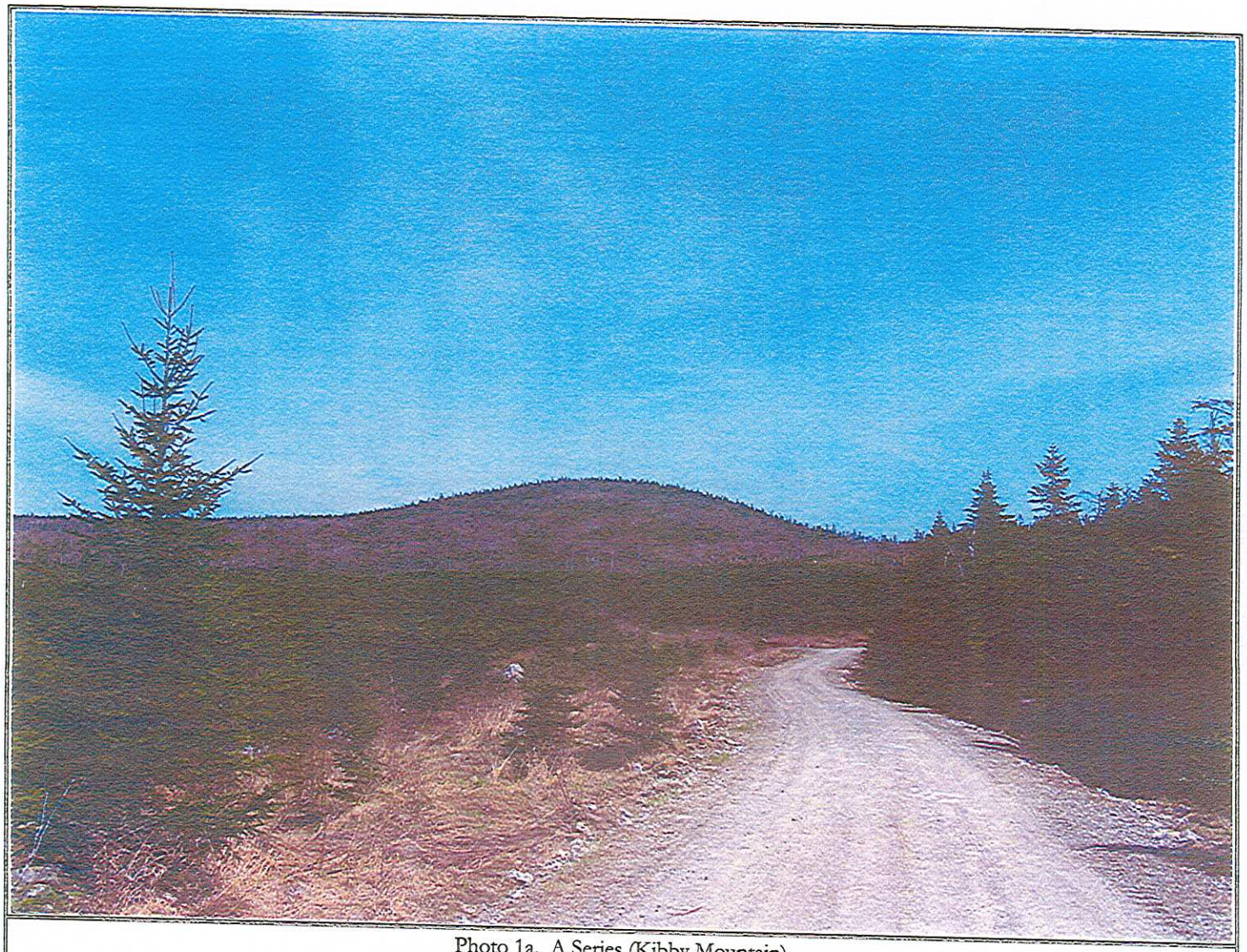


Photo 1a. A Series (Kibby Mountain)
View to met tower from Spencer Bale Road

Photo 1b. View to B2 Meteorological Tower from Logging Road on Site

VIEWS OF THE KIBBY PROJECT RIDGES FROM SURROUNDING AREAS

The following photographs illustrate views from roads and recreation areas surrounding the projects site. Photo numbers are keyed to the Viewshed Maps (Appendix A). Photographs are unavailable for a few points for which visibility was determined from the viewshed map only. For several of the viewpoints simulation photographs illustrating how the project would appear can be found in Appendix D. All photographs were taken at a 50mm equivalent focal length unless otherwise noted. Distances to the nearest proposed turbine are indicated in parentheses. In a few instances, photographs illustrate views seen from the viewpoint in directions other than toward the project site (e.g photos 2c-h from Kibby Mountain Fire Tower and views toward the Bigelow and Sugarloaf-Saddleback Ranges).

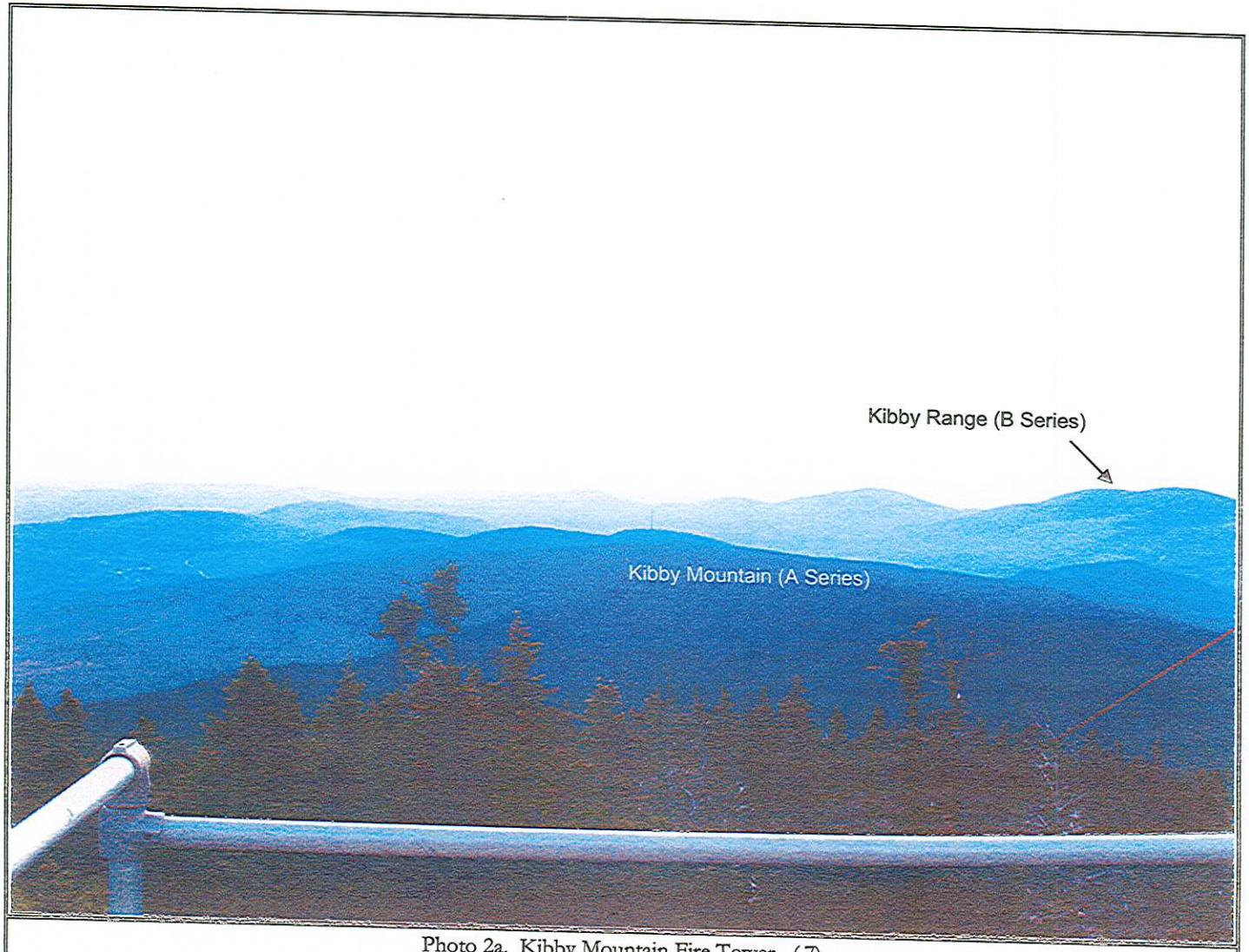


Photo 2a. Kibby Mountain Fire Tower (.7)
A Series ridge is directly ahead with the met tower visible.

Photo 2b. Kibby Mountain Fire Tower (.7)
Looking southwest over foreground ridge (A Series) to Kibby Range beyond (B Series)

Views Around Kibby Mountain Outside the Project Area[1]

The following six photographs illustrate the panorama of views from the Kibby Mountain Fire Tower in which the project would not be seen.

Photo 2c. Southeast of project site to King and Bartlett Lake
Spenser Bale Mountain at left

Photo 2d. Southwest of project site to Gold Brook Road in Valley,
and unnamed mountains to right.

[1] Views toward Flagstaff Lake and the Bigelow and Longfellow Ranges are not illustrated due to extensive haze at that distance on the day of the visit.

Photo 2e. NE toSpencerBale Mountain (right); Kibby Mountain (left); Tumbledown beyond.

Photo 2f. View West to Unnamed Mountains

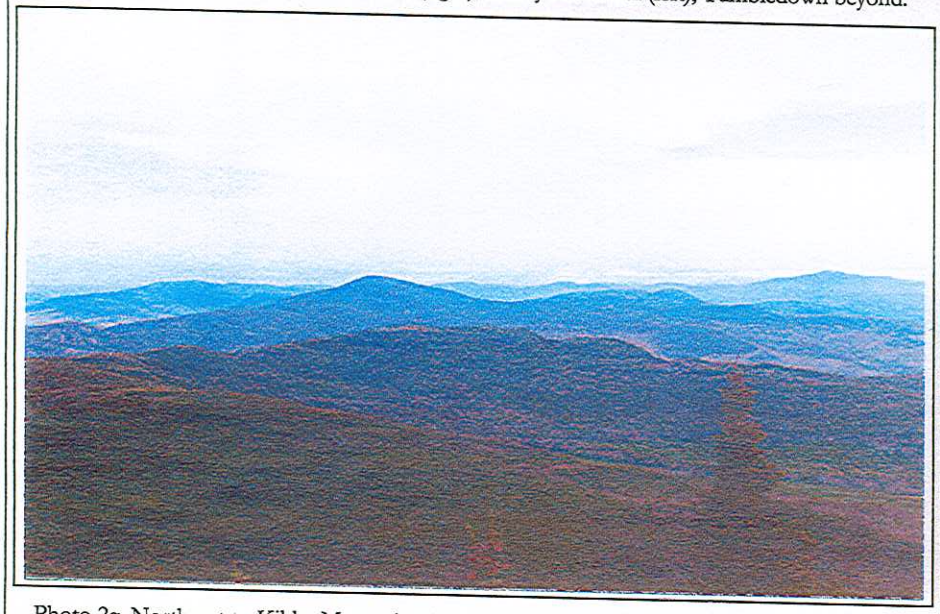


Photo 2g. Northeast to Kibby Mountain (foreground ridges); Tumbledown Mountain beyond.

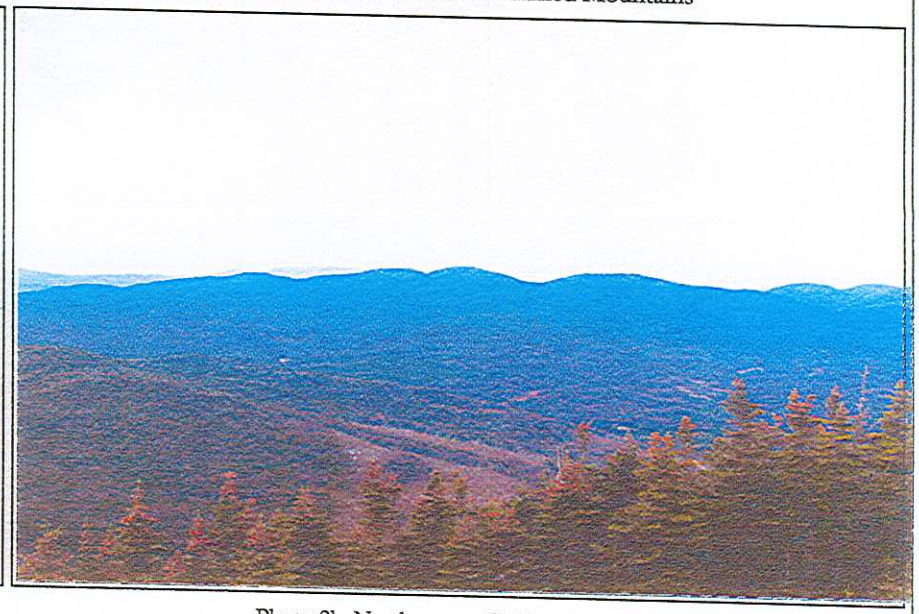


Photo 2h. Northwest to Caribou Mountain

Photo 3a. Gold Brook Road to A Series (Kibby Mountain) (1 mile)

Photo 3b. Gold Brook Road to B Series, Mile 7 (1 mile)

Photo 3c. Gold Brook Road to B Series, Mile 9.5 (1 mile)

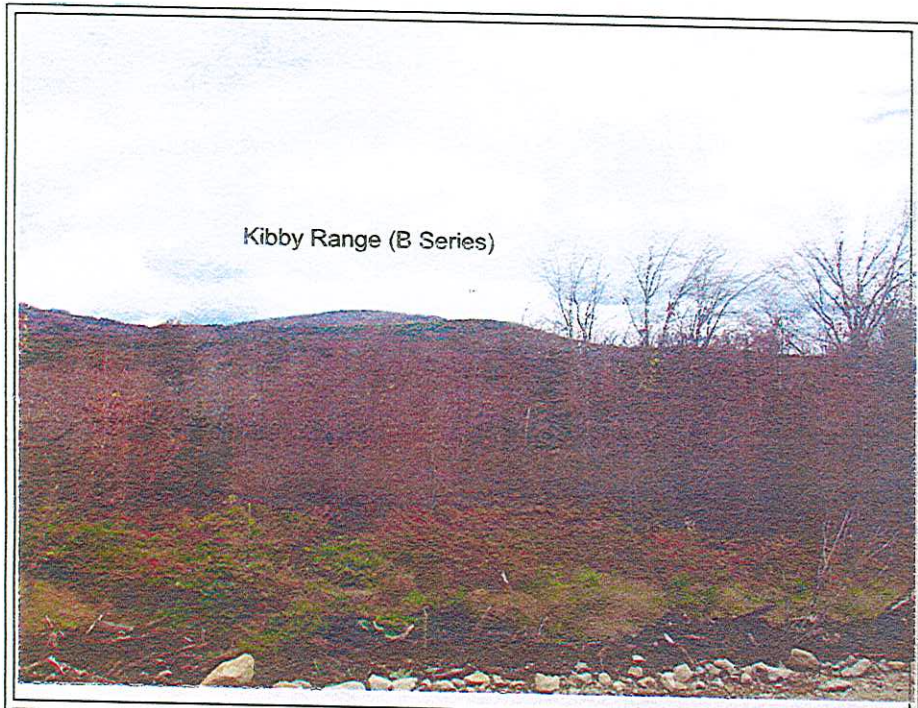


Photo 4a. Wahl Road
View of substation site on Kibby Range

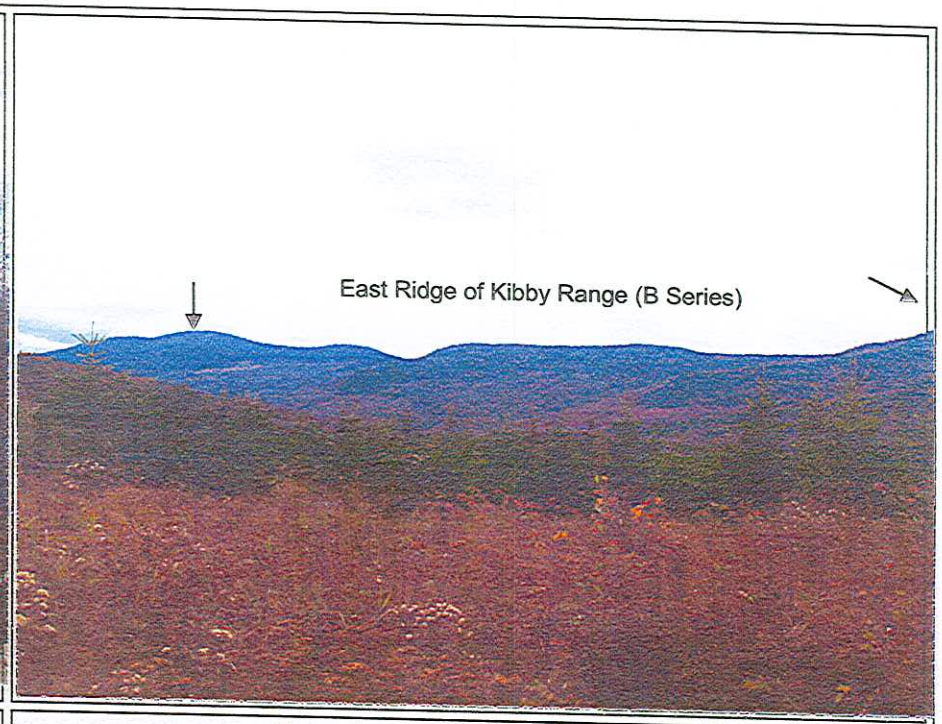


Photo 4b. SpencerBale Road (1 mile)
View of Kibby Range (B Series)

Photo 5. Route 27 Near Vine Road (3 miles)
View to a portion of B Series (Kibby Range)

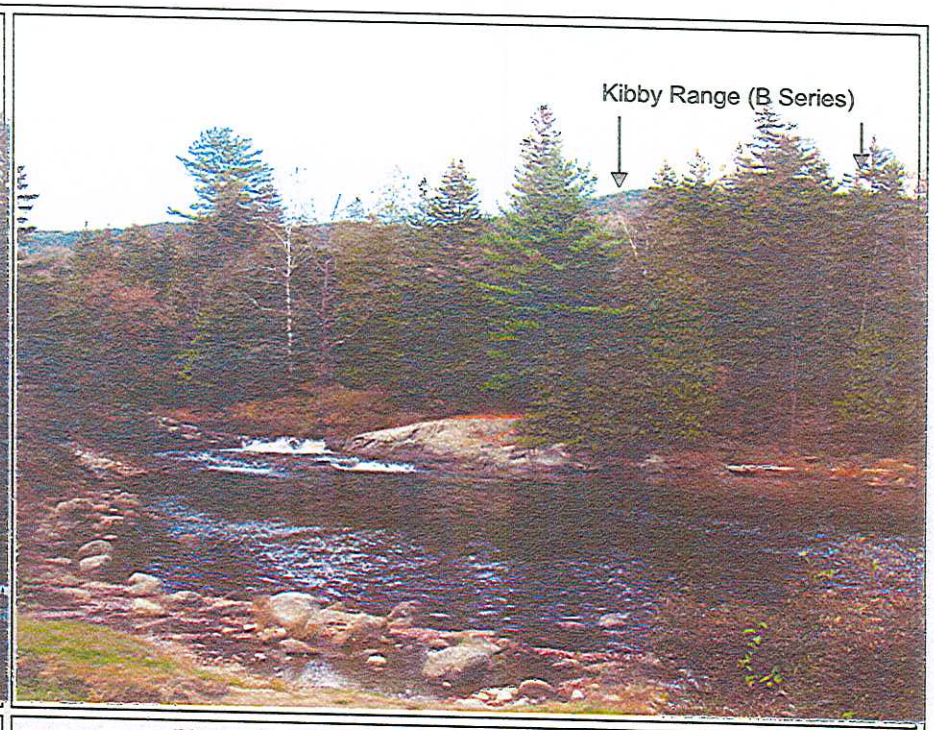


Photo 6. Route 27 Sarampus Falls Rest Area (1.5 miles)
Kibby Range is behind trees.

Photo 7a. View of Natanis Pond from Route 27 Overlook
The Proposed Project would not be visible from this point.

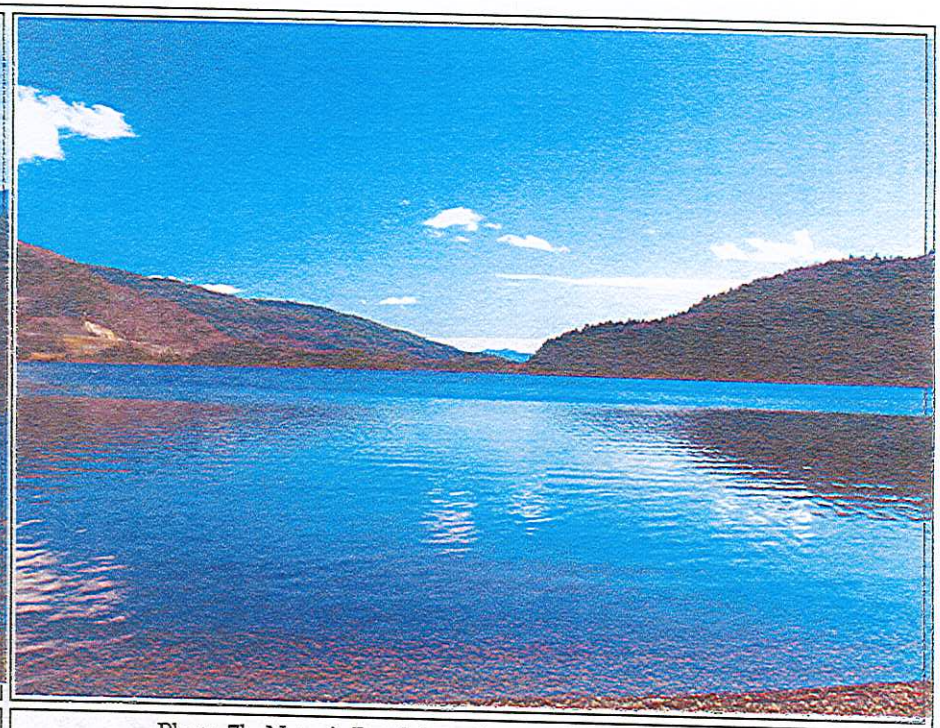


Photo 7b. Natanis Pond from Campground Beach (6 miles)
The blades tips of three turbines would be visible over the hill on the left (flanks of Sisk Mountian). The Bigelow Range is seen in the distance at the end of the lake.

Photo 9a Jim Pond (4.8 miles)

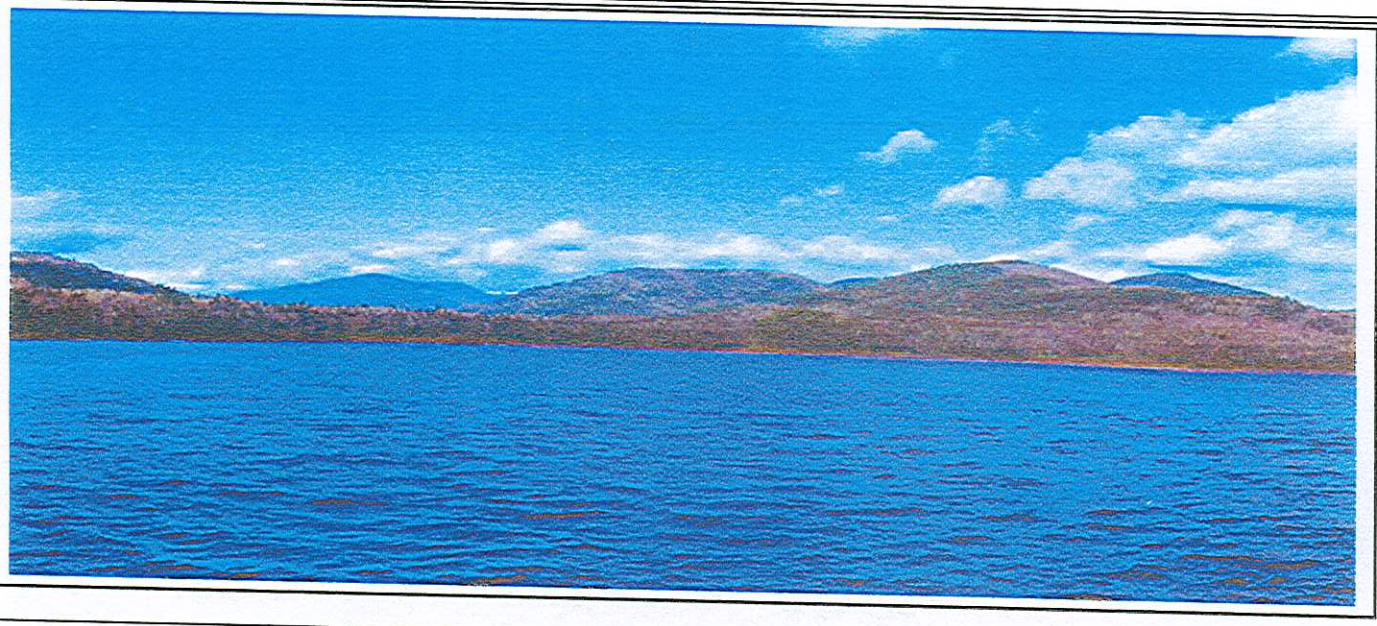


Photo 9b Jim Pond Panorama Looking North

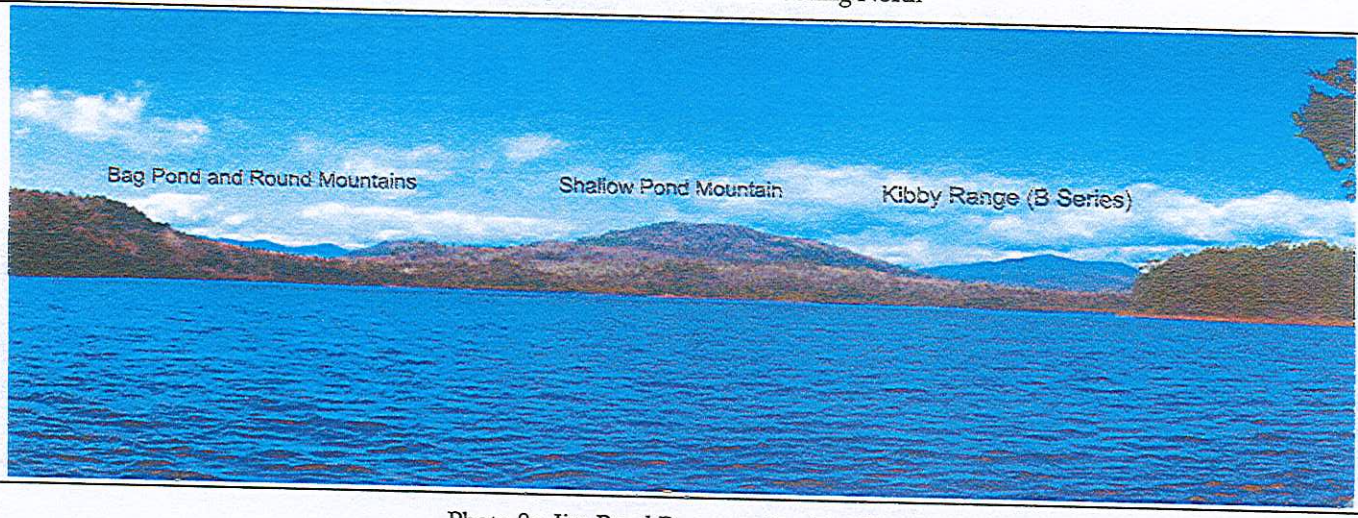


Photo 9c. Jim Pond Panorama Looking West
Bag and Round Mountains are seen in the distance.

Photo 10. View from King and Bartlett Camps
The project would not be visible from Camp but would be from eastern portions of the lake. (7.5 miles)

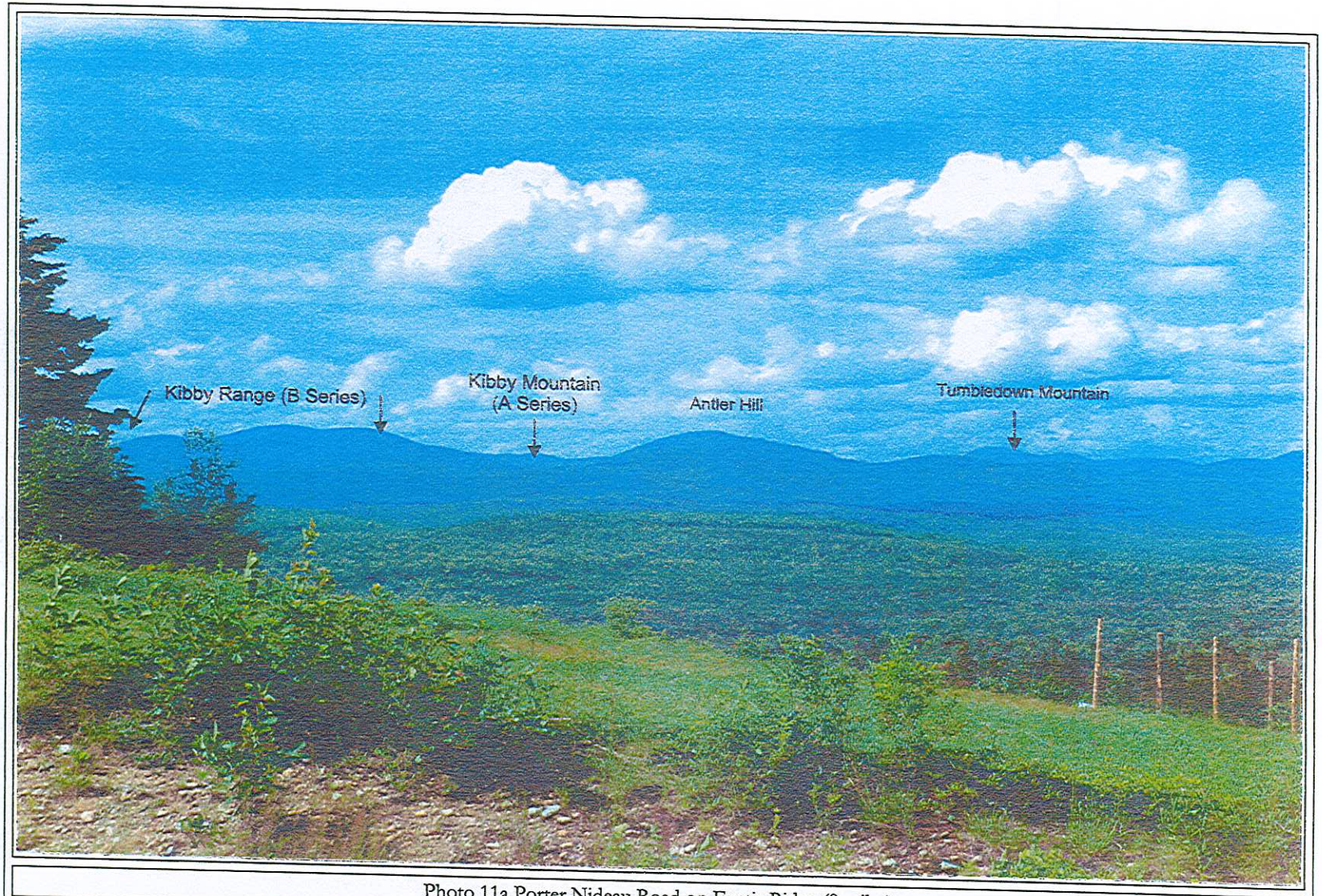


Photo 11a Porter Nideau Road on Eustis Ridge (8 miles)

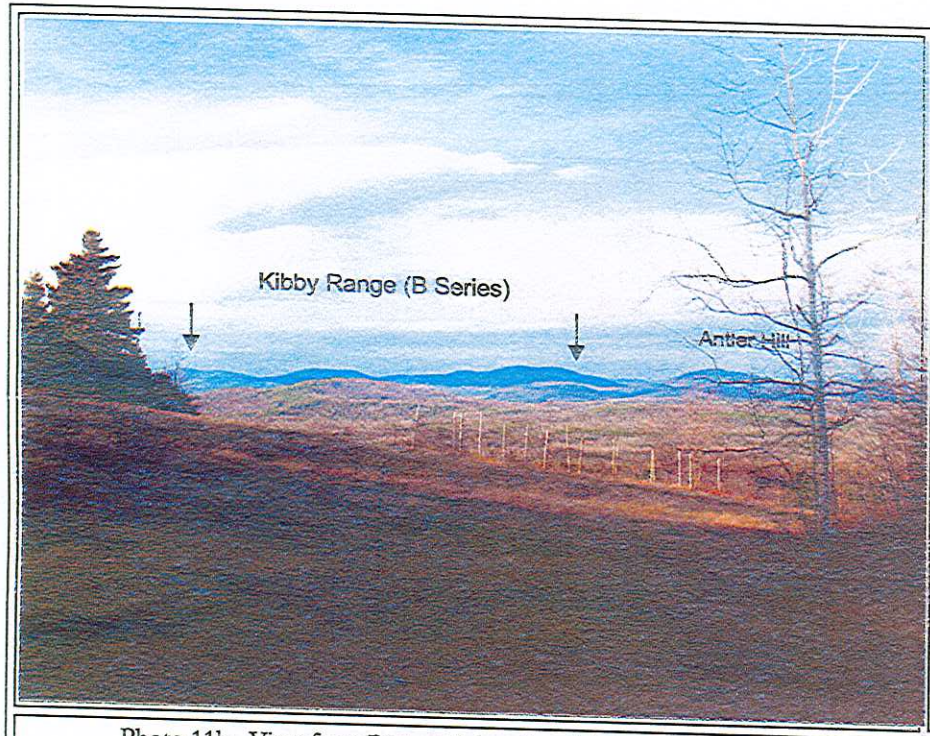


Photo 11b. View from Porter Nideau Road, Eustis Ridge (8 miles)
Same view as above in leaf-off conditions.

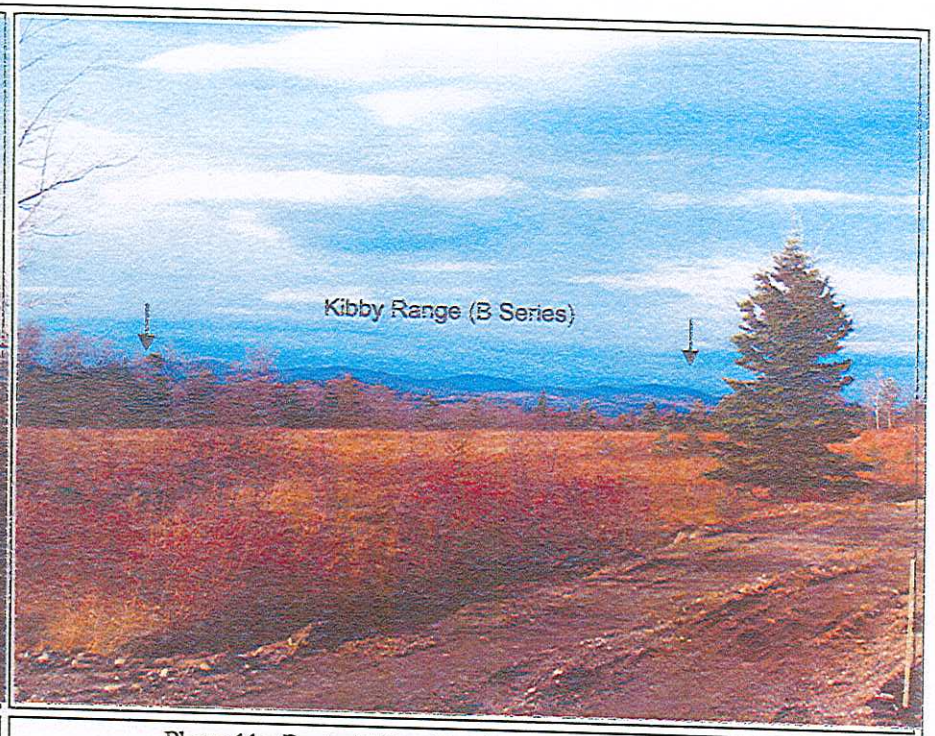


Photo 11c. Porter Nideau Road on Eustis Ridge (8 miles)
A second viewpoint further east.

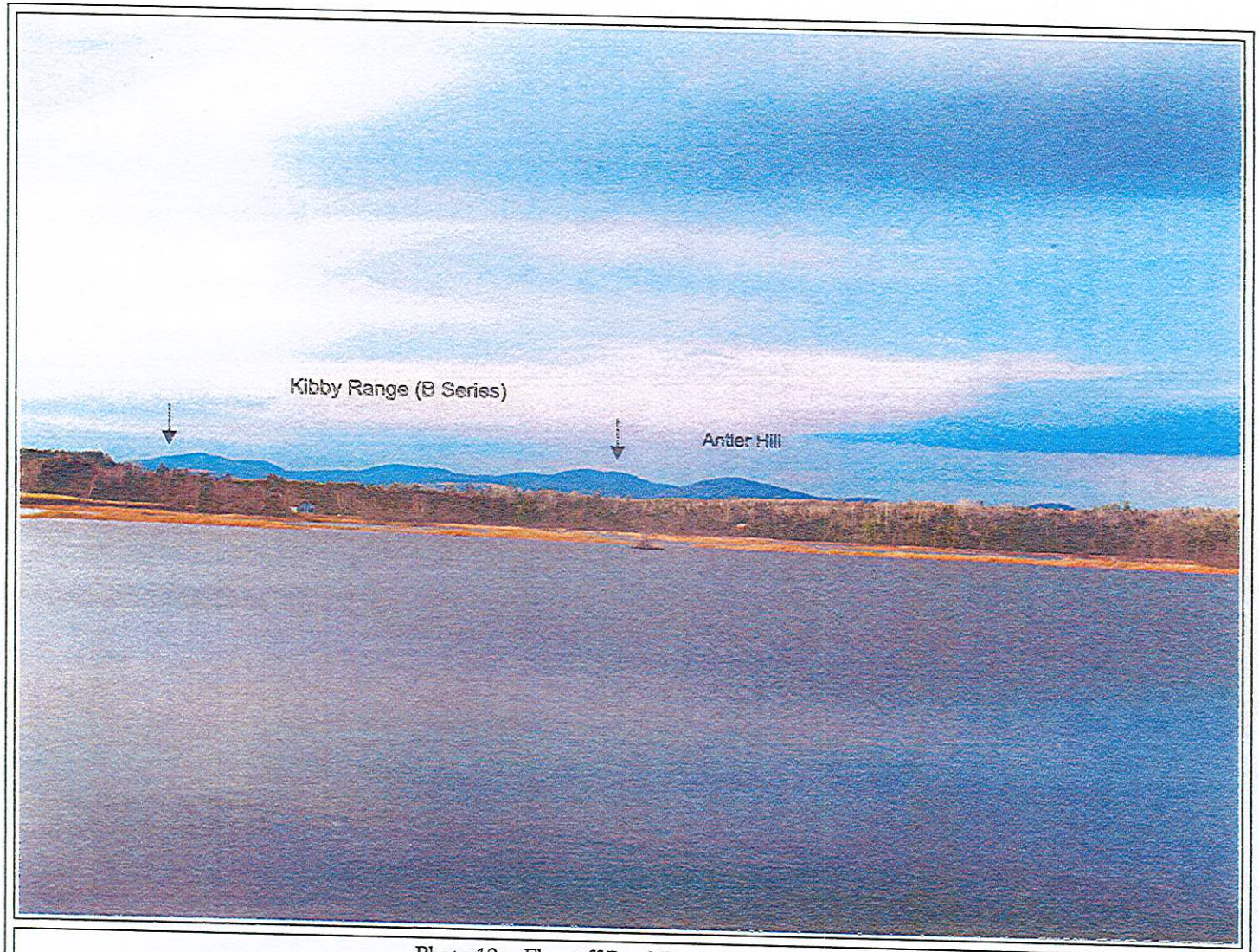


Photo 12a. Flagstaff Road Causeway (10 miles)
Looking north to Kibby Range (center) with Antler Hill in Front.

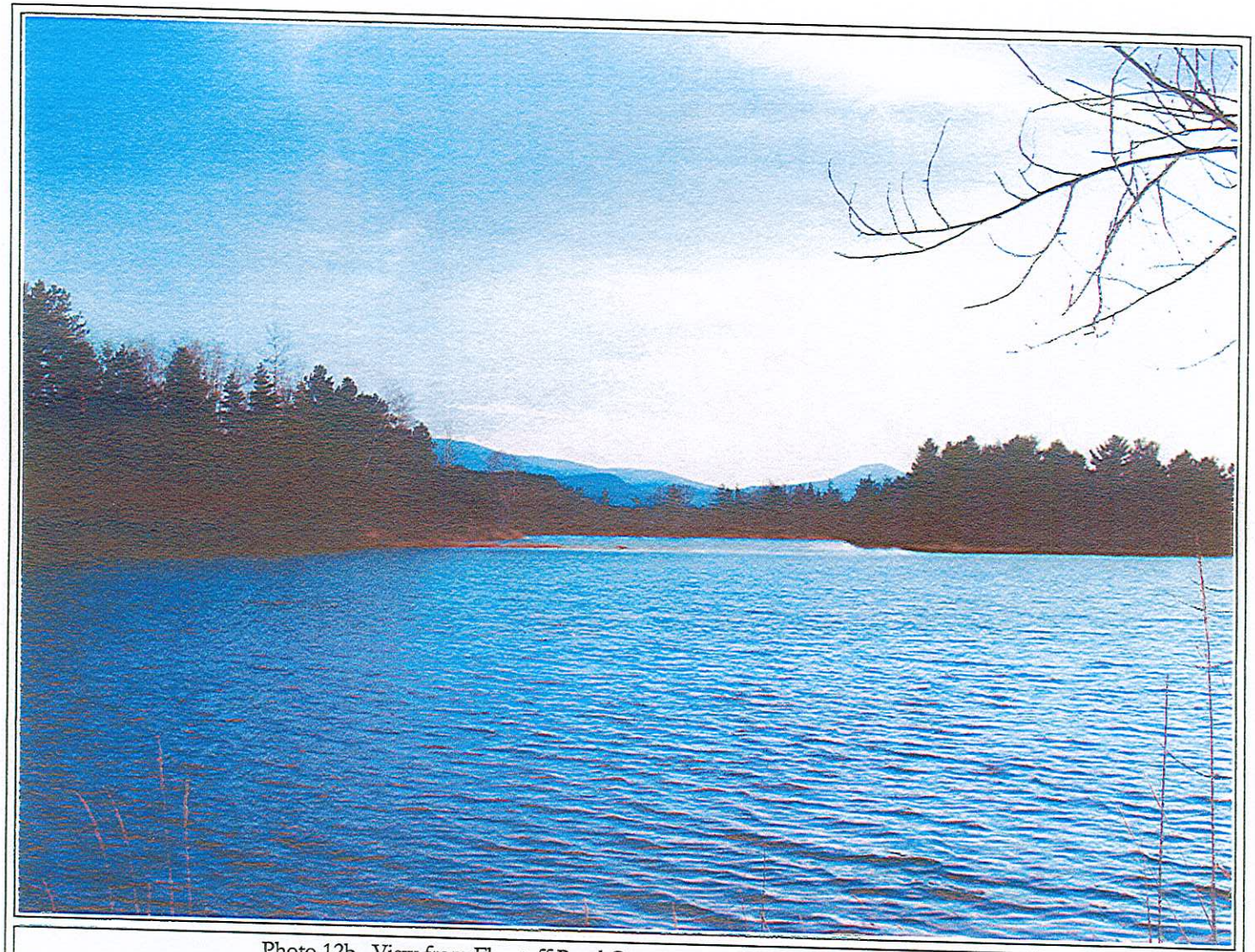


Photo 12b. View from Flagstaff Road Causeway looking south to Bigelow Range

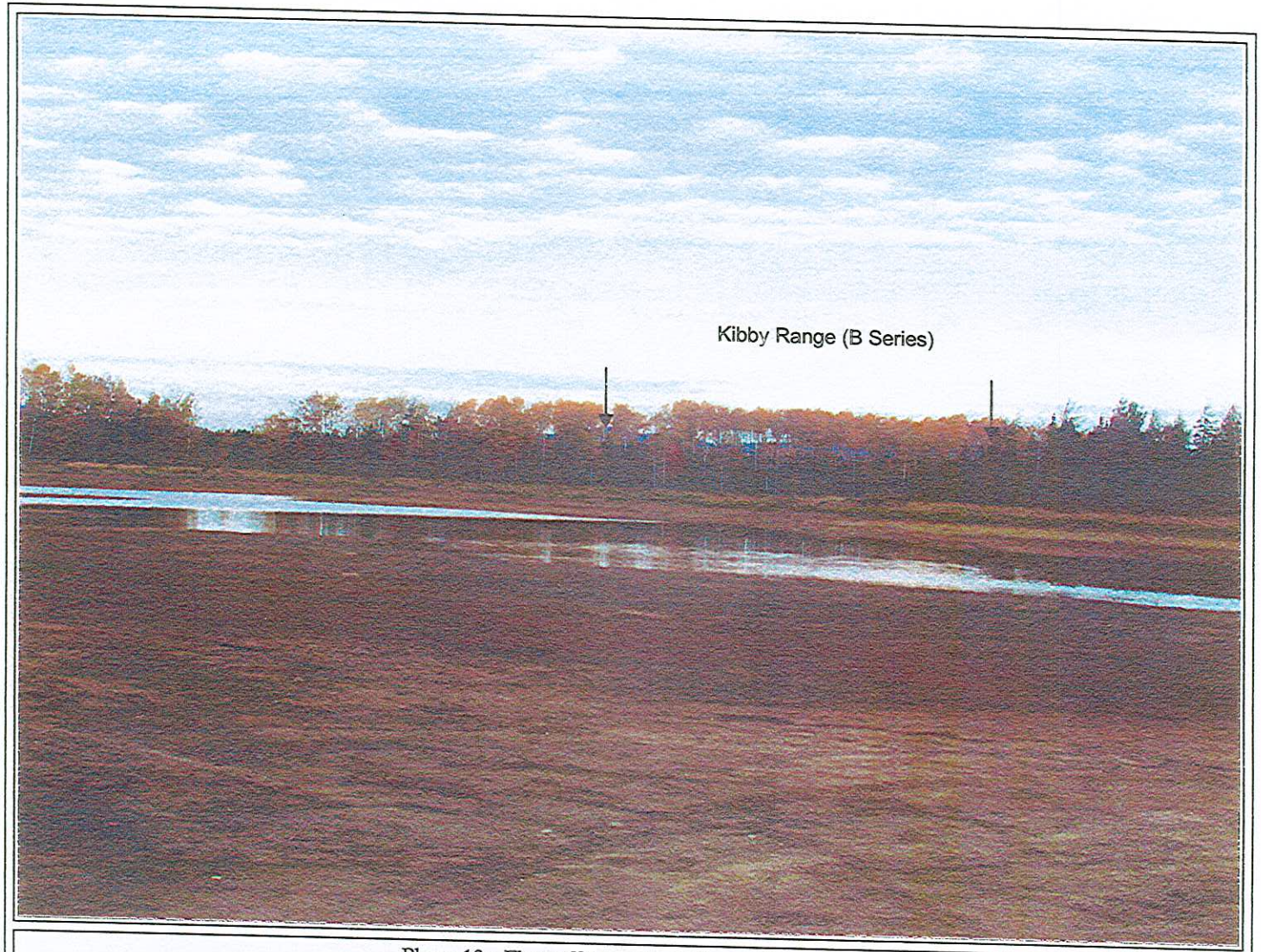


Photo 13a. Flagstaff Lake South Shore (12.5 miles)
From campsite in Bigelow Preserve. Kibby Range is behind trees.

Photo 13b. Flagstaff Lake Safford Brook Campsite (18 miles)
Flagstaff Mountain is in the foreground right; Camera Ridge is in the middleground with Kibby Range beyond left, and the southern end of the Kibby Mountain ridge visible at right beyond Flagstaff Mountain. An unnamed peak is between the two ridges in the background.

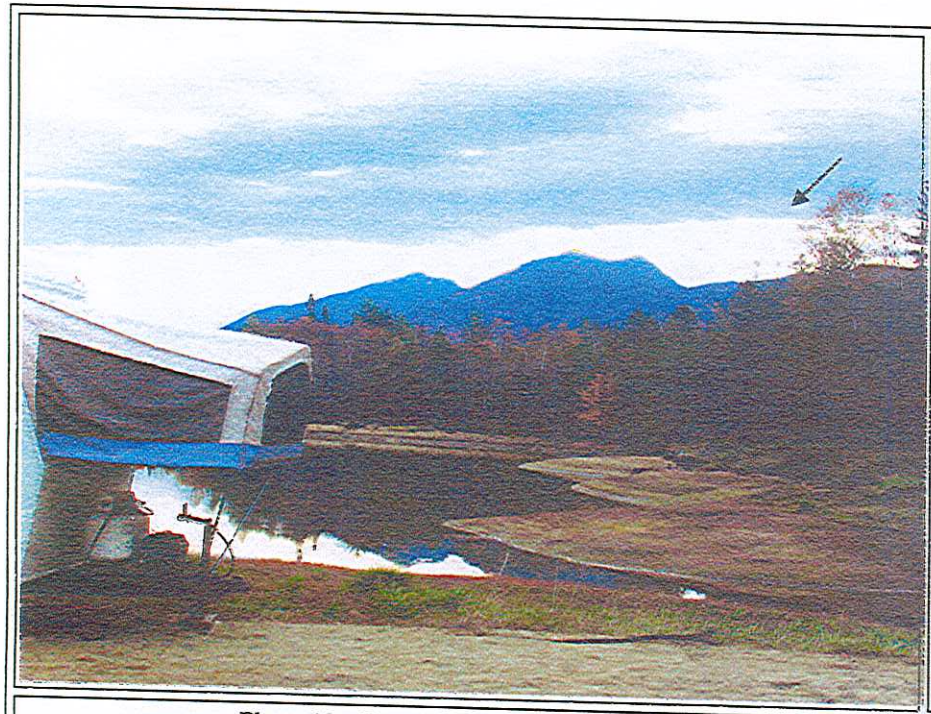


Photo 13c. Flagstaff Lake to Bigelow Range
From Campsite along the Southern Shore in Bigelow Preserve

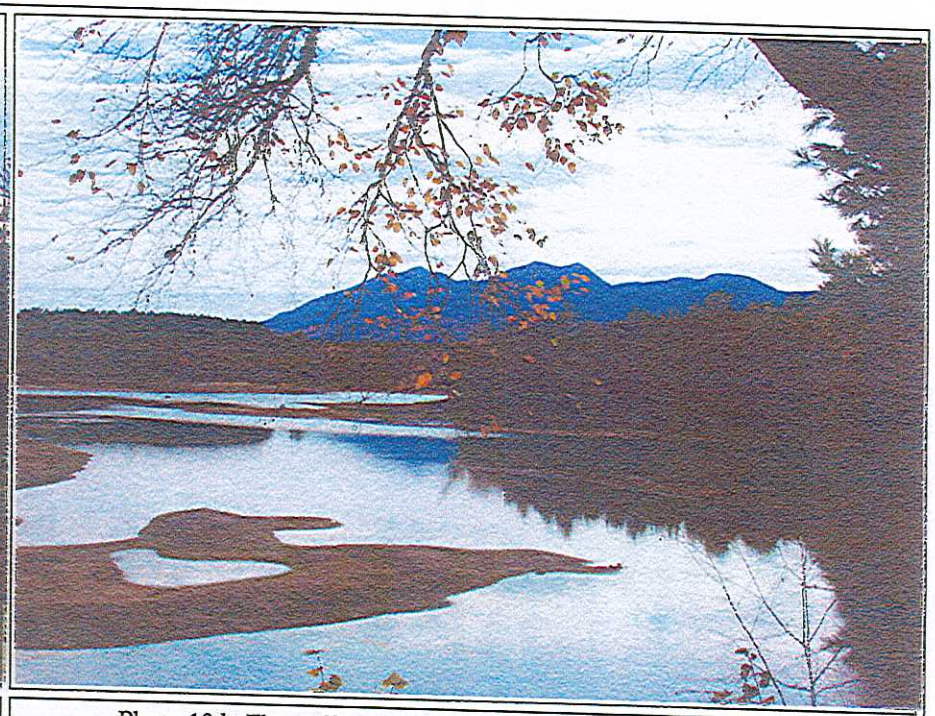


Photo 13d. Flagstaff Lake Cathedral Pines Area to Bigelow Range
Views of the Bigelow Range are dominant around the Lake

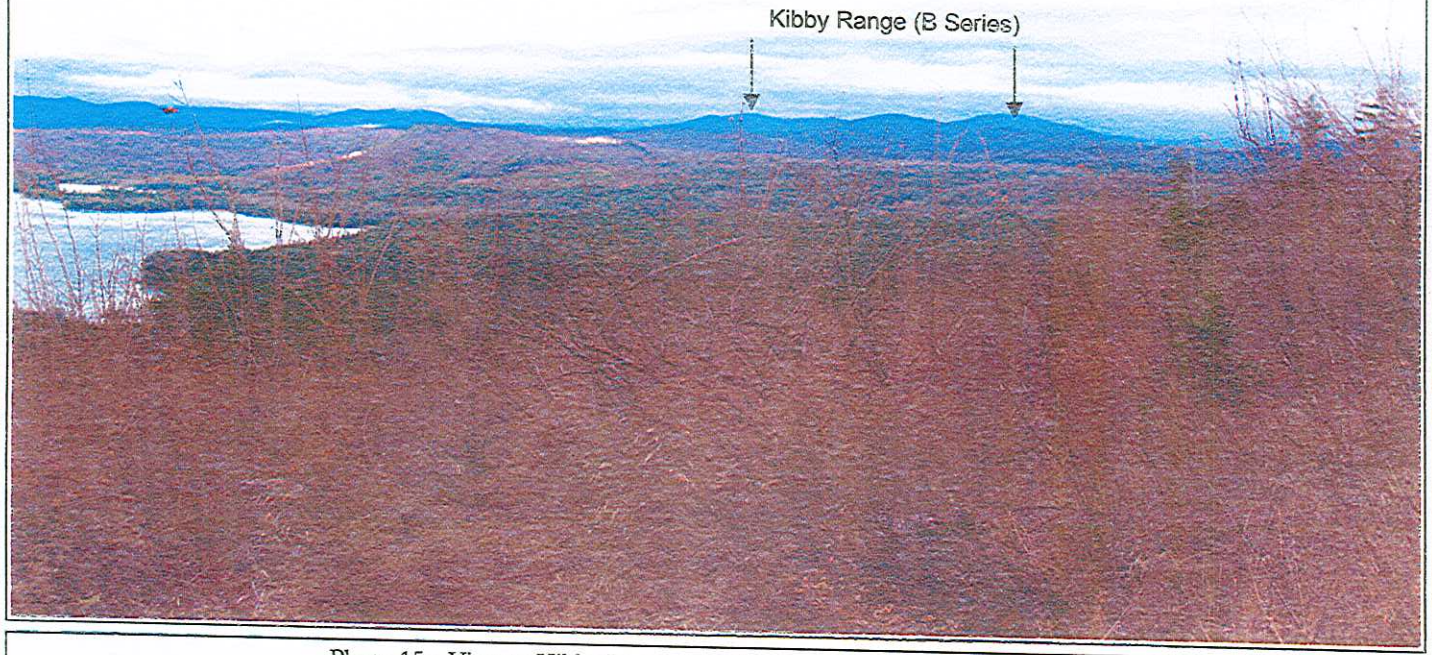


Photo 15a. View to Kibby Range from Flagstaff Mountain Road (12 miles)
Kibby Range is seen behind Antler Hill; the highest point on the left is in the clouds.

Photo 15b. Flagstaff Mountain Road panorama.

Photo 17a. View from West Peak, Appalachian, Trail Bigelow Range (17 Miles)
The ridges appear lower than background ridges from this vantage point.

Photo 17b. View from Avery Peak, Appalachian, Trail Bigelow Range

Photo 18. View from Crocker Mountain, Appalachian, Trail Bigelow Range (21.5 miles)
Kibby Mountain is beyond Cranberry Peak (left). The proposed project would be to the south (left) of Kibby Mountain.

Photo 19a. View from Jackman Rest Area Route 201 (21 miles)
The proposed project is largely behind foreground ridges and would be difficult to see.

Photo 19b. Telephoto View from Jackman Rest Area, Route 201 (21 miles)
Only a small portion of the Kibby Range (B Series) can be seen behind other foreground mountains.

VIEWS OF TRANSMISSION LINE CROSSING LOCATIONS

The following photographs illustrate locations where the proposed 115kV transmission line would cross state roads and the Appalachian Trail. At both the Appalachian Trail and the Route 16/27 crossings (below), the line would parallel the existing Boralex line which can be seen in both photographs, and the visual impacts would be very similar. The lower photographs illustrate the Route 16 crossing and Route 27 (north of Stratton) crossing locations. Trucks or people are shown at the crossing locations.

Photo 20a. Existing Boralex 115kv Transmission Line At AT Crossing
Most plantings are very dense and the line is difficult to see. The proposed line would be similarly screened

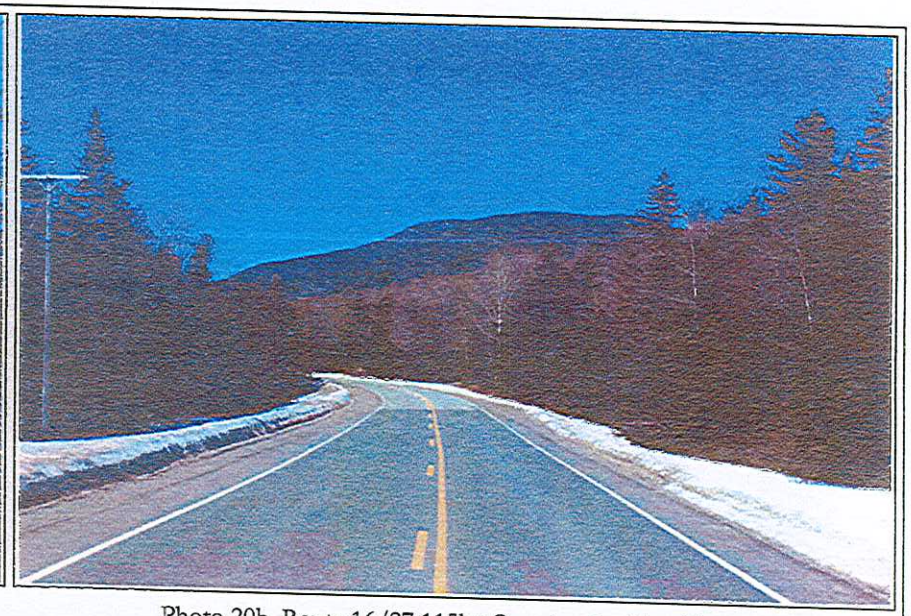


Photo 20b. Route 16/27 115kv Crossing Looking North
Only the wires are visible at the crossing of the existing Boralex line; poles would be similarly set back from the road with the proposed line.

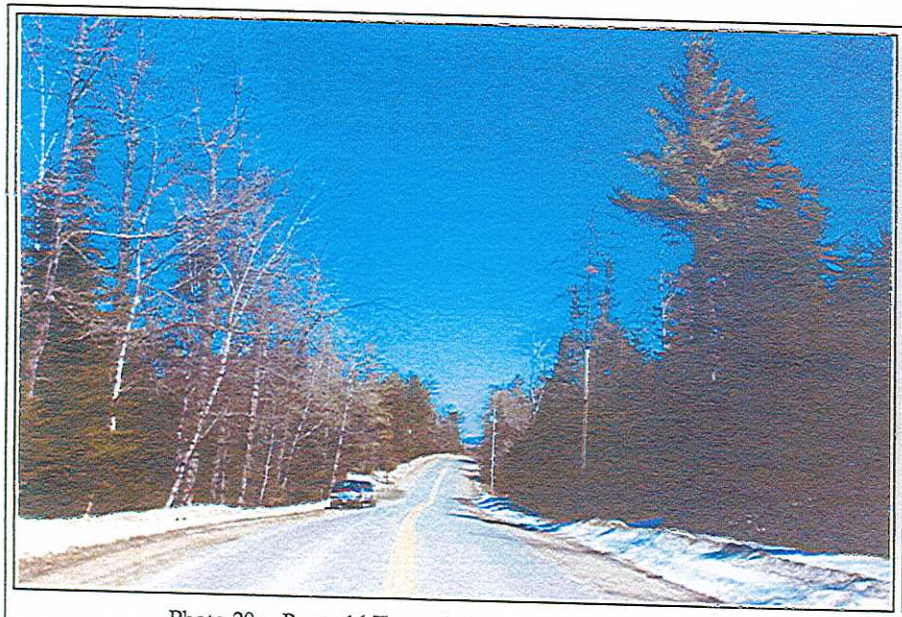


Photo 20c. Route 16 Transmission Crossing Looking North.

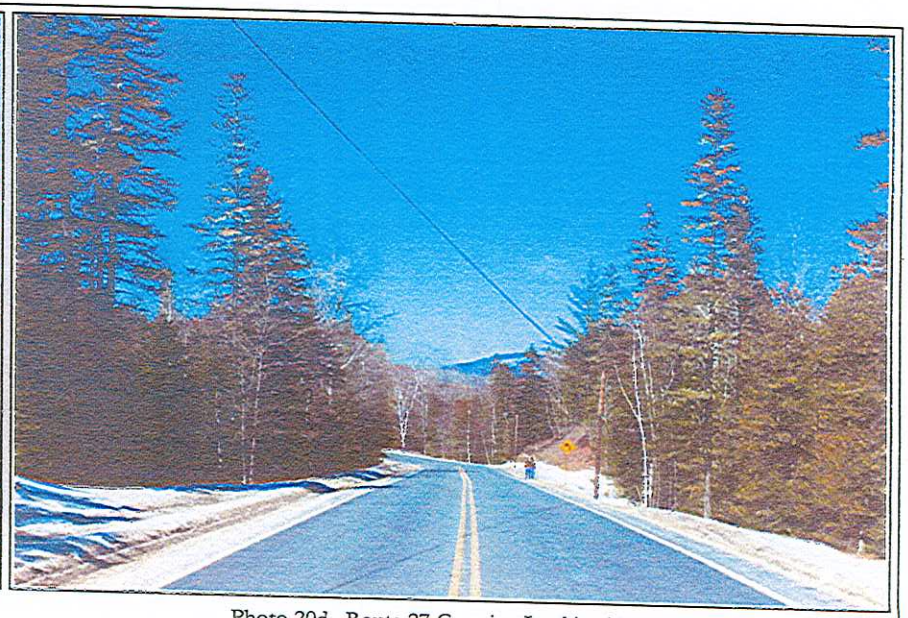


Photo 20d. Route 27 Crossing Looking North

APPENDIX D

SIMULATIONS

- Kibby Mountain Fire Tower Southeast
- Kibby Mountain Fire Tower South
- Kibby Mountain Fire Tower Composite
- Route 27 Near Vine Road
- Sarampus Falls Picnic Area (Route 27)
- Jim Pond
- Porter Nideau Road, Eustis Ridge
- Avery Peak
- Simulation Methodology

Note:

This panorama was created from the montages shown for Viewpoint 1a and Viewpoint 1b. For technical information on the montages, please refer to the figures for those viewpoints.

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Prepared by:

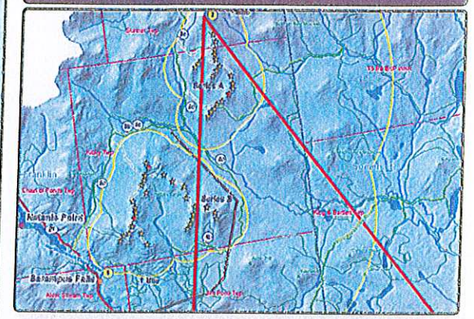
Jean E. Vissering Landscape Architecture

STONE ENVIRONMENTAL INC

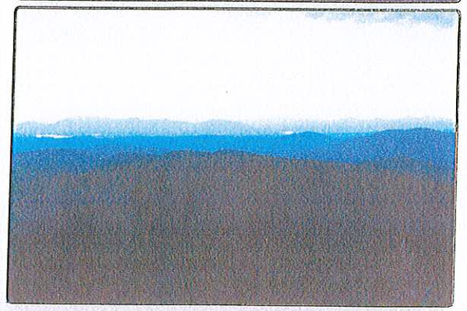
Xtra-Spatial Productions, LLC.

Viewpoint #2: Kibby Mountain Fire Tower Panorama

Viewpoint Location Map



Original Image



Technical Information

Turbine Information	
Turbine Model	V90-3.0 MW
Hub Height	80 meters
Rotor Diameter	90 meters
Turbine Layout Date	November 7th, 2006
Viewpoint Information	
Waypoint #	057
View Coordinates (easting, northing)	379184.87 m, 5030711.81 m
Viewpoint Location	Kibby Mountain Firetower
Viewer Elevation	1109.2 m / 3639.06 ft.
Angle of View / H.F.O.V.	159.25° / 40.0°
Distance to Closest Turbine	.587 Mi (TURA01)
Distance to Farthest Turbine	7.090 Mi (TR B-16)
Camera Model	Olympus E500
Lens Setting	50mm
f-Stop	6.3
Date and Time	2006/11/11-11:30:26
Proper Viewing Distance	16.19 inches

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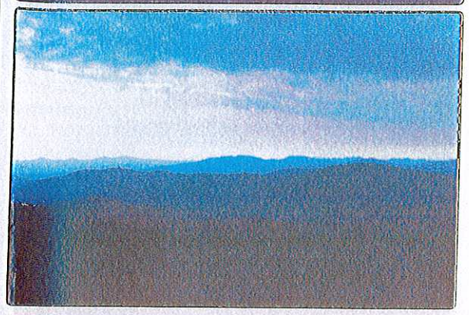
Viewpoint #2a: Kibby Mountain Fire Tower Southeast

Viewpoint Location Map

Original Image



Technical Information

Turbine Information	
Turbine Model	V90-3.0 MW
Hub Height	80 meters
Rotor Diameter	90 meters
Turbine Layout Date	November 7th, 2006
Viewpoint Information	
Waypoint #	057
View Coordinates (easting, northing)	379184.87 m, 5030711.81 m
Viewpoint Location	Kibby Mountain Firetower
Viewer Elevation	1109.2 m / 3639.06 ft.
Angle of View / H.F.O.V.	186.75° / 40.0°
Distance to Closest Turbine	.587 Mi (TURA01)
Distance to Farthest Turbine	7.090 Mi (TR B-16)
Camera Model	Olympus E500
Lens Setting	50mm
f-Stop	7.1
Date and Time	2006/11/11-11:30:40
Proper Viewing Distance	16.19 inches

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Viewpoint #2b: Kibby Mountain Fire Tower South

Viewpoint Location Map

Original Image

Technical Information

Turbine Information	
Turbine Model	V90-3.0 MW
Hub Height	80 meters
Rotor Diameter	90 meters
Turbine Layout Date	November 7th, 2006
Viewpoint Information	
Waypoint #	064
View Coordinates (easting, northing)	376818.76 m, 5013878.65 m
Viewpoint Location	Rte. 27 - near Vine Road
Viewer Elevation	376.458 m / 1235.08 ft.
Angle of View / H.F.O.V.	353.75° / 38.58°
Distance to Closest Turbine	13.644 Mi (TR B-25)
Distance to Farthest Turbine	19.162 Mi (TURA01)
Camera Model	Olympus E500
Lens Setting	50mm
f-Stop	5.0
Date and Time	2006/11/11-14:31:15
Proper Viewing Distance	16.90 inches

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Viewpoint #5: Route 27 Near Vine Road

Viewpoint Location Map

Original Image

Technical Information

Turbine Information	
Turbine Model	V90-3.0 MW
Hub Height	80 meters
Rotor Diameter	90 meters
Turbine Layout Date	November 7th, 2006
Viewpoint Information	
Waypoint #	014
View Coordinates (easting, northing)	374182.24 m, 5017664.42 m
Viewpoint Location	Rte. 27 - Sarampus Falls
Viewer Elevation	375.212 m / 1231.00 ft.
Angle of View / H.F.O.V.	20.15° / 28.07°
Distance to Closest Turbine	1.392 Mi (TR B-14)
Distance to Farthest Turbine	1.949 Mi (TR B-11)
Camera Model	Olympus E500
Lens Setting	50mm
f-Stop	5.0
Date and Time	2006/10/10-09:52:00
Proper Viewing Distance	23.6 inches

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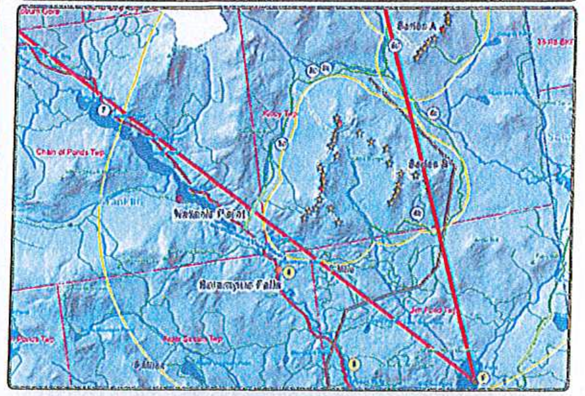
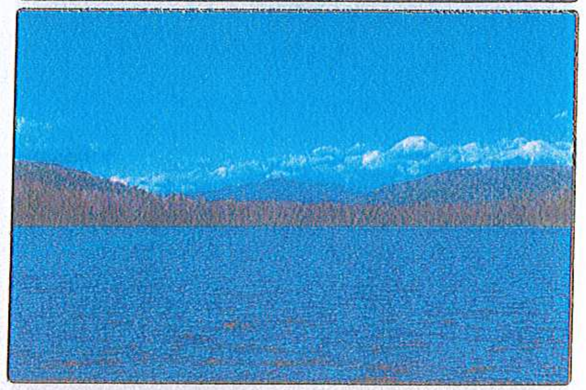
Viewpoint #6: Sarampus Falls Picnic Area

Viewpoint Location Map



Original Image



Technical Information

Turbine Information	
Turbine Model	V90-3.0 MW
Hub Height	80 meters
Rotor Diameter	90 meters
Turbine Layout Date	November 7th, 2006
Viewpoint Information	
Waypoint #	043
View Coordinates (easting, northing)	382047.49 m, 5013318.40 m
Viewpoint Location	Jim Pond
Viewer Elevation	374.76 m / 1229.51 ft.
Angle of View / H.F.O.V.	318.7° / 38.58°
Distance to Closest Turbine	5.064 Mi (TR B-25)
Distance to Farthest Turbine	7.479 Mi (TR B-01)
Camera Model	Olympus E500
Lens Setting	50mm
f-Stop	7.1
Date and Time	2006/11/01-11:45:21
Proper Viewing Distance	16.90 inches

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Viewpoint #9: Jim Pond

Viewpoint Location Map

Original Image

Technical Information

Turbine Information	
Turbine Model	V90-3.0 MW
Hub Height	80 meters
Rotor Diameter	90 meters
Turbine Layout Date	November 7th, 2006
Viewpoint Information	
Waypoint #	067
View Coordinates (easting, northing)	381550.98 m, 5006171.91 m
Viewpoint Location	Eustis Ridge
Viewer Elevation	468.003 m / 1535.42 ft.
Angle of View / H.F.O.V.	349.875° / 39.5°
Distance to Closest Turbine	9.343 Mi (TR B-25)
Distance to Farthest Turbine	15.032 Mi (TURA01)
Camera Model	Olympus E500
Lens Setting	50mm
f-Stop	5.6
Date and Time	2006/11/11-15:23:04
Proper Viewing Distance	16.43 inches

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Viewpoint #11a: Porter Nideau Road, Eustis Ridge

Viewpoint Location Map

Original Image

Technical Information

Turbine Information	
Turbine Model	V90-3.0 MW
Hub Height	80 meters
Rotor Diameter	90 meters
Turbine Layout Date	November 7th, 2006
Viewpoint Information	
Waypoint #	None
View Coordinates (easting, northing)	399752.46 m, 5000037.09 m
Viewpoint Location	Avery Peak
Viewer Elevation	1242.66 m / 4076.92 ft.
Angle of View / H.F.O.V.	314.2° / 25.8°
Distance to Closest Turbine	15.698 Mi (TR B-28)
Distance to Farthest Turbine	20.746 Mi (TURA01)
Camera Model	Olympus E500
Lens Setting	50mm
f-Stop	22.0
Date and Time	2006/09/12-12:28:38
Proper Viewing Distance	25.77 inches

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Viewpoint #17: Avery Peak, Appalachian Trail

Appendix D

Methodology Used in Preparing Photomontages for the Proposed Windfarm on Kibby Mountain, Maine

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12 December 2006

1. Introduction

A digital photomontage is the end result of a computer graphics operation in which portions of two (or more) digital images are combined or composited into a single digital image. The technique of photomontaging has been used to present photosimulations of proposed construction projects that may alter visual resources such as scenic vistas, skylines, and nighttime scenes. The digital photomontage is a specific type of photosimulation where a portion or portions of a computer-generated scene are "pasted" onto an actual, real-world image captured with a camera in the field. This contrasts with the more prevalent form of photosimulation where the entire image is computer-generated.

The advantage of a digital photomontage over the computer-generated photosimulation lies in the higher degree of verisimilitude—a work with a high degree of verisimilitude means that the work is very realistic and believable; works of this nature are often said to be "true to life"—conveyed by the photomontage since most of the image is derived from an actual image of the subject matter. Moreover, by alternatively displaying the unaltered image and the photomontage, changes can be seen in their natural context.

This document describes the methodology used by Xtra-Spatial Productions, LLC in the creation of a set of photomontages of a proposed forty-seven turbine Windfarm on Kibby Mountain and the Kibby Range near the town of Stratton, Maine.

The requisite inputs and the process of creating a digital photomontage are described below.

2. Required Data

This section describes the requisite data inputs to create a successful digital photomontage.

2.1 Imagery Depicting Baseline Conditions

One of the two imagery streams feeding into the photomontage process is the *in situ* digital image of the scene. A necessary component of this imagery is the data about the image, or the image *metadata*.

For this project, seven digital images were selected to demonstrate the visual impact of the project from six locations in the viewshed of the proposed Windfarm project.

2.1.1 Digital Imagery

This data is the actual digital image captured in the field with one of two digital cameras.

A Nikon D100 six-megapixel digital camera with a fixed-focal-length lens was used to acquire one image (Avery Peak). An Olympus EVOLT E-500 eight-megapixel digital camera with a Zuiko Digital 14-45mm focal length zoom lens was used to acquire digital image from six other locations deemed to be representative of areas where visual resources may be compromised by the construction of the Kibby Mountain Windfarm.

The Nikon D100 captured image was saved as an uncompressed RAW files that was converted to minimally compressed JPEG image with pixel dimensions of 3008 wide by 2000 high. No filter was used on the lens.

The Olympus E-500 captured images as uncompressed Olympus Raw Format (ORF) files with pixel dimensions of 3264 wide by 2448 high. A UV Skylight filter used when capturing the image to reduce haze and the backscattering of light in backlit images.

2.1.2 Metadata for Digital Imagery

Data about the data (metadata) were required to expedite the process of camera matching described in §3.1.2 below. Many of these data are recorded to the JPEG and ORF images and accessible through the Image Editing software Photoshop (Adobe, Inc.).

2.1.2.1 Digital Camera Specifications

The dimensions of the Nikon D100's imaging sensor were needed to assist in determining the horizontal and vertical fields of view of the camera for a specific focal length. From Digital Photography Review (http://www.dpreview.com/reviews/specs/Nikon/nikon_d100.asp), the sensor size is 23.7mm x 15.5 mm.

The dimensions of the Olympus EVOLT E-500's imaging sensor were needed to assist in determining the horizontal and vertical fields of view of the camera for a specific focal length. From the manufacturer's web site (http://www.olympusamerica.com/cpg_section/product.asp?product=1192&fl=4), the sensor size is 17.3mm x 13.0mm.

2.1.2.2 Time of Day

Time of day is captured both on camera's memory card file system and in the file's metadata tags. The owner of the Nikon D100 camera failed to properly set the AM/PM

setting and to advance the time setting to adjust for Daylight Saving Time. The error in the timestamp for the Avery Peak image was corrected by adding 13 hours to it.

The owner of the Olympus EVOLT E-500 camera failed to properly reset the time from Daylight Saving Time for the Eustis Ridge, Jim Pond, and Kibby Mountain images, so the recorded times were actually one hour advanced from actual time. A simple adjustment was made to correct this error.

The time of day is critical for replicating the position of the Sun when simulating illumination of the turbines, meteorological towers, tower pad clearings, roads, and powerline swaths to in the Computer Model.

The times of day for the seven images are presented in Appendix A. Metadata for *In Situ* Digital Images.

2.1.2.3 Day of the Year

The day of the year is captured both on camera's memory card file system and in the file's metadata tags.

The day of the year is critical for replicating the position of the Sun when simulating illumination the turbines, meteorological towers, tower pad clearings, roads, and powerline swaths to in the Computer Model.

The days of the year for the seven images are presented in Appendix A. Metadata for *In Situ* Digital Images.

2.1.2.4 Location of Camera

A GPS unit was used to capture the 2D (latitude and longitude, but not elevation) of the location of each camera station. These locations were used to create an ESRI Shapefile in the WGS 83 Geographic (latitude and longitude) coordinate system. The names of the locations are referred to in the text and Appendix as:

- Sarampus Falls
- Avery Peak
- Eustis Ridge
- Route 27 near Vine Road
- Jim Pond
- Kibby Mountain (two images were recorded here, one towards Series A turbines, the other towards Series B turbines)

The locations of the camera stations were examined in ArcMap (ESRI, Inc.) using USGS Digital Raster Graphics (described in §2.2.1.4) and a digital representation of the road network as a backdrop to ascertain the validity of the coordinates.

The location of the cameras is crucial in replicating the camera positions in the Computer Model.

2.1.2.5 Orientation of Camera

The parameters defining the exterior orientation of the camera are crucial for the camera matching operation described in §3.1.2 below. These parameters include:

- *Bearing* of the camera's optical axis in compass degrees using true North (as opposed to magnetic North) as zero degrees; this measure is also known as the *azimuth* of the camera or the camera's *heading*; the bearing was measured in the field using an orienteering compass aligned to the camera lens; the values were bearings from magnetic North; these were converted to bearings from true North by subtracting 13.78 degrees (as determined by the GeoMag software version 2.3.0.0). For unknown reasons, the field measurements were not accurate enough to achieve acceptable camera matching on their own; instead they served only as an initial estimate of bearing for the empirical method of camera matching described in §3.1.2 below.
- *Inclination* or *pitch* of the camera's optical axis, where a perfectly horizontal camera has a pitch of zero degrees, and a camera pointing straight up has a pitch of –90 degrees. This information was not captured in the field, but rather estimated by the camera matching method described in §3.1.2 below.
- *Bank* (or *tilt* or *roll*) of the vertical axis of the camera's sensor; ideally, there should be no bank in the camera, but unless a bubble level is incorporated into the camera body, this is a difficult proposition. Bank was not recorded in the field, but estimated using the camera matching method described in §3.1.2 below.
- *Horizontal Field of View (HFOV)* of the lens which has a trigonometric relation to the focal length of the lens and the image sensor (defined in §2.1.2.1 above); the HFOV can be calculated as

  (1) $\text{HFOV} = 2 * \tan^{-1}((\text{image sensor width} / 2) / \text{focal length})$

  All Olympus E-500 images were taken with a (nominal) 25mm focal length setting on the zoom lens. While not verified by the author, the 25mm focal length reported in the images' metadata is presumed to be an estimate with precision no better than 1mm. Assuming a 25mm focal length, the HFOV for this image is calculated as

  (2) $\text{HFOV} = 2 * \tan^{-1}((17.3\text{mm} / 2) / 25.0\text{mm})$
  $= 2 * \tan^{-1}(0.346)$
  $=38.17°$

  The Nikon D100 image was taken with a fixed focal length lens of 50mm. The HFOV for this image is calculated as

  (3) $\text{HFOV} = 2 * \tan^{-1}((23.7\text{mm} / 2) / 50.0\text{mm})$
  $= 2 * \tan^{-1}(0.237)$
  $= 26.66°$

2.1.2.6 Atmospheric Conditions

In order to match the atmospheric conditions of the Computer Model with that of the imagery, a qualitative assessment of the amount of haze and direct light is needed. The images were acquired on four separate days, September 12th, October 10th, November 1st and November 11th. The September12th Avery Peak, October 10th Sarampus Falls, and November 1st Jim Pond images all appeared to be illuminated a full Sun (*i.e.*, there was no partial obscuration by clouds) with only a light haze present. A linear haze model with a 90km 100% haze (all colors blend to a light blue hue beyond this distance) was used in the Computer Model for rendering these images. Furthermore, to simulate bright sunlight and light haze, a small amount of ambient light was included in the atmosphere component of the Computer Model. This provides more contrast between directly illuminated portions of the render and those portions illuminated by only ambient light.

The November 11th images from Route 27 near Vine Road, Eustis Ridge, and Kibby Mountain all show a sky with heavy overcast conditions and much more haze. For these images a Sun with 25% of its rays absorbed or reflected (*i.e.*, only 75% intensity) was used for rendering. An exponential haze model with a 100km 100% haze (all colors blend to a medium blue-gray hue beyond this distance) was used in the Computer Model for rendering these images. Since a more diffuse light was simulated on this day, more ambient light was included in the atmospheric component of the Computer Model.

2.2 Computer Model of Altered Landscape

The second input stream to the Photomontage is generated by creating a Computer Model of the study area depicting the additional 3D Objects (wind turbines and meteorological towers), turbine/tower pad clearings, and new access roads. This Computer Model should be as close to reality as possible. The methodology used in the generation of the Computer Model is beyond the scope of this document, but the required data are briefly described below.

2.2.1 GIS Data

All data used in the creation of the Computer Model is in the form of Geographic Information System (*GIS*) datasets. There are two basic types of GIS datasets: vector-based (discrete points, lines, and polygons), and raster-based (arrays of values representing either continuous variables, such as elevation, or nominal values, such as land cover).

2.2.1.1 Camera Stations

The GPS data describing the camera station location (see §2.1.2.4) were used to create an ESRI Shapefile containing a point for each place of acquisition of the seven field images. These points corresponded to the camera station and contained additional attributes such as image sequence number, nominal bearing, and location name.

2.2.1.2 Terrain Model

A set of raster Digital Elevation Models (*DEMs)* was obtained from the USGS Seamless Database for the 46km (East-West) by 38km (North-South) study area encompassing the proposed Windfarm and camera locations. The nominal resolution for this dataset is 1/3 of an arc-second. When projected to the Universal Transverse Mercator (UTM) projection, the resolution was approximately 10 meters in both the North-South and the East-West directions.

2.2.1.3 Land Cover Data

A raster dataset characterizing the land cover for the study area was obtained from the U.S. Fish & Wildlife Service. The Gulf of Maine Landcover (GOMLC) dataset (http://www.maine.gov/dep/gis/training/melcd/gulf_of_maine_landcover_2000_fgdc_metadata.txt) is "an amalgamation of basically all the available landcover data for the Gulf of Maine basin as of 1997, including NLCD [National Land Cover Dataset], Gap [Gap Analysis Program], CCAP [Coastal Change Assessment Program], and wetlands data" (http://www.maine.gov/dep/gis/training/melcd/review_of_legacy_data.shtml). To be compatible with existing ecosystem models at Xtra-Spatial Productions, LLC, the GOMLC dataset were "cross-walked" or remapped to the Anderson Level 2 Land Cover classification as defined by the NLCD the USGS Seamless Database website. This data was used for purposes of both camera matching and vegetative screening of the altered conditions (roads, turbines, towers, pads, powerline swaths).

2.2.2 3D Object Data

The wind turbines and meteorological towers ("met towers") represent major differences between the *status quo* and the proposed alteration of the visual resource of the study area. Therefore, the turbines and met towers had to be modeled as entities and then placed in the correct locations in order to depict them in their proper scale, appearance and locations in the digital photomontage.

2.2.2.1 Geometry of 3D Objects

Xtra-Spatial Productions, LLC already had a three-blade, horizontal axis wind turbine model that was used for another project (Gamesa G87 2MW). The dimensioning, however, did not conform to the dimensions proposed for the Kibby Mountain Windfarm (Vestas V90 3.0MW). Using 3D Studio MAX (Kinetix, Inc.), a new model was created to conform to the specified dimensions:

- 80m height to rotor axis and
- 127m maximum height to blade tip at top-dead-center

Additionally, all dimensioning as described in Horizon Wind's document titled *Appendix 4: Vestas V82 and V90 Wind Turbine Specifications, and the Vestas V100 Wind Turbine Product Brochure* (http://www.horizonwind.com/images_projects/Arrowsmith/permit/ARR_App_4_Turbine_Specs.pdf) were used to build a highly realistic model of the G87 turbine. The turbine 3D model is depicted below both with the rotor still and with the rotor in rotation.

Turbine with rotor still

Turbine with rotor spinning

From this "master 3D model," six derivative models were built representing the blades in various positions along their rotation:

- Blade #1 at top-dead-center (0°)
- Blade #1 at 20°
- Blade #1 at 40°
- Blade #1 at 60°
- Blade # 1 at 80°
- Blade # 1 at 100°

This was done to simulate the random nature of the spinning blades at 20° increments. Note that due to the trifold radial symmetry of the blade configurations, no further

variations were needed to simulate a full revolution of the turbine rotor. In other words, a 120° rotation of Blade #1 would look the same as a 0° rotation of Blade #1.

The met towers were modeled as simple tubes, 84 meters tall and with a base diameter of 1.5 meters tapering to 1.0 meter at the top of the tower.

2.2.2.2 Materials of 3D Objects

A single material was assigned to the entire turbine (save the aircraft warning beacons). The material was a semi-glossy white paint that maximizes visibility to aircraft. The base of the tower was assigned a concrete material.

The met towers use a single material simulating flat light-gray galvanized metal. Guy wires were modeled but for the photomontages, the wires were not rendered.

2.2.2.3 Locations and orientation of 3D Objects

A CAD drawing of turbine locations, pad dimensioning, and access roads was provided by Stone Environmental Inc. The elevations of the base of the tower were assumed to be the terrain elevation from the 10-meter DEM (§2.2.1.2) at the turbines' locations.

The turbines were oriented to face due northwest or 315° (the direction of the prevailing winds) with a +/- 10° random variation.

The met tower locations were provided in a text file containing crude latitude/longitude coordinates. When mapped along with the turbines and pads, it was apparent that the met towers' locations were not precise enough. The towers were moved to the nearest pad and placed therein to preclude interference between the supporting guy wires, and turbine rotor blades.

3. Processing

This section describes the steps necessary to convert the data into a digital photomontage.

3.1 Creation of the Computer Model

The Computer Model was created using Visual Nature Studio (*VNS*) version 2.75 (3D Nature, LLC). The entire process of creating the model is beyond the scope of this document, but the highlights are presented below.

3.1.1 Integration of GIS Data and 3D Object Data

VNS models are created by applying textures, billboarded images, and 3D models to a terrain surface. The terrain surface was imported from the DEMs described in §2.2.1.2 above.

Shapefiles of access roads and turbine pad boundaries were imported into the VNS project. A cross-section was created for the access roads with a 20-foot (~6.1m) width of gravel and a 24-foot-wide shoulder of disturbed earth on each side of the road. The

cross-section for ridgetop roads between turbines was modeled as a 34-foot (~10.5m) width of gravel and a 24-foot-wide shoulder of disturbed earth on each side of the road.

Turbine pads were assigned a disturbed earth ecosystem to represent the necessary clearing to construct and erect the turbines.

Shapefiles for the camera location and the turbine locations were added to the VNS project. The six 3D Models of the turbine (see §2.2.2.1) were imported into the project and assigned at random to all forty-seven turbine locations. Similarly, the met tower 3D Model was assigned to points representing their locations.

For each field image, a light simulating the Sun's position and intensity was created to match the time of day and the atmospheric conditions corresponding to *in situ* conditions when the digital photo was acquired.

3.1.2 Camera matching

The process of creating a model camera that matches the orientation of the actual digital camera is the most time-consuming aspect of the project. Fortunately, the position and HFOV of the camera was specified with a high degree of confidence. The estimated bearing was useful to set up a crude orientation of the camera, but an iterative approach to tweaking this, and other parameters (*i.e.*, pitch and bank) was necessary. This iterative approach was achieved using a down-sampled version of the original digital image and a preview render of the terrain model of the same pixel dimensions. The field image was superimposed on the rendered image with some transparency. Furthermore, a Post-Process that simulates cartoon inking was used to darken portions of the rendering where the distances between adjacent pixels in the rendered image exceed a certain threshold. This technique, in effect, produces local horizon lines that were instrumental in confirming the veracity of the camera matching operation. In cases of mismatch, the preview render was moved horizontally and vertically, as well as rotated, until the skylines and foreground ridgelines were coincident. The amount of displacement and rotation of the preview was noted, and the heading, pitch and bank parameters of the VNS camera were adjusted. A new preview render was generated and the process repeated until the camera match was optimal.

Once the camera's orientation was matched, the parameter values were keyframed to prevent accidental changes to the parameter values.

3.2 Rendering of Computer Model to Match Digital Images

The terrain and the turbines were rendered at the same resolution as the digital images (*e.g.*, 3008 by 2000 pixels for Nikon D100; 3264 by 2448 for Olympus EVOLT E-500).

For each of the seven photomontages, a set of two computer renderings was produced. The first rendering was a photosimulation of the Computer Model from the simulated camera using all components: lights, atmospheres, 3D Objects, new roads, pads, powerline swaths, as well as the ecosystems defined by the remapped GOMLC database

described in §2.2.1.3 above. To match the overall hue and saturation of the field image, post-processes to partially desaturate and apply a bluish tint were applied as needed.

A second rendering was made to serve as a binary mask delineating those parts of the altered landscape that would be visible in from the camera location thereby excluding portions of the altered landscape that would be obscured by ridgelines or screened by vegetation. For this operation all elements of the altered landscape (turbines, met towers, access roads, pads) were assigned a 100% luminous (glowing) white material. Sunlight, ambient light, haze were all turned off for this rendering and a black sky was used. This produced a rendering where those portions of the altered landscaped elements that are unscreened and unobscured are white and the rest of the image is black. Edges of the unobscured/unscreened altered landscape elements are anti-aliased as shades of gray in the rendering process. This prevents the occurrence of stairstepping of pixels and facilitates the smooth compositing of rendered elements and the field image. This image will hereafter be referred to as "the mask."

3.3 Compositing of Computer Model Output and Digital Images

The process of compositing two images involves the preservation of parts of each image and the discarding of the complimentary parts of the image. The only parts of the photosimulation image that were retained were the portions that were not black in the mask image.

To initiate the compositing operation, the field digital image was loaded into Photoshop. Next, the mask was opened, copied, and pasted as a new layer over the digital image. Finally, the photosimulation output of the Computer Model was opened, copied, and pasted as yet another new layer over the digital image.

3.3.1 Render Image Masking

The portions of the mask that are pure black were selected using the Magic Wand tool of Photoshop (using a tolerance of "0," anti-aliasing enabled, and contiguous pixels disabled). This selection was then inverted to create a selection of pixels that correspond to the unobscured/unscreened portions of the altered landscape elements in the photosimulation.

3.3.2 Foreground Object Masking

Since no attempt was made to photosimulate foreground elements in the field image, in some photomontages it was necessary to deselect some selected pixels from §3.3.1 that would be obscured by foreground objects in the base image. Trees in the foreground presented the majority of the foreground objects requiring this deselection operation. The marquee and polygonal lasso tools were used to deselect pixels from the selected set by temporarily disabling visibility of the mask layer and the photosimulation layer.

3.3.3 Assignment of Layer Mask for Photosimulation

Once the selected set of pixels has been limited as described in §3.3.1 and §3.3.2 above, the selected set of pixels was saved as a Layer Mask for the photosimulation layer and visibility of that layer was re-enabled. This operation created transparent pixels in all portions of the photosimulation layer not in the selected set of pixels, creating the photomontage.

3.3.4 Application of Gaussian Blur to Computer Model Output

Since the rendering of the computer model is done without optics, the image is often "too sharp" and doesn't look like it was captured optically as was the digital image. Therefore, in cases where such sharpness creates a distracting or less convincing photomontage, a Gaussian Blur filter with a radius value of 0.8 pixels was applied to "soften" the visible portions of the photosimulation layer. Thus the turbines appeared to be similar in sharpness as the digital image.

4. Results

Photometrically correct photomontages produced using accurate Sun position failed to produce significant contrast of the turbines and met towers in several simulations. Such conditions were found when the turbines were illuminated when the Sun was either nearly directly behind the camera or nearly directly behind the turbine (backlit). At the behest of the contractor, a new photosimulation was produced wherein the turbines were not lit by the actual Sun at its computed position based on the field image, but rather by an artificial light more perpendicular to the camera's optical axis. Additionally, this light was used to cast some shadowing on the turbines (self-shadowing). Using VNS it is possible to have each light in the Computer Model illuminate certain objects and not illuminate others. The results of this operation produced photomontages that better showed the turbines and other elements of the altered landscape.

5. Caveats

There are several caveats to consider when presenting photomontages to an audience that may be unfamiliar with this form of analysis. Lack of awareness of these caveats can create mistrust and even deception among the audience and the presenter.

5.1 Digital Imaging versus Human Visual Perception

Human visual perception represents millions of years of evolutionary progress and is indeed a marvel of Nature. Photography has been around for 150 years or so, and digital imaging is a product of the late Twentieth Century. There are some important differences in the way the eye/brain system perceives visual stimulus and the way digital images present themselves to this system.

Most notable is that human visual perception is not constant across the entire field of view. While the distribution of the sensing rods and cones are more or less constant from the fovea of the eye to the peripheral areas of the retina, the distribution of the optical ganglia is not. At the fovea, there is a one-to-one ratio of sensors (rods and cones) to

ganglia; each sensor has its own ganglion. As one moves away from the fovea (*i.e.*, increases eccentricity), more sensors feed into a single ganglion, which "averages" their photoreceptive impulses. Thus the eye is a variable resolution imaging system. The digital camera is a constant resolution imaging system. We have no way to create digital raster images that mimic this characteristic of the eye/brain system. The resolving power at the fovea of the eye is incredibly greater than any digital imaging device. So even if a turbine appears to be an insignificant smudge on our digital photomontage, the eye may see an actual turbine in detail if a turbine actually was to be there.

5.2 Proper Viewing Distances

In order to preserve the scale of objects in a photograph of digital image, the viewer must be placed at the correct distance from the photograph or image. All images should be viewed at the distance that preserves the HFOV as shown in Appendix A, column "Photomontage Viewing Instructions." So, for example, if the Eustis Ridge image is projected onto a screen such that it is 10 feet wide, the viewer should stand such that she is approximately 14 feet away from the screen. Likewise, if the image were printed on an 8" x 10" sheet, the viewer should hold the sheet at a distance of approximately 14 inches.

5.3 Tradeoffs between Full Resolution and Full Field of View

Since the human eye has much greater resolving power than any extant digital imaging system, a tradeoff must be made between resolution and field of view. The binocular eye/brain system has a HFOV of 180 degrees if one includes low resolution portions of peripheral vision and about 40 degrees if one limits it to the highest resolution portions of the retina. If one were to produce a fisheye (~160° HFOV) image of a vista, it is most unlikely that anything on the horizon would be discernable since there are only a finite number of pixels that can be used to cover such a wide field of view. Likewise, if one were to replicate the resolving power of the foveal region of the retina, she would need to restrict the HFOV to only a couple of degrees! This would not give the viewer the context of the scene that is so often crucial to the decision-making process. This tradeoff should be considered when presenting a photomontage to the public.

Appendix A. Metadata for *In Situ* Digital Images

Location Name	Date of Image Acquisition	Time of Image Acquisition	Bearing	Pitch	Roll	Horizontal FOV	Equivalent Focal Length	Viewing Instructions
Sarampus Falls	October 10th, 2006	9:52am EDT	20.15°	9.9° up	1.0° CW	28.07°	70.00mm	Distance = 2.00 x image width
Avery Peak	September 13th, 2006	1:28pm EDT	314.2°	0.15° down	1.1° CW	25.8°	76.41mm	Distance = 2.18 x image width
Route 27 near Vine Road	November 11th, 2006	1:31pm EST	353.75°	2.75° up	0°	38.58°	51.44mm	Distance = 1.43 x image width
Jim Pond	November 1st, 2006	10:45pm EST	318.7°	1.95° up	0°	38.58°	51.44mm	Distance = 1.43 x image width
Eustis Ridge	November 11th, 2006	2:23pm EST	349.875°	1.50° up	1.88° CW	39.5°	50.13mm	Distance = 1.39 x image width
Kibby Mountain to Series A	November 11th, 2006	10:30am EST	159.25°	2.38° down	0.75° CW	40.0°	49.45mm	Distance = 1.37 x image width
Kibby Mountain to Series B	November 11th, 2006	10:30am EST	186.75°	1.00° down	0.50° CW	40.0°	49.45mm	Distance = 1.37 x image width

APPENDIX E

RESUMES

- Jean E. Vissering Landscape Architect
- David Healy, Stone Environmental
- James Zack, Xtraspatial Productions

Jean E. Vissering Landscape Architecture

3700 NORTH STREET MONTPELIER VERMONT 05602 802-223-3262/jeanviss@attglobal.net

RESUME

EDUCATION

Master of Landscape Architecture - 1975, North Carolina State University, Raleigh, NC, American Society of Landscape Architects Book Award.

Bachelor of Science in Landscape Architecture - 1972, University of Massachusetts, Amherst, MA. Cum Laude. Honors Thesis on Pedestrian Environments.

PROFESSIONAL EXPERIENCE

Professional Consulting: Recent Design and Planning Projects

- Currently preparing a visual assessment of the Deerfield Wind Project on behalf of Vermont Environmental Research Associates (VERA) and PPM. The project would include up to 22 turbines in the vicinity of the existing Searsburg Wind Facility.
- Currently working with the Center for Victims of Violent Crimes to design a ceremonial garden to honor those who have lost their lives to violent crimes. The garden will be located on State property near the State House in Montpelier.
- Appointed as member of the National Academy of Science Wind Energy Committee. The Committee's report will be finalized in 2007.
- Currently assisting the Vermont District #2 Environmental Commission to review a proposed subdivision adjacent to Interstate 91 in Windsor.
- Worked with the Addison County Regional Planning Commission in aesthetic review under §248 of the Vermont Electric Coop (VELCO) Northwest Reliability Project. The project includes additional 345kV, 115kV transmission lines and new and expanded substations. I have worked with the Towns of Leicester, Salisbury, Middlebury and New Haven, and with affected property owners.
- Reviewed proposed wind energy proposals in the vicinity of Jordanville and Cherry Valley, NY for Otsego 2000.
- Assisted the Bennington Regional Commission and the Town of Manchester in a public information and review process by providing information regarding the aesthetic effects of the proposed Little Equinox Wind Energy Project.
- Scenic evaluation methodology and protection strategies for the Town of Huntington's

Conservation Commission to be used as a tool for prioritizing conservation efforts.

- Elm Court Park: a small pocket park developed by the Trust for Public Land and the City of Montpelier. The park demonstrates ecological approaches to design and contains a butterfly garden.
- Prepared a visual assessment for the proposed Glebe Mountain wind project on behalf of the Town of Londonderry. My review also examined impacts to surrounding towns. (I am now working with the Glebe Mountain Group on this project.)
- Presented an overview of the visual issues involved in wind energy development to Scenic America's Board of Directors and Affiliates at their annual meeting in Washington, D.C. Scenic America will use the information to develop a policy on wind energy issues and a strategy for involvement.
- Prepared the report, *Wind Energy and Vermont's Scenic Landscape*, for the Vermont Public Service Department summarizing discussions among stakeholders concerning the visual impacts of wind energy. The guidelines are intended for use by the PSB, prospective developers, and by local and regional planning organizations.
- Sabin's Pasture, Montpelier: a site plan for a 147-unit mixed-use neighborhood-scaled project. The project was designed to provide a model for development using "smart growth" principles including compact and traditional patterns of growth and the preservation of open space. The design was part of a community process and was funded by the Central Vermont Community Land Trust, a housing advocacy organization.
- Brochure for the Public Service Board, *Siting a Wind Turbine on Your Property,* designed to encourage the sensitive siting of small wind turbines to protect scenic views.
- City of Montpelier's *Open Space Plan Views and Vistas Study*: I worked with the Conservation Commission to develop priorities for protection. Arrowwood Environmental conducted ecological studies. This study included a professional visual assessment, public survey, and public meetings.
- Turntable Park, Stonecutters Way, Montpelier: design for restoration of an historic turntable, along with accommodation of recreational and theatrical use of a small park. (Designed in collaboration with the Office of Robert White).
- Review of numerous projects for aesthetic impacts under Vermont's Land Use Law, Act 250. Examples include Old Stone House Subdivision in South Burlington, a proposed RV park in Sharon, a wind turbine in Middlebury, Pittsford Post Office, a proposed gas station in Hartland, the Sheffield Quarry, and a Bell Atlantic Communications Tower in Sharon.
- Design and construction supervision for numerous residential and institutional projects.
- Randolph Family Housing and Templeton Court, landscape design for low-income housing projects in Randolph and White River Junction, VT.
- Plainfield Common, a public riverside park and small formalized parking area in the village center of Plainfield; this project involved extensive public involvement
- Streetscape Master Plan for Chelsea village: village plantings and hardscape improvements for the village center's greens and streets, as well as for several parks and public areas.
- Street tree inventory and plan for the City of Montpelier.
- Conservation and development plans for landholdings in various towns. Plans provide for the protection of important resources including scenic values, agricultural lands, wetlands, and valuable forestland while identifying appropriate areas for development.

- "Scenic Resource Evaluation Process": a team project to develop guidelines for Vermont Agency of Natural Resources' review of Act 250 projects.

Teaching Experience

- **2000-present:** Landscape Design courses at Studio Place Arts in Barre.

- **1982 -1997: Lecturer (University of Vermont, School of Natural Resources and Department of Plant and Soil Science)**
  I taught a variety of courses depending on the semester and year. Courses included *Park and Recreation Design* (Recreation Management); *Landscape Design Studio,* and *Colloquium in Ecological Landscape Design* (Plant and Soil Science), and *Visual Resource Planning and Management* (Natural Resources graduate level), and *Environmental Aesthetics and Planning* (Natural Resources). I also organized a seminar and lecture series for Shelburne Farms and for Plant and Soil Science focusing on topics in Sustainable and Ecological Landscape Design. I assisted graduate students in Natural Resources Planning and served on several graduate committees.

- **1996: Faculty (Vermont Design Institute)**
  Served as a faculty facilitator for a summer workshop on finding patterns in the landscape as a planning tool.

- **1995: Lecturer (Norwich University, Department of Architecture)**
  Taught a course in Landscape Architecture, the first to be taught in the school. Early Design and Planning Experience

Additional Experience

- **1981 - 1982: State Lands Planner (Agency of Natural Resources, Department of Forests, Parks and Recreation)**
  Preparation and Coordination of all land management plans for the Department of Forests, Parks, and Recreation; review of plans under Act 250 and Act 248 for aesthetic impacts; provided design services and related expertise to other Agency departments and to municipalities.

- **1978 - 1981: Park Planner (VT. Dept. of Forests, Parks and Recreation)**
  Designed state park facilities including site analysis and working drawings, grading plans, construction details, planting plans, etc. Also prepared permit applications, organized public meetings and supervised construction of projects. Reviewed plans under Act 250 for aesthetic impacts. Instrumental in organizing a new state lands management unit.

PUBLICATIONS AND ILLUSTRATIONS

Sabin's Pasture: A Vision for Development and Conservation, Central Vermont Community Land Trust, March 2003.

Siting a Wind Turbine on Your Property: Putting Two Good Things Together, Small Wind Technology & Vermont's Scenic Landscape, Public Service Board, December 2002

Wind Energy and Vermont's Scenic Landscape: A Discussion Based on the Woodbury Stakeholder Workshops, Vermont Public Service Department, August 2002.

Scenic Resource Evaluation Process, Vermont Agency of Natural Resources, July 1, 1990. Guidelines to be used by the Agency of Natural Resources in reviewing visual impacts of development projects under Act 250 in areas of regional and statewide scenic significance.

"Impact Assessment of Timber Harvesting Activity in Vermont: Final Report-March 1990": a research project conducted by the University of Vermont on behalf of the Vermont Department of Forests, Parks, and Recreation. My focus was the visual impacts of timber harvesting.

"Landscapes, Scenic Corridors and Visual Resources": a chapter of the 1989 Vermont Recreation Plan which outlines a five year plan for protecting and enhancing scenic resources in Vermont.

"Healing Springs Nature Trail Guide": a nature trail at Shaftsbury State Park, text, illustrations, and design of trail and bridges.

"The View from the Sidewalk": a walking tour emphasizing the interconnections of environment and culture that shaped the cityscape of Raleigh, North Carolina, text and illustrations. Published by the Raleigh Chamber of Commerce.

Illustrations for other books, guides and newsletters.

DAVID J. HEALY

EDUCATION

University of California, Los Angeles
M.A., Urban Planning, 1972

University of Massachusetts, Lowell
B.S., Meteorology, 1969

WORK EXPERIENCE

Stone Environmental, Inc.
Montpelier, Vermont, USA, *Vice-President*, 1995 - Present

Develop and grow GIS and database application services business unit. Guides the design, development and manages all geographic information system project applications. Responsible for planning, public policy, education, information analysis, data product development and training for the company. Principle-in-charge of wastewater and water resource planning and modeling projects.

visualDATA, inc.
Co-Founder & President, 1992 - 1995

Conducted GIS planning, studies, surveys, training, education, information analysis and data product development, nationally and internationally.

Office of Geographic Information Services, State of Vermont
Montpelier, Vermont, USA
GIS Operations Administrator, 1989 - 1992

Developed and executed all aspects of intergovernmental GIS--plans, database development & management, standards, policies and training programs; prepared project technical specifications, RFPs and managed all size contracts; oversaw software and hardware acquisition; developed application priorities and oversaw their execution. (*Interim Director* - July, 1989 to March, 1990)

Governor's Office of Policy Research, State of Vermont
Montpelier, Vermont, USA
Policy Analyst, 1982 - 1989

Developed plan for the Vermont Geographic Information System (VGIS); managed acquisition, installation, staff training of GIS hardware & software; drafted Vermont's GIS legislation and guided it through legislature; prepared GIS Executive Order, policies, guidelines and standards. Prepared growth trend analyses for the *Commission on Vermont's Future*. Conducted numerous demographic, economic and environmental policy analyses. Developed and managed interagency implementation of measures to streamline statewide permit/license systems. Managed the Vermont State Data Center and served as official contact with the U.S. Bureau of the Census.

Planning and Budget Affairs Office, Commonwealth of the Northern Mariana Islands
Saipan, Northern Mariana Islands
Program Planning Coordinator, 1980 - 1981

Assisted in supervising operations of environmental and energy planning programs and 14 person office; developed procedures for capital improvement projects; prepared energy, environmental and physical development plans, policies, draft legislation and grant applications; reviewed impacts of major development projects in coastal zone; and established citizen advisory committee for review of policies and plans.

Consultant
San Francisco, California, USA
1978 - 1980

Conducted studies for various public and private clients on: EPA policies on secondary air quality impacts associated with wastewater treatment facilities; transportation control strategies in South Coast Air Quality Management Plan; and history of California air quality implementation plans.

U.S. Environmental Protection Agency, Region IX
San Francisco, California, USA
Community Planner, 1972 - 1978

Developed programs for achieving air quality standards in the Los Angeles air basin; initiated regional policies for the mitigation of secondary air quality impacts of wastewater treatment facilities; initiated recommendations for national and regional air quality policies and regulations; initiated innovative governmental approaches for integrated

environmental management; managed grants to South Coast Air Quality Management District; negotiated and managed numerous contracts with public agencies and consulting firms; developed transportation control strategies and regulations in air implementation plans; reviewed Federal EIS'; and provided guidance to and review of California water basin and waste treatment facility plans.

UCLA/Friends of Mammoth Environmental Study Project
Mammoth Lakes, California, USA
Field Team Coordinator, 1972

Developed alternative land use and institutional arrangement proposals for a small community impacted by a major ski area expansion.

PUBLICATIONS AND PRESENTATIONS

Healy, D.J., and Stancioff, A *Poverty/Vulnerability Mapping in Niger, Developing Multiple-factor Poverty Mapping Indicators for Poverty Reduction Programs,* Africa GIS 03, Dakar, Senegal

Healy, D.J., *Using GIS to Help Understand Poverty/Vulnerability In Africa,* ESRI 2003 International User Conference, San Diego, CA

Healy, D.J., *Developing a Poverty Information System, Niger Experience*, The Impact Of Poverty Maps: Past Experiences And New Directions Workshop, Brussels, Belgium

Stancioff, A and Healy, D.J., *Conflict Forecasting Using GIS*

Winchell, M, Healy, D.J. and B. Douglas, "A New Paradigm for Town-wide Decentralized Wastewater Needs Analysis." NOWRA 2002 Conference & Education Program, Kansas City MO

Healy, D.J. and B. Douglas, 1999, "Use of GIS Tools for Conducting Community On-site Septic Management Planning." USEPA Conference on Environmental Problem Solving With Geographic Information Systems, Cincinnati OH

Estes, T. L., M.H. Pottinger, D.J. Healy, C.T. Stone, and A. Hiscock, 1998. "Chemical-Specific Method for Determining Geographic Distribution of Leaching Potential." American Chemical Society Annual Meeting, Boston, MA.

Healy, D.J., 1996. "Atlas of Crop Acreage by County for the United States." Stone Environmental.

Healy, D.J., 1996. "Areas of the United States With a High Potential Susceptibility to Groundwater Contamination." Stone Environmental.

Healy, D.J., 1992. "Vermont's GIS, Four Years Later, Lessons Learned, Proceedings 1992 Annual ESRI User Conference.

Healy, D.J., 1991. "VGIS Handbook of Policies, Standards, Guidelines, and Procedures." Vermont Office of Geographic Information Services.

Healy, D.J., 1990. "Vermont's GIS." 1990 Northeast URISA Conference.

Healy, D.J., 1990. "Vermont's GIS - Planning to Implementation." *Proceedings 1990 URISA Conference.*

Healy, D.J., 1988. "Demographic and Economic Analysis, Technical Appendix, *Final Report of the Commission on the Future of Vermont.*"

Healy, D.J., M. Wilson, T. Douse, 1986. "County Profile Series, Vermont County Demographic & Economic Reports." OPRC & DET.

Healy, D.J., S. McReynolds, F. Schmidt, 1984. "Close Up/Vermont" *American Demographic.*

Healy, D.J., P. Gillies, 1984. "The Regulation of Vermont." Office of the Secretary of State.

Healy, D.J., 1982-1984. "Vermont Vital Trends." Study Paper Series, State Planning Office.

Healy, D.J., 1975. "Attempting Regional Environmental Management." Regional Environmental Management, Coate and Bonner, Editors, John Wiley and Sons, New York.

Healy, D.J., 1972. "Land Use Alternatives and Implementation." Facing the Future: Five Alternatives for Mammoth Lakes, SAUP/UCLA, Friends of Mammoth, Mammoth Lakes, CA.

ADDITIONAL EDUCATION

- Certified Public Manager, State of Vermont
- Courses in ARC/INFO® and Public Finance
- Authorized ArcView® Instructor

HONORS AND AWARDS

- EPA Bronze Medal
- U.S. Public Health Service Traineeship in Environmental Planning and Management

PROFESSIONAL AND COMMUNITY ACTIVITIES

Vermont Center for Geographic Information
Member, Board of Directors

James A. Zack

President, Xtra-Spatial Productions, LLC

Experience Summary

Mr. Zack has over twenty years of experience in the field of geodata processing. During the past fifteen years, he has concentrated on the application of Geographic Information Systems, Internet/Web, and Landscape Visualization technologies to a wide range of natural/cultural resource and environmental projects. Mr. Zack formed Xtra-Spatial Productions, LLC in July of 2000 and serves as its president and owner. He has worked on GIS Software Development efforts, and has designed and delivered software trainings. Mr. Zack has designed and implemented geodatabases and developed custom applications using GIS technology. He has served as a GIS consultant to various governmental and private enterprises. He has also taught introductory courses in GIS and Remote Sensing at the Boulder campus of the University of Colorado. Mr. Zack is a 3DNature Certified instructor for World Construction Set. He is also an accomplished digital photographer specializing in panoramas and re-occupation of sites of archived photographs.

Credentials

M.S., Geography -- University of California-Riverside (1989)

B.Sc. Geology -- University of Florida (1979)

Professional Affiliations

Member of the American Planning Association

Member of the Capital District Planning Association

Member of Urban and Regional Information Systems Association

Member of the American Society for Photogrammetry and Remote Sensing

Other Affiliations

Member of the Residents Committee to Protect the Adirondacks

Organizer of Sustainable Saratoga Springs

Honors

American Society for Photogrammetry and Remote Sensing "Best Scientific Paper in GIS" Award 1992

Phi Beta Kappa, 1979

Employment History

2000-present: President, Xtra-Spatial Productions, LLC, Boulder, CO and Saratoga Springs, NY

2000-2003: Research Associate, Natural Resources Ecology Laboratory, Colorado State University, Ft. Collins, CO

1997-2000: Senior GIS Analyst, Geomega, Inc., Boulder, CO

1995-1997: Research Associate, Natural Resources Ecology Laboratory, Colorado State University, Ft. Collins, CO

1990-1994: Research and Teaching Assistant, Department of Geography, University of Colorado, Boulder, CO

1990: Data Modeler/Consultant, Platte River Associates, Denver, CO

1985-1990: GIS Applications Programmer, Environmental Systems Research Institute, Redlands, CA

1980-1984: Geophysicist, Cities Service Oil and Gas Co., Tulsa, OK

1979-1980: Seismic Analyst, Chevron Geosciences Co., Houston, TX

Computer Skills

Mr. Zack is proficient with Wintel-based, Macintosh and Linux/Unix workstations. He has programming experience in C, Java, and Visual Basic. Mr. Zack has extensive experience with ESRI GIS software (ArcGIS, ArcView with Spatial Analyst and 3D Analyst Extensions, ArcInfo, Internet Map Server) and the fourth-generation languages specific to that product line (VBA, Avenue, Arc Macro Language, and Map Objects). He has Internet/Web skills for HTML and JavaScript coding, XML document design, XSL Transformation language, Virtual Reality Modeling Language (VRML), Keyhole Markup Language (KML) and uses Adobe GoLive and LiveMotion software to design pages and sites. Mr. Zack is also proficient in the Adobe line of multimedia products including Premiere, Photoshop, and Encore DVD. He is also proficient in audio editing using Cakewalk Pro Audio. Over the past nine years, Mr. Zack has gained experienced in three-dimensional modeling using AutoDesk's 3D Studio MAX. Also during this time, he has become a master of 3D Nature's World Construction Set and Visual Nature Studio software for 3D landscape visualization, as well as realtime scene generation using Scene Express. Mr. Zack has used a wide range of hardware and OS variants and has performed many system administrative tasks.

Key Projects

Landscape Visualization (most of the more recent projects can be viewed at Xtra-Spatial Productions, LLC website: http://www.spatialexperts.com/projects)

Trained and assisted the staff of Nicklaus Design, LLC in efforts to visualize proposed golf course design plans.

Created and produced a set of animations showing wetlands rehabilitation and recreation facility improvements for riparian corridor in Springfield, Oregon.

Produced a set of animated flyovers for six eighteen-hole golf courses along the Carolina coast (in collaboration with VR Marketing, Inc., N. Myrtle Beach, SC).

Designed, created, and produced a scientific animation showing the proposed renovation of a golf course green complex (in collaboration with TerraVea, Boulder, CO)

Trained and assisted staff of Envision Utah in efforts to visualize various scenarios related to Transfer of Development Rights for Layton, Utah, and to visualize small community development in Mantua, Utah.

Created photosimulations of a proposed mountaintop Digital TV tower site as part of a qualitative analysis of visual resources on the western edge of the Metropolitan Denver Area.

Created photorealistic "time-lapse" animations of the proposed mining operations expansion/reclamation efforts for a major gold producer in Colorado.

Created photorealistic images of Rocky Mountain National Park under present day conditions and under several scenarios of global climate change to be used in visual quality analysis.

Created photorealistic fly-through animation of a large open pit copper mining operation in Indonesia as part of a promotional campaign.

Created a Web-based interactive experience for visualizing a golf course using linked photorealistic panoramas, fly-overs, and other HTML-based assets.

Created texture maps used in the background of a best-selling snowboarding video game.

Provided technical assistance and guidance for external landscape and urban scene visualizations.

Multimedia, GIS, and Internet Mapping

Conducted Wildlife Impact Assessment Temporal Analysis of the Town of Bolton, NY 1966-2004 for the Residents Committee to Protect the Adirondacks.

Conducting Analysis of Buildout and the spatial distribution of development pressures for the Adirondack State Park, NY for the Residents Committee to Protect the Adirondacks.

Produced high-quality large-format maps for assisting in Open Space acquisitions in the Adirondack State Park, NY for the Residents Committee to Protect the Adirondacks.

Produced instructional 3D, animated video for public education at a Superfund site in Georgia.

Co-designed, developed, and implemented SCoP, a Web-based Mapping System for presenting multiscale biological resource data for the state of Colorado (http://ndis.nrel.colostate.edu/).

Designed and conducted spatially discrete analysis of perceived Digital TV tower sizes to census blocks along the western edge of the Metropolitan Denver Area.

Developed and implemented methodology for predicting probabilities of finding archaeological sites based on environmental variable for an Air Force base in Montana.

Mapped multiple soil characteristics across a 5000-acre site to examine correlations with vegetation abundance.

Provided spatial modeling support for regression-based analysis of revegetation potential for a Nevada Copper mine.

Publications/Presentations/Achievements

Interpretive Poster of "The Great Carry," a perspective view of the Old Military Road between Fort Edward and Fort William Henry used by the British Army during the French and Indian War. In progress with anticipated release to commemorate the 250th anniversary of the 1755 Battle of Lake George. (www.spatialexperts.com/Interpretive_frame.html)

Winner of the 2001 Poster Contest ESRI-Denver Regional Office for "A Quantitative Comparison of the Visual Intrusion of Proposed Digital TV Towers at Two Sites." September 2001.

Theobald, D., and **J. Zack**, Presentation of "Disseminating Natural Diversity Information Using ArcView IMS: Design Issues and Technical Considerations," Eighteenth Annual ESRI User Conference, San Diego, CA, July 1998.

Product/Project Engineering of "ClimateData and HydroData ArcData products (alpha and beta versions)," with Hydrosphere Data Products, Inc., April, 1993.

Cartographic production for "Natural Hazards in Puerto Rico: Attitudes, Experience, and Behavior of Homeowners" by Dr. Risa Palm and Dr. Michael E. Hodgson, 1993.

Presentation of "Summary of GIS Database Operations to Support the RSS/MODM Project," Twelfth Annual ESRI User Conference, Palm Springs, CA, June 1992.

Participant in City and County of Boulder Wildland Fire Symposium, Boulder, CO, May 1992.

Zack, J., "Hurricane Hazard Mitigation in Puerto Rico: A Quantitative Approach," paper presented for Quantitative Methods in Geography, Dr. Andrei Rogers, University of Colorado at Boulder, 1992.**Zack, J.**, and R. Minnich, "Integration of a Geographic Information Systems with a Diagnostic Wind Field Model in Complex Terrain for Fire Management," *Forest Science*, June 1991.

Palm, R., J. Molinelli, D. Lyons, D. Blanchard, and **J. Zack**, "Multi-hazard Risk Perception in Puerto Rico after Hurricane Hugo," presentation at First Conference on Natural Hazards, Boulder, Colorado, June 1991.

Marozas, B., and **J. Zack**, "GIS and archaeological site location," in *Interpreting Space*, Allen, Green and Zubrow, eds., Taylor and Francis: London. 1990.

Zack, J., "Assessing the Effects of Terrain on a Multispectral Classification of Fuel Models as Part of a Wildfire Management Decision Support System," paper presented for Remote Sensing of the Environment, Dr. Alexander F.H. Goetz, University of Colorado at Boulder, 1990.

Presentation of "Integration of a Geographic Information Systems with a Diagnostic Wind Field Model in Complex Terrain for Fire Management," Annual Meeting of the Great Plains and Rocky Mountain Division of the American Association of Geographers, Kearney, Nebraska, October, 1990.

Presentation of "Calculation and Cartographic Display of Spatial Statistics in the ARC/INFO Environment," Tenth Annual International ARC/INFO Users' Conference, Palm Springs, CA, May 1990.

Presentation of "TIN Tricks and Shortcuts," in *Proceedings Ninth Annual International ARC/INFO Users' Conference, Technical Sessions*, Plam Springs, CA, May 1989.

Primary designer of two-day "Applications Programming" course presented by Environmental Systems Research Institute to corporate/governmental clients, 1988-9.

Zack, J., "Integration of a Geographic Information Systems with a Diagnostic Wind Field Model in Complex Terrain for Fire Management," Master's Thesis, UC-Riverside, 1989.

Marozas, B., and **J. Zack**, "The Use of Geographic Information to Measure Independent Variables for Archaeological Site Location Studies," Paper presented at the 53rd Annual Meeting for American Archaeology, Phoenix, Arizona, 1988.

ATTACHMENT 6

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MEMO

To: Marsha Spencer-Famous, LURC

From: David P. Rocque, State Soil Scientist

Subject: Rezoning Application ZP 709
Kibby Wind Power Project

Date: April 30, 2007

After reviewing the subject application, I offer the following comments:

OVERVIEW:

The primary focus of my attention when reviewing a rezoning application is the suitability of the soils and slopes for the intended purpose. In the event that there are significant soil and/or slope limitations for the proposed use but the applicant has limited options from which to choose a more suitable location, I turn my attention to the applicants proposal to overcome those limitations to minimize any environmental harm. Such is the case with this application. The applicant desires to install wind turbines in one of the prime windfarm locations; the top of a couple of mountain ridges, but this is also a sensitive ecological area with significant soil, slope and hydrology limitations to overcome. In particular, I am concerned about the construction of roads needed to access the mountaintops by which the wind turbine components will be brought to their installation locations. I would much prefer to see another transport method used but I have been assured that roads are the only feasible option, which can be used given the size and weight of the wind turbine components. My comments therefore will be specific to the applicants proposal to overcome soil, slope and hydrology limitations associated with building roads up the mountains and along the ridge tops.

General:

It is my professional opinion that the applicant has:

1. Demonstrated an understanding of the soil, slope and hydrology limitations which will be encountered while undertaking the proposed construction project located on mountainsides and tops, and

2. Indicated a willingness to incorporate any and all appropriate Best Management Practices recommended by experts in the field to overcome soil, slope and hydrology limitations and thereby minimize environmental impacts. This includes having an on-site expert on erosion/sediment control, hydrology and stormwater to assure appropriate measures are used where and when needed during construction. It also includes providing a discussion of the type of techniques, which will be used, where they will be used and when.

SPECIFIC:

The following comments are specific comments concerning various aspects of the rezoning application.

1. Soils Report and Maps – In general, it appears that the applicant has proposed to locate the access roads in soils that are as suitable as reasonably possible on mountainsides and tops. The majority of the road sections proposed to cross soils that are typically associated with wetlands have been so located because of existing road or skid trails going into or through them.

   I did note that there was no mention in the soils report of soils with oxyaquic conditions (oxygenated groundwater). These are unique conditions restricted mostly to soils on long sloping sites with dense hardpan and/or shallow depths to bedrock similar to what is found in the mountains. This creates a higher seasonal groundwater table than can be expected from an observation of the soil morphology and is an important consideration when construction roads up the sides of mountains in order to minimize alteration of the hydrology. Those areas may not be large enough to show up as distinct soil map units but should be discussed as inclusions within soil map units. They should however, be identified and shown where possible as separate soil map units on the development plan, should the rezoning application be approved by the Commission. That would be important information for the design and construction of the project.

2. I noted and endorse the applicant's intent to have an on-site expert in soil erosion/sediment control, hydrology and stromwater control at all times during construction. That is the best way possible to identify areas where special techniques are needed (since it will be impossible for all of them to be identified prior to construction) and to supervise their correct installation.

3. I did not see a discussion of what time of year construction is to take place, which may have been an oversight on my part. I would recommend that construction, at least significant construction, be restricted to that time of year when soils are not frozen or saturated. If the applicant wishes to undertake significant construction when the soil is frozen, specific techniques to overcome those severe limitations should be developed and approved first. I would prefer however, to limit construction to those times of year when the soil is not frozen. No construction should occur when the soils are saturated.

4. I noted that each turbine site requires 1 acre of clearing and grubbing but only 0.5% or less of the site needs to be leveled. If only 0.5% of the 1-acre sites need to be leveled, is it necessary to grub the entire area? I would much prefer to see only clearing done so that as much of the area as possible retains tree roots and the organic duff layer (minimize alteration to the greatest extent possible).

5. Deep cuts for a few road sections are proposed (both sides of the road). I understand the need to do this at times to attain the desired road grade without building an excessive amount of road but this will be a big challenge when dealing with stormwater. Such deep cuts should be minimized to the maximum extent possible to avoid difficult to manage stromwater problems or the need for structural measures which require costly and time consuming maintenance.

6. The applicant intends to reuse excavated material in the construction of this project. They have indicated that any organic horizon material will be stockpiled and reused for erosion control. Where will the organic matter be stockpiled (sometimes, especially on steep slopes with upslope road cuts, it will not be possible to stockpile the materials on site due to the slopes)? Also, the "Thixotrophic" BHs horizon will have to be removed (in areas where it is thick) and can only be used in areas where bearing strength is not a factor, such as at the toe of slope. It can however, be removed with the organic duff material (it is very high in organic matter) and used for creating topsoil to be used at lower elevations.

7. I noted a discussion in the application where appropriate drainage techniques will be used in all newly constructed roads. Those techniques should also be used when old logging roads and/or skid trails are rebuilt or improved.

8. The typical wetland crossing proposes to use a "rock sandwich" material stone that is 2" –3" in diameter. I would prefer to see 3" – 4" stone used instead. That is because smaller stone may plug up with sediment or debris such as leaves.

9. I noted where upslope interceptors are to be used to divert runoff from the work site. There will also likely be instances where upslope groundwater interceptors will also be needed in order to work on a site. In those cases, once the work is done, the groundwater should be reconnected via a rock sandwich or similar device.

10. I suggest the applicant include a typical cross-section for a road which is built on a steep slope where large rock is used as a base, similar to the road I took the applicants engineer to see in Elliotsville Twp. This can dramatically decrease the need for a downslope fill extension. The rock may be available from a tallus slope or from blasting necessary in cut areas, which are shallow to bedrock.

MET TOWERS:

11. Access to met towers is proposed to be by trials that require little or no soil disturbance. If soil disturbance is required and erosion control devices are to be used, I suggest using either hay bales, erosion control mix or something like Gator Guard, which is a geotextile "sock" stuffed with foam. It is light, easy to carry and install and does not require additional disturbance to install. Silt fence requires too much soil and vegetation disturbance for the good it would be with small areas of disturbance. Final erosion control should not be by loam and seed. It should either be by erosion control bark mulch or replacement of the removed organic duff material.

12. When crossing wet areas to access met tower sites, laying down slash is a good technique to provide the necessary bearing strength. It is available at the site and is a natural material so it does not need to be carried out after all work is done. In large wet areas or where deeper wet soils are found, it may be necessary to use other techniques discussed in the application.

TRANSMISSION LINE:

13. I noted where the applicant indicated that about 20% of the proposed transmission line would need to cross through hydric soil map units. They calculate that amount as being about 29, 500 linear feet or about 5.5 miles. Approximately half of that amount however, is listed as being CNC and CRB soil map units. CNC is described in the soils legend as being Colonel-Dixfield-Pillsbury and CRB is described as being Colonel-Pillsbury-Skerry soils. None of those soils are hydric. Therefore, it appears as though only about 10% of the total transmission line length will have to cross through

hydric soils map units. None-the-less, approximately 2.25 miles of potential poorly and very poorly drained soils is a lot to cross. And, that is not counting the wetland inclusions in the map units not listed as being hydric. I would like to see the applicant only undertake construction on very poorly drained soils in the winter when the soil is frozen. Driving over very poorly drained soils at other times is very difficult and can be quite damaging. As for the poorly drained soils, they should be only worked over when frozen or during the driest months of the year (July, August or September). That is because they typically dry up in the summer and have good bearing strength (and damage to them is minimized). For small wet area crossings during the time of year that groundwater is present in poorly drained soils, I suggest using slash to provide bearing strength and to minimize damage to the wet area.

14. The applicant proposes to create sediment traps for dewatering excavations made for poles. I suggest that the sediment traps be made by using staked hay bales, erosion control mix berms or fabric socks.

15. I recommend that the applicant use erosion control mix instead of loam and seed for permanent stabilization of disturbed areas along the transmission line. It is a more natural material, immediately provides stabilization, minimizes the potential for bringing in unwanted plant species and will encourage native species to vegetate the area.

16. Is the applicant going to attempt restricting ATV use over those sections of transmission line, which have poorly or very poorly drained soils? If not, are crossings to be constructed for ATV use? ATV's can cause much environmental damage if allowed to travel along the transmission line over poorly or very poorly drained soils. Snowmobile use of the transmission lines should not be a problem as they travel over frozen and snow covered ground.