1A. ALTERNATIVES ANALYSIS

1A.1 PROJECT DESCRIPTION

Blue Sky West, LLC and Blue Sky West II, LLC (Applicants),[1] subsidiaries of First Wind, LLC, have proposed construction of the Bingham Wind Project (project), a utility-scale wind energy facility in Bingham, Moscow, Mayfield Township, Kingsbury Plantation, Abbot, and Parkman, in Somerset and Piscataquis Counties, Maine (Figures 1 and 1-2). The project includes 62 turbines (63 potential turbine locations are being permitted) in Bingham, Kingsbury Plantation, and Mayfield Township capable of generating up to 191 megawatts (MW) of electricity. Other project features include upgrades to existing roads and new roads to access the turbines; up to 5 permanent and up to 5 temporary meteorological (met) towers; an Operations and Maintenance (O&M) building in Mayfield Township; above and below ground 34.5-kilovolt (kV) electrical collector lines among the turbines (the majority of which will be buried alongside project roads) and connecting to a new collector substation in Mayfield Township; and an approximately 17-mile 115-kV generator lead connecting to an existing Central Maine Power Company (CMP) substation in Parkman, Maine. It is anticipated that a dynamic reactive device (DRD) such as a synchronous condenser will be required at the project collector substation to meet the interconnection requirements of ISO NE and CMP.

The final project size, design, and layout reflects an extensive and iterative process in which multiple ridgelines were evaluated for siting the wind generation facilities and then once the ridgelines were narrowed down, potential turbine locations were evaluated along those ridgelines. The overall design objective was to maximize wind energy generation and minimize environmental and other impacts. The location of the generator lead line resulted from a similar evaluation of several route alternatives, and the final route is available, feasible, and minimizes overall environmental impacts. This section describes the process and alternatives that were considered and demonstrates compliance with the specific requirements of 38 M.R.S.A. § 487-A(4) with respect to the generator lead line, as well as the more general avoidance and minimization requirements of Chapter 335 of the Maine Department of Environmental Protection (MDEP) rules, 06-096 CMR §335(3).

This section begins with an evaluation of the criteria used in selecting the overall project location within the State of Maine. Next, the analysis discusses the alternatives explored regarding specific turbine locations within the project area. The analysis then evaluates the alternative generator lead locations. Finally, tactics for avoidance and minimization of impacts at the project are discussed. Section 7 provides additional detail regarding the measures to avoid and minimize impacts to specific Significant Wildlife Habitat resources.

[1] Blue Sky West, LLC is the wind energy project entity; Blue Sky West II, LLC is the electrical generator lead entity.

1A.2 PROJECT PURPOSE AND NEED

The purpose of the project is to construct a utility-scale wind energy facility in central Maine that will generate clean, renewable wind energy and deliver that power to the New England electric market. In 2008, the Maine Legislature made a significant statement of its preference and desire to attract wind power in the State through its adoption of recommendations of the wind power task force.[2] This legislation, referred to loosely as the "Maine Wind Energy Act" (the Act), mandated the State to "take every reasonable action to encourage the attraction of appropriately sited development related to wind development" and includes measures designed to streamline and standardize the regulatory process for wind farm development. It was deemed to be "immediately necessary for the preservation of the public peace, health and safety."[3] The Act further states that the encouragement of wind energy may displace power generation through fossil fuels and thus "improve environmental quality."[4] In addition to specific provisions governing the permitting of wind power in Maine, the Act establishes a goal of developing at least 2,000 MW of installed wind power capacity in Maine by 2015, and 3,000 MW of installed capacity by 2020. As of December 2012, there were 468 MW of commercial wind power operating, under construction, or permitted in Maine. With potential to generate up to 191 MW, power from this project represents an important and substantial step toward meeting the State's goal of developing more than 2,000 MW of wind power by 2015.

1A.3 SITE SELECTION

The proposed project is located within an area designated by the State of Maine as expedited for wind permitting,[5] and is specifically sited to maximize energy generation while minimizing impacts to environmental resources.

Selection of a viable wind energy project site is based on a multitude of factors, including quality of wind resource, suitable geography, proximity to transmission infrastructure, and compatibility with existing land uses. In addition, the project area has majority support from the municipalities in which it will operate as evidenced by town votes in support of community benefit agreements associated with the project. Following is a discussion of the factors the Applicants analyzed when choosing the proposed project site.

Quality of Wind Resource

As described in the following section, geography can play an important role with respect to the quality of the wind resource. Accordingly, terrain features exhibiting considerable topographic relief compared to the surrounding landscape such as ridgelines, hills, and plateaus are traditionally attractive places for siting turbines. From the perspective of wind resource quality, the Bingham project area is characterized by such desirable topography.

[2] P.L. 2007, ch. 661 (effective Apr. 18, 2008); An Act to Implement Recommendations of the Governor's Task Force in Wind Power Development.
[3] Id.
[4] Id.
[5] M.R.S.A Title 35-A, Chapter 34-A, Expedited Permitting of Grid-Scale Wind Energy Development.

The National Renewable Energy Laboratory (NREL) makes available information about wind resource potential across the country, including Maine, in the form of state wind speed maps (there is some inherent inaccuracy with these high level maps), which estimate 80-meter turbine hub height wind speeds. Per the Maine state wind speed map available from NREL, estimated 80-meter wind speeds at the project site range from 5 to 6.5 meters per second (m/s).

To determine the project's actual wind resource, First Wind installed six met towers in the project area. To date, the towers have collected a cumulative total of 150 months of meteorological data. The wind resource at the project site, normalized to 80 meters for comparison, has proven to be much stronger than indicated by the state wind speed map available from NREL. The project has demonstrated an average hub height wind speed that exceeds 7 m/s. Such a resource, by industry standards, is considered attractive and has been determined viable by First Wind to support the proposed project.

Suitable Geography

Locations with strong wind resources are only valuable as development locations if the topography and land form of the area allows the project to be built at both a reasonable cost and with low environmental impacts. Topography and land form must be suitable for turbine array, wind capture, and construction purposes. In addition, the project should minimize environmental, visual, sound, and other impacts to the greatest extent possible.

The proposed project site includes a series of linear or near linear hills, plateaus, and ridgelines that make the project area ideally positioned to capture the prevailing wind that dominates northern and western Maine. The topography surrounding the project turbine arrays is rolling terrain with other scattered mountains and ridgelines, and the elevation to the project area rises gradually from river valleys to the east and west. This is ideal for wind projects, as air flow can compress and accelerate as it travels up and over topographic features. The majority of the proposed project area has moderate slopes, which is important for construction purposes. In addition, Route 16 and existing logging roads provide ready access, which minimizes construction costs and environmental impacts.

The Applicants' review of prospective sites statewide and local to the project area indicates that the proposed project site has the appropriate combination of ridgeline orientation, gradual grades, and linear adjacent ridgelines close enough to connect to one another. This combination is not typical, and makes the geography of the selected site well-suited for wind development.

Proximity to Transmission Infrastructure

The proximity of existing electrical transmission infrastructure that has the capacity to deliver the project output is an important site selection criterion. This selection directly influences both project costs and environmental impacts, not only for the infrastructure that the project must build to reach the transmission system, but also the upgrades that may be necessary on the transmission system to accommodate and deliver the project's output. The proposed project site will require approximately 17 miles of new generator lead line construction to reach the existing CMP substation in Parkman. This proposed corridor currently has a network of existing logging roads and cleared areas. These roads and cleared areas will be utilized during

construction to reduce costs and minimize environmental impacts. The substation in Parkman and the CMP-owned transmission line connecting the substation to the rest of the electrical system will require minimal upgrades and avoid extensive new transmission lines and upgrades to substations compared to other interconnection options evaluated.

The interconnection point must also have the capacity and stability to transmit power generated by the project into the New England grid and to consumers in an efficient and reliable manner. During the early stages of site selection, studies were completed to determine potential points of interconnection.

Compatibility with Existing Land Uses

The proposed wind turbine array will be located in an area that is currently used for commercial timber management operations, a land use that is particularly compatible with wind power development. Logging activities can continue unimpeded in the surrounding area, and the existing network of logging roads can be utilized and upgraded where necessary to provide construction and operational access for the project, thereby minimizing the need to build new roads. To the extent that the Applicants improve existing roads or need to build new roads, these improvements would facilitate continued commercial land management activities in the area and improve road conditions. In some instances, new roads will need to be built to avoid wetland impacts associated with upgrading or expanding existing roads. Stormwater controls to be installed associated with the upgrade of existing roads will help reduce erosion and sediment run-off and will have a long term benefit on water quality. These improvements from the proposed development would have a positive and synergistic impact on existing uses and would serve to reduce overall environmental impacts. New roads and improvements to existing roads would result in discontinued use of some roads and trails throughout the project area. These roads will be reseeded and allowed to revert to their natural state within the landscape.

In addition, the proposed site has a long history of timber management operations. The forest and landscape surrounding the project has been extensively cut and disturbed by logging equipment over the past several decades. The project is also compatible with the existing landowners' timber management operations. Wind energy projects provide an alternative source of economic value to landowners during a time when value derived from timber and fiber production continues to decline. During operations, landowners can continue forest management activities on the surrounding land; the proximity of the project to other privately owned working forests would not decrease the economic value of those lands. A report on the future of forests in Maine described wind turbines as "[c]apital intensive to build but have no fuel costs, meaning that leasing space for them can bring major benefits to landowners. Like carbon storage but in a more tangible way, windpower creates additional value for landowners and helps preserve the larger forest economy."[6]

Other factors relevant to compatibility with existing land uses include proximity to and number of residences near the project and potential impact to those residential uses. The proposed site has very sparse residential use.

[6] Keeping Maine's Forests: A Study of the Future of Maine's Forests, November 2009. Coordinated and managed by the Center for Research on Sustainable Forests, University of Maine.

Support from Municipalities
Support from municipalities is an important consideration in site selection. The Applicants have conducted extensive outreach in the host communities. As part of the tangible benefits requirements, they have developed host community benefit agreements with the Towns of Bingham, Abbot, Parkman, and Moscow, and Kingsbury Plantation. Specifically, the municipalities in which the proposed project will be located have expressed their support by way of public votes in favor of the acceptance of Community Benefits Agreements associated with the project (see Section 28). The Town of Bingham voted 45 for, 28 against on March 7, 2011; the Town of Moscow voted nearly unanimously for on November 15, 2012; Kingsbury Plantation voted 13 for, 1 against on December 15, 2012; the Town of Abbot voted 27 for, 8 against on February 25, 2013; and the Town of Parkman voted 43 for, 9 against on February 2, 2013. In addition, First Wind has been a local presence for four years, and the project has support from numerous local stakeholders such as a mountain bike club, all-terrain vehicle (ATV) clubs, and snowmobile clubs, as well as support from the regional economic development corporation (see Section 28). Based upon this evidence of local community support, the project location is an appropriate site for wind development.

Minimizing Environmental Impacts
The project site is not highly unique in terms of ecological function and values and provides some compatible uses with the proposed project (e.g., hunting, fishing, ATV use, snowmobiling). Habitat or potential habitat for some rare wildlife species, including the northern bog lemming (*Synaptomys borealis*), which is listed as Threatened in Maine, and northern spring salamander (*Gyrinophilus porphyriticus*), which is listed as Special Concern, are present within all alternatives, but impacts to these habitats have been greatly reduced throughout the siting process. In addition, much of the project area is mapped as Critical Habitat for Atlantic salmon (*Salmo salar*), which is federally listed as Endangered (see Sections 7, 9, and 10 for complete discussions).

To the extent practicable, the proposed project has been designed to minimize direct impacts to wetlands and streams and to maintain buffers on these habitats outlined in the Maine Natural Resources Protection Act (NRPA). As currently designed, the project will avoid all direct in-stream work. The project also has been designed to avoid and minimize impacts to Significant Wildlife Habitat, including Significant Vernal Pools (SVPs), Deer Wintering Areas (DWAs), and Inland Waterfowl and Wading Bird Habitat (IWWH). Avoidance and minimization efforts include utilizing existing roads, burying sections of the collector line, realigning the generator lead, increasing spacing between poles and narrowing the right-of-way (ROW) in sections, and adjusting turbine grading limits. Turbine pads were sited in upland areas, away from wetland boundaries. Some footprint of some turbine pads were reshaped or reduced in order to avoid impacts to nearby wetlands (see Avoidance and Minimization below and as further discussed in Section 7).

1A.4 TURBINE LOCATION SELECTION

The final design of the turbine locations and collector lines was developed to avoid and minimize impacts to natural resources while meeting the necessary design requirements listed in site selection above. For each turbine location alternative, a discussion is provided regarding

feasibility, logistics, and potential environmental impacts. A number of locations were reviewed, with the ultimate goal of identifying an alternative that meets the project purpose and has the least environmental impacts. As discussed more thoroughly below, the final turbine locations are the most practicable locations available.

1A.4.1 Turbine Location Selection Criteria

The Applicants considered multiple criteria to consider when determining turbine locations for the proposed project. First and foremost, the site had to have quality wind resource. Once this was established, measures were taken to reduce the impacts of construction and operation of turbines on the site. Proximity of the turbines to existing infrastructure (e.g., roads and electrical substations) was an important factor as it minimized the amount of roads, bridges, and generator lead that would have to be constructed. This also reduced the amount of cutting and filling that would be required. Low to moderate slopes were preferred to minimize the amount of erosion and runoff potential as well as to reduce cut and fill impacts in steeper areas. Avoiding wetlands, stream crossings, and other high value natural resources such as bog lemming habitat, spring salamander streams, and SVPs was considered in the siting of the turbine locations. It was also important to maintain the established buffers around these significant resources. Calculations were made to measure and reduce the proximity to sound receptors. It was preferred to locate turbines in areas with few to no dwellings and away from scenic resources as this would reduce impacts on local residents, as well as reduce the potential for any visual impacts.

1A.4.2 Turbine Location Alternatives

After factoring in all turbine location criteria, the Applicants identified three potential locations for siting turbines. Natural resource surveys were completed on each of the ridgelines associated with the three alternatives. This detailed natural resource data allowed for development of a strong and defensible alternatives analysis. Wetlands, streams, and vernal pools were identified and mapped. All three alternatives were extensively analyzed. An overview map of the area that identifies each proposed alternative is attached as Figure 1A-3. The three alternatives include:

Alternative 1 – This initial and largest alternative includes 138 turbines located on ridgelines located in Bingham, Moscow, Mayfield Township, Kingsbury Plantation, and Blanchard Township.

Alternative 2 – This alternative includes 99 turbines located on ridgelines in Bingham, Moscow, Mayfield Township, and Kingsbury Plantation.

Alternative 3 – This alternative includes 62 turbines located on ridgelines in Bingham, Mayfield Township, and Kingsbury Plantation. Although a smaller project, this alternative meets the project purposes and is the least damaging to the environment.

1A.4.3 Turbine Location Analysis

Alternative 1

Alternative 1 includes 138 turbines located on Johnson Mountain and an unnamed ridge bisected by T Road in Bingham; an unnamed ridge bisected by Townline Road, Coburn Ridge, an unnamed ridge west of Route 151, and an unnamed ridge associated with Hayden Pond Road in Mayfield Township; an unnamed ridge bisected by Old Mountain Road in Kingsbury Plantation; and Crockett Ridge in Kingsbury Plantation and Blanchard Township.

Environmental Impacts
Alternative 1 would have moderate to high environmental impacts with approximately 420 wetlands, 48 streams, and 95 vernal pools identified within the ridgeline areas. Seven of the 48 streams have habitat potentially suitable for northern spring salamander. Two IWWHs occur within Alternative 1; there would be no direct impact to the wetland complex or the 250-foot zone surrounding either IWWH. The potential presence of northern bog lemming was identified in a large wetland complex on Crockett Ridge in Blanchard Township. Turbine locations in Alternative 1 would likely impact the wetland and associated bog lemming habitat due to its central location along the top of the ridge. Significant Wildlife Habitat (SVP_25TT_N) is located adjacent to proposed turbine locations. This naturally occurring vernal pool is situated in a small depression on one of the highest points of Crockett Ridge. Turbine pads and crane paths would likely impact the critical terrestrial habitat of the SVP. Compared to other alternatives, turbines located on Crockett Ridge would have greater visibility from Bald Mountain Pond and the Appalachian Trail located in Bald Mountain Township to the north. Steep terrain surrounding Crockett Ridge and lack of existing roads from the other project areas creates challenges for access road and crane path construction. Construction of these project roads would cut into the steeper slopes of the ridge and would be more visible on the surrounding area. Alternative 1 turbine locations on the unnamed ridge bisected by Townline Road in Moscow and Coburn Ridge in Mayfield may also be visible from Bald Mountain Pond and the Appalachian Trail located approximately 4.5 miles to the north. Turbines on the unnamed ridge in Moscow and Coburn Ridge would require up to 2.5 miles of electrical collection and new access roads in order to connect with the main project area and would likely create additional wetland impacts.

Alternative 2

Alternative 2 includes 99 turbines located on Johnson Mountain and an unnamed ridge bisected by T Road in Bingham; an unnamed ridge west of Route 151, and an unnamed ridge associated with Hayden Pond Road in Mayfield Township; and an unnamed ridge bisected by Old Mountain Road in Kingsbury Plantation.

Environmental Impacts
Alternative 2 would have moderate to high environmental impacts with approximately 320 wetlands, 40 streams, and 53 vernal pools identified within the ridgeline areas. Six of the 40 streams have habitat potentially suitable for northern spring salamanders. Two IWWHs occur within Alternative 2; there would be no direct impact to the wetland complex or the 250-foot zone surrounding either IWWH. Several large wetland complexes were identified on the low elevation ridgeline bisected by T Road in Bingham and Moscow in Alternative 2. This

Alternative would likely have unavoidable, permanent impacts to these wetlands associated with crane paths and electrical collection and potentially the turbine pads. Two SVPs and 7 naturally occurring vernal pools were identified to the west of Hilton Ponds in Kingsbury Plantation. This cluster of naturally occurring pools, which collectively acts as an important amphibian breeding area, would likely be impacted by turbine pads and crane paths in Alternative 2.

Alternative 3

Alternative 3 includes 62 turbines located on Johnson Mountain and an unnamed ridge east of T Road in Bingham; an unnamed ridge west of Route 151, and an unnamed ridge associated with Hayden Pond Road in Mayfield Township; and an unnamed ridge bisected by Old Mountain Road in Kingsbury Plantation. Alternative 3 has been selected as the alternative that meets the project purpose and is the least damaging to the environment.

Environmental Impacts
Alternative 3 would have low to moderate environmental impacts with approximately 311 wetlands, 35 streams, and 50 vernal pools identified within the ridgeline areas. Five of the 35 streams have habitat potentially suitable for northern spring salamanders. Two IWWHs occur within Alternative 3; there would be no direct impact to the wetland complex or the 250-foot zone surrounding either IWWH. The potential presence of northern bog lemming was identified within Alternative 3. The proposed project will not directly impact the habitat or the hydrology of this complex where the bog lemming activity was observed, but a portion of the aboveground electrical collector line will be located approximately 600 feet to the south in proximity to Route 16. Northern spring salamander were documented within one of the project area streams, and one other surveyed stream provides good potential habitat for this species; however, no direct in-stream work is proposed within the project area. No disturbance is proposed within 250 feet of the stream where northern spring salamander was documented. One permanent access road will be constructed at the head of a stream within a wetland that provides potential habitat for this species, but this crossing location is upstream of the more suitable potential habitat. The Appalachian Trail is located approximately 6.5 miles north of Alternative 3.

1A.4.4 Comparative Analysis of Turbine Location Alternatives

The Applicants evaluated three alternatives for turbine location based on environmental impacts and based on this analysis, and selected the alternative that meets the project purpose and minimizes environmental impacts.

Environmental Impacts
Alternative 1 would have moderate to high environmental impacts. Turbine locations would likely require substantial clearing in and around some of the approximately 420 wetlands, 48 streams, and 95 vernal pools located within this alternative. Turbine locations or crane path would likely have direct impacts to SVPs and northern bog lemming habitat. There would be greater turbine visibility from Bald Mountain Pond and the Appalachian Trail.

Alternative 2 would have moderate to high environmental impacts. Turbine locations would require substantial clearing in and around some of the approximately 320 wetland, 40 streams,

and 53 vernal pools located within this alternative. Turbine locations would likely have impacts to significant vernal pools and large wetland complexes.

Alternative 3 would have low to moderate environmental impacts. Turbine locations would require clearing in and around some of the approximately 311 wetlands, 35 streams, and 50 vernal pools located within this alternative. Turbine locations would have minimal impacts to wetlands.

Table 1A-1. Bingham Wind Project Turbine Location Alternatives Comparison

	Alternative 1	**Alternative 2**	**Alternative 3**
Total Number of Turbines	138	99	63
Environmental Impact	Moderate to High *420 wetlands, 48 streams, 95 vernal pools; Likely impacts to northern bog lemming habitat, SVPs, streams, and large wetland complexes; Potential impacts to northern spring salamander; Increased turbine visibility from Bald Mountain Pond; New access roads and crane paths needed on steep slopes; Turbines visible within APE from Appalachian Trail*	Moderate to High *320 wetlands, 40 streams, 53 vernal pools; Likely impacts to SVPs, streams, and large wetland complex; Potential impacts to northern spring salamander*	Low to Moderate 311 *wetlands, 35 streams, 50 vernal pools; Minimal impacts to wetlands; Potential impacts to one northern spring salamander stream*
Cost	High	High	Moderate

1A.4.5 Selection of the Practicable Turbine Location Alternative

Based on the analyses provided above, the Applicants selected Alternative 3 as the alternative that meets the project purpose and minimizes environmental impacts. Alternative 1 was ruled out primarily because of environmental impacts associated with visibility from Bald Mountain Pond and the Appalachian Trail (Alternative 1 would have had turbines visible in the area of potential effect of the Appalachian Trail), likely impacts to an SVP and northern bog lemming habitat, as well as the high number of wetland impacts. Alternative 2 resolved the visual and northern bog lemming habitat impacts but was still ruled out primarily based on likely impacts to SVP habitat and large wetland complexes. As detailed above, Alternative 3 has 75 fewer turbines than Alternative 1 and 36 fewer turbines than Alternative 2, significantly lower environmental impacts compared to the other alternatives such as permanent wetland fill, impacts to vernal pools, impact to potential northern bog lemming habitat, cut and fill impacts and visual impacts from scenic resources, as well as a lower cost of construction. Alternative 3 has no turbines visible within the area of potential effect of the Appalachian Trail.

1A.5 GENERATOR LEAD SELECTION

For each generator lead alternative presented below, discussion is provided regarding feasibility, logistics, and potential environmental impacts. Five options were reviewed, with the ultimate goal of identifying an alternative that meets the project purpose and has the least environmental impacts. As discussed more thoroughly below, the selected route is the most practicable and least environmentally damaging route available.

1A.5.1 Route Selection Criteria

Grid Connection

A critical component for any utility-scale wind power project is a connection to the electrical transmission grid that is reliable, secure, and contains sufficient transmission capability to deliver into an organized market such as ISO NE. To meet the project purpose, energy generated by the project must be delivered to the New England energy market, but congestion within parts of the transmission grid can limit a project's output. Transmission congestion refers to the ability of the infrastructure to accommodate the additional generation in light of other existing proposed or reasonable foreseeable generation that would utilize the same infrastructure. Note that only those alternatives that included the ultimate delivery of power directly to the ISO NE grid were considered in this alternatives analysis. This is based not only on the existing infrastructure and its limitations, but on the other planned projects in the ISO NE Generator Interconnection Queue that may be planned in the same area. The ISO has identified the Wyman Substation area as currently export constrained, meaning that the current generation mix in this area can experience congestion. There are several other projects in the ISO NE Interconnection Queue that will exacerbate this congestion unless new transmission infrastructure is built. This alternatives analysis took this into consideration when evaluating options for delivering the project output to the market.

Landowner Impacts

Landowner impacts refer to the ability to obtain ROW easements along a route and the potential impacts of locating a generator lead adjacent to abutting landowners (e.g., visual impacts). Because this is a privately owned generator lead, it does not have the right of eminent domain and must rely on willing landowners and negotiated agreements for route selection. Specific criteria used to analyze ROW acquisition issues include the number of parcels crossed by the ROW; direct impacts to landowners in proximity to the ROW; and willingness of underlying landowners to convey the necessary property interests. Another major contributing factor relates to the generator lead corridor either running parallel to or travelling within existing ROWs, roadways, railways, or other infrastructure.

Environmental Impacts

Potentially suitable generator lead routes were evaluated for natural resource impacts using available information. Full and complete delineations were completed on four of the five alternatives proposed. These verified survey data provide the foundation for a complete and accurate alternatives analysis. Specific analysis criteria include impacts to existing land uses, the effect of each alternative on existing wildlife habitat, and the proximity of potential impacts to significant wetland resources, fisheries, and vernal pools. The Applicants also considered the

types and classifications of waterbodies crossed and potential visibility from regulated scenic resources.

Project Cost
For an alternative to be "practicable" under MDEP rules, the alternative must be available and capable of being completed after considering costs, technology, and logistics. Specifically, Chapter 310 of the MDEP rules, 06-096 CMR § 310(3)(R), defines "practicable" as "[a]vailable and feasible considering cost, existing technology and logistics based on the overall purpose of the project."

This criterion includes budget-grade estimates of construction and operation costs based on historical data. Factors affecting cost in this analysis include constructing electrical generator leads of various lengths, updating substations or other facilities, new construction of substations or new transmission lines, if necessary, ROW acquisition, permitting, and design.

1A.5.2 Route Selection Alternatives

After evaluating route selection criteria, the Applicants identified five potential alternatives for siting the generator lead. An overview map of the area that identifies each proposed alternative is attached as Figure 1A-4. The five alternatives include:

Alternative 1 – Proceeds approximately 23.9 miles north and then southeast to the existing Guilford substation in Parkman.

Alternative 2 – Similar to Alternative 1, but proceeds 23.6 miles north and then southeast to the existing Guilford substation in Parkman, and crosses the Piscataquis River in a downstream location compared to Alternative 1.

Alternative 3 – Proceeds south and east from the project substation for approximately 17.2 miles to the existing Guilford substation in Parkman.

Alternative 4 – Proceeds southwest for approximately 12.2 miles from the project substation to a proposed new interconnection substation on CMP 241 line near Johnson Corner in Bingham.

Alternative 5 – Similar to Alternative 4, this proposed line proceeds southwest for approximately 12.2 miles from the project substation to the CMP 241 line near Johnson Corner in Bingham, but then parallels the existing CMP 241 line for approximately 28 miles to an existing CMP substation in Detroit. The total generator lead length for this alternative is approximately 40.2 miles.

1A.5.3 Route Selection Analysis

Alternative 1: Northern Route 1

Alternative 1 proposes to connect to the New England grid at an existing CMP Guilford substation in Parkman. CMP is the owner of a currently undeveloped transmission corridor sufficient to accommodate a new 115-kV generator lead that runs from Parkman to Greenville.

The route evaluated to connect to the Guilford substation would take a northerly route and then enter this corridor in the area of Blanchard Township and Monson. The existing CMP corridor passes through Abbot, approximately 9 miles east of the project location. This 23.9 mile alternative would require new ROW for approximately 15 miles before entering an existing CMP ROW for approximately 9 miles. Once in the CMP ROW, the line would be built in undeveloped ROW for approximately 3.3 miles and then parallel an existing CMP transmission line for approximately 3.7 miles and then be built in undeveloped ROW for an additional 2 miles until connecting into the Parkman substation. This alternative was developed with a larger project size in mind, and one that reached farther north in scope, making the CMP corridor an attractive route. As the layout was reduced in scope and concentrated to the south of Mayfield Township and Kingsbury Plantation, this alternative became more costly and resulted in relatively higher resource impacts than the selected alternative.

Grid Connection

Alternative 1, 2, and 3 share similar grid impacts in that there is minimal work needed for the CMP System to connect to the project and allow the generation to be delivered into the ISO NE Market. These three alternatives have minimal costs and minimal environmental impacts for the additional work needed on CMP's existing transmission system to accommodate the project output.

Landowner Impacts

Approximately 15 miles of the proposed generator lead would be new ROW through primarily undeveloped forest, and approximately 9 miles would be located within existing CMP ROW. At least 6 residential homes would be impacted by construction and operation. A landowner on the east shore of the Piscataquis River in Monson was unwilling to allow the generator lead to cross the river on his property because there would have been a substantial amount of clearing on his property and the lines and utility poles would have been visible from his house. Furthermore, in conversations with MDEP, the Applicants were encouraged to move the river crossing downstream to co-locate with an existing bridge in Monson. This led to the development of Alternative 2, discussed below. In September 2012, the residents of Monson passed a moratorium on the construction of privately owned highways and utility corridors within the town. This included the possibility to extend the moratorium an additional six months to allow development of local regulations to address and potentially prohibit these types of projects. Because 4 miles of generator lead in Alternative 1 run through the Town of Monson, this moratorium and anticipated local regulation may preclude this alternative, which resulted in the development of Alternative 3, discussed below.

Environmental Impacts

Alternative 1 would be moderate to high, especially in the segment that is co-located with the existing CMP transmission line. In Alternative 1, there would be direct impacts or wetland conversion to approximately 136 acres of wetland. The co-located portion of the corridor includes large wetland complexes, some exceeding several thousand feet in length, and several SVPs. This expanded ROW would result in substantial wetland conversion from forested wetland systems to emergent/shrub wetlands. In addition, the corridor would cross approximately 30 perennial and intermittent streams in Blanchard Township, and includes several streams where northern spring salamanders have been documented. Alternative 1

crosses the Piscataquis River twice, once in Monson and again in Abbot. The Piscataquis River is designated as critical habitat for Atlantic salmon and a river of scenic significance. The portion of the Piscataquis River in Monson is an identified outstanding river segment, as defined in Section 480-P.13 of the NRPA. Although there would be no direct in-stream work within the Piscataquis River, construction and maintenance would require clearing adjacent to its banks. Clearing of ROW will likely occur in 2 areas mapped as IWWH in Blanchard Township, 2 areas mapped as IWWH in Abbot, 1 mapped DWA in Abbot, and 1 mapped DWA in Parkman for a total impact to IWWH of 9.79 acres and to DWA of 13.01 acres. The new ROW segments in Alternative 1 would also cause increased habitat fragmentation, which could negatively impact some wildlife species.

Project Cost
Alternative 1 would require some upgrades to the existing CMP substation in Parkman. The total estimated construction cost of the generator lead would be high and cost and complexity of upgrades to the substation for a connection to the CMP transmission line at Parkman would be low.

Alternative 2: Northern Route 2

Alternative 2 would follow a similar, approximately 23-mile route as described in Alternative 1. A section of generator lead associated with the Piscataquis River crossing in Monson would be redesigned to address the landowner issue described above.

Grid Connection
Alternative 1, 2, and 3 share similar grid impacts in that there is minimal work needed for the CMP System to connect to the project and allow the generation to be delivered into the ISO NE Market.

Landowner Impacts
Approximately 14.6 miles of the proposed generator lead would be new ROW through primarily undeveloped forest; approximately 9 miles would be located mainly within an existing transmission line easement owned by CMP. Landowner impacts would be limited for this section, especially the 4.5 miles co-located with an existing transmission line owned by CMP that would not result in additional division of private land. Because the majority of the generator lead would be located within CMP-owned ROW, only four other parcels would be affected and at least six residential structures would be impacted by clearing or construction activities. The difficulty of land acquisition for the new portion of ROW would be moderate due to the need to create a completely new corridor in areas where little development has occurred. In September 2012, the residents of Monson passed a six-month moratorium on the construction of privately owned highways and utility corridors within the town. This included the possibility to extend the moratorium an additional six months to allow development of local regulations to address and potentially prohibit these types of projects. Because 3.5 miles of generator lead in Alternative 1 run through the Town of Monson, this moratorium and anticipated local regulation may preclude this alternative, which resulted in the development of Alternative 3, discussed below.

Environmental Impacts
Environmental impacts for Alternative 2 would be similar to those described in Alternative 1 and would be moderate to high. In Alternative 2, there would be impacts to approximately 126 acres of wetlands. Large wetland complexes, some exceeding several thousand feet in length, and several SVPs are present along this proposed generator lead. The new ROW would result in substantial wetland conversion from forested wetland systems to emergent/shrub wetlands. This conversion can potentially negatively impact rivers and streams, increasing thermal insolation and reducing the quality of fish habitat. The Piscataquis River crossing in Monson would be co-located with an existing bridge on Barrows Falls Road thereby reducing clearing along the riverbanks. The corridor would cross approximately 30 perennial and intermittent streams in Blanchard Township, which include several streams where northern spring salamander have been documented. Clearing of ROW would likely occur in 2 areas mapped as IWWH in Abbot, 2 areas mapped as IWWH in Blanchard Township,1 mapped DWA in Monson, 1 mapped DWA in Abbot, and 1 mapped DWA in Parkman for a total IWWH impact of 9.79 acres and a DWA impact of 14.35 acres. The new ROW segments in Alternative 2 would also cause increased habitat fragmentation, which could have a negative impact on some wildlife species.

Project Cost
Project cost would be expected to be similar to Alternative 1.

Alternative 3: Southern Route

Alternative 3 proposes to connect to the New England grid at an existing CMP substation in Parkman. This alternative proposes a new 115-kV generator lead that would originate at the project substation and extend south and east in an approximately 17.2-mile ROW, which would tie into the Parkman substation.

Grid Connection
Alternative 1, 2, and 3 share similar grid impacts in that there is minimal work needed for the CMP System to connect to the project and allow the generation to be delivered into the ISO NE Market.

Landowner Impacts
The proposed electrical generator lead would be constructed primarily within new ROW and would run mostly through regenerating forest. Land on the western half of the new ROW is owned by two large timber companies, and no residential structures would be directly affected. The eastern half of the new ROW crosses approximately 20 affected parcels, but no residential structures would be impacted by construction or operation.

Environmental Impacts
Alternative 3 uses approximately 0.8 mile of an existing CMP ROW, and will be located within the road ROW for approximately 2 miles along Crow Hill/Gales Road in Parkman and Abbot. The remainder of the corridor will cross through primarily commercial forestland, and the Applicants' analysis has concluded that wetland impacts would be moderate. In Alternative 3, there would be approximately 30 acres of wetland clearing. Similar to Alternatives 1 and 2,

wetlands and streams are present along the Alternative 3 corridor. Because these resources are generally smaller in size and are spaced farther apart, there are greater opportunities to avoid and minimize direct impacts. Clearing of ROW will likely occur in 1 mapped DWA in Kingsbury Plantation and 3 mapped DWAs and 1 IWWH in Parkman for a total IWWH impact of 3.13 acres and a DWA impact of 19.7 acres (see Section 7). The largest of these DWA crossings occurs within an existing CMP ROW. Efforts to minimize these impacts include placing the proposed corridor close to the outer boundaries of the DWAs, adhering to buffer guidelines as detailed in Section 10, and utilizing existing access roads whenever possible.

Project Cost
Alternative 3 is approximately 6 miles shorter in length than Alternatives 1 and 2 but would still require the construction of a new 115-kV generator lead from the project to Parkman and upgrades to the existing CMP substation. The total estimated construction cost of the generator lead for Alternative 3 is moderate and upgrades to the substation for a connection to the CMP transmission line at Parkman is low.

Alternative 4: Southwestern Route

Alternative 4 proceeds southwest for approximately 12.2 miles from the project substation to a proposed new interconnection substation near Johnson Corner in Bingham. This alternative follows CMP 241 line. The total generator lead length for this alternative is 12.2 miles.

Grid Connection
Alternative 4 was proposed to connect into CMP Line 241, which is now in service and runs from the CMP Wyman substation south toward Albion Road. Through several discussions with ISO NE and CMP, the Applicants learned that the Wyman area is considered to be congested and an export constrained area. Further, because the Wyman substation was congested with a number of other projects in the interconnection queue, it was determined that this area would not be capable of safely handling electricity generated by the proposed project. In order to upgrade the transmission system to accommodate this project's generation at this location, the ISO and CMP indicated that a rebuild of the Wyman Substation in a new location and possibly a new transmission line from Wyman into the rest of the New England system may have to be constructed in order to accommodate this interconnection location. Building directly to Detroit (as further explained in Alternative 5) was deemed to be a more feasible solution than connecting into Line 241.

Landowner Impacts
Alternative 4 would be located principally on land owned by a large timber company, and no residential structures would be directly impacted.

Environmental Impacts
Alternative 4 would be constructed within a new ROW crossing primarily through undeveloped forest. This ROW includes relatively few wetlands and stream resources, would not impact any DWAs, and would have a total IWWH impact of 0.87 acre in 1 mapped IWWH area in Mayfield Township. In Alternative 4, impacts to wetlands would be low; there would be approximately 16 acres of mostly conversion impacts to wetlands.

Project Cost
Alternative 4 provided the shortest route to a CMP-owned transmission facility; however, when considering the network upgrades necessary to connect to the grid at this point and deliver the energy to the New England Market, the alternative was not deemed a viable alternative.

The cost of the generator lead line itself was not substantial; however, further analysis of this alternative revealed the need for substantial upgrades to the CMP infrastructure that would result in a high cost for this alternative.

Alternative 5 – Southwestern Route to Detroit

Alternative 5 proposes to connect to the New England grid at an existing CMP substation in Detroit. CMP is the owner of Line 241 that runs from Moscow to Detroit. The existing CMP line passes through Bingham, approximately 12.2 miles southwest of the project location. This approximately 40.2-mile alternative would parallel the existing CMP line for 28 miles. The remaining 12.2 miles of the line in Bingham and Mayfield Township would travel through new ROW along the same route as Alternative 4.

Grid Connection
Alternative 5 alleviates the congestion concerns detailed in Alternative 4 by building a new 28 mile generator lead line to Detroit. This line would essentially remove the project's output from the congested Wyman area.

Landowner Impacts
Approximately 28 miles of the proposed generator lead would be co-located with an existing CMP transmission line. Although clearing of new ROW adjacent to the existing CMP transmission line would not result in additional division of private land, approximately 95 landowners would be affected making the acquisition of land along the entire length of the generator lead difficult. Clearing and construction activities may have impacts to 18 residential structures along the route.

Environmental Impacts
The Applicants' analyses concluded that wetland impacts along Alternative 5 would be moderate to high, especially in the segment that is co-located with the existing CMP transmission line. The co-located portion of the corridor includes large wetland complexes, some exceeding several thousand feet in length. This expanded ROW would result in substantial wetland conversion from forested wetland systems to emergent/shrub wetlands. Clearing of ROW would occur in 3 mapped DWAs in Hartland and 1 mapped DWA in Pittsfield for a total DWA impact of 15.6 acres. Clearing of ROW would occur in 2 IWWHs in Hartland, 1 mapped IWWH in Pittsfield, and 1 mapped DWA in Mayfield Township for a total IWWH impact of 4.86 acres. The existing CMP transmission line also crosses the DWAs and IWWHs in these locations.

Project Cost
The total estimated construction cost of the new generator lead would be high and upgrades to the substation for a connection to the NE Grid in Detroit would be low.

1A.5.4 Comparative Analysis of Route Alternative

The Applicants evaluated five alternatives for connecting the power generated by the turbines to the regional power grid based on landowner impacts, environmental impacts, and project cost. Based on this analysis, Alternative 3 is the route that is practicable and minimizes overall environmental impacts.

Landowner Impacts
Alternative 1 would have relatively low impacts to landowners with the exception of one landowner at the Piscataquis River crossing in Monson. Nearly half of the length of this alternative is located within or adjacent to an existing CMP transmission line or ROW, and the remainder is located on commercial forestry land. The moratorium on construction of private utility corridors in Monson precluded Alternative 1. In addition. at least six residential homes would be impacted by construction and operation. A landowner on the east shore of the Piscataquis River in Monson was unwilling to allow the generator lead to cross the river on his property because there would have been a substantial amount of clearing on his property and the lines and utility poles would have been visible from his house.

Alternative 2 would have low impact to landowners, primarily because nearly half the length of the generator lead is located within or adjacent to an existing CMP transmission line or ROW. The remainder is located on commercial forestry land. The moratorium on construction of private utility corridors in Monson precluded Alternative 2. The majority of the generator lead would be located within CMP-owned ROW, and four other parcels would be affected. At least six residential structures would be impacted by clearing or construction activities.

Alternative 3 would have moderate landowner impacts. Impacts to landowners would be low along the western portion of the line where it runs through relatively undeveloped commercial forest. The eastern portion of the line in Parkman and Abbot affects approximately 20 different landowners. Commercial forestry practices are less prevalent in the area, but the land still remains largely undeveloped. No residential structures are affected by the generator lead.

Alternative 4 would have low landowner impacts. The proposed generator lead would be located entirely on land owned by a single timber management company. The cleared ROW would likely be visible from several dwellings located on Mahoney Hill Road and Lake Road. The constraints on the CMP transmission system in the areas of Line 241 and the Wyman substation in this location make Alternative 4 unfeasible.

Alternative 5 would have moderate to high landowner impacts. Approximately 95 parcels are located adjacent to the existing CMP transmission line leading to a high difficulty of land acquisition. Clearing and construction activities would likely impact several dwellings and private structures that are located within close proximity to the existing CMP transmission line.

Environmental Impacts
Alternative 1 would have moderate to high environmental impact. This alternative would require substantial clearing adjacent to an existing CMP ROW where several large wetland complexes are present. The new ROW would have potential impacts to 9.79 acres in 4 IWWHs, 13.01 acres in 2 DWAs, and numerous streams, and would require 2 crossings of the Piscataquis River.

Alternative 2 would have moderate to high environmental impact. These are similar impacts to the large wetland complexes and streams to those in Alternative 1, and include impacts to 14.35 acres in 3 DWAs and 9.79 acres in 4 mapped IWWH areas. While two crossings of the Piscataquis River would still be required, this alternative co-locates one of the crossings with an existing bridge on Barrows Falls Road in Monson. Placing this crossing at the existing bridge would decrease the amount of additional clearing needed for the proposed generator lead and reduce visual impacts.

Alternative 3 would have relatively moderate environmental impact. Overall, Alternative 3 would require less clearing in and adjacent to wetland and stream resources, would not cross the Piscataquis River, and would involve less clearing in the IWWH (3.13 acres in 1 mapped IWWH) than Alternatives 1 and 2. Alternative 3 would involve clearing within mapped DWAs (19.7 acres in 4 mapped DWAs), however, design efforts have been made to minimize these impacts. This route would require new ROW through undeveloped forest in varying stages of active forestry, resulting in some forest fragmentation.

Alternative 4 would have the lowest environmental impact. Because it is the shortest route, Alternative 4 would require less clearing in and adjacent to wetland and stream resources along the route. No DWAs would be crossed by Alternative 4, and 0.87 acre of 1 IWWH would be impacted.

Alternative 5 would have the highest environmental impact. This alternative would require substantial clearing adjacent to an existing CMP ROW for over 28 miles where several large wetland complexes are present. The new ROW would have potential impacts to 4.86 acres in 4 IWWHs, 15.6 acres in 4 DWAs, and numerous streams. In addition, impacts along this route would be higher given its total length of approximately 40 miles.

Grid Connection
Alternatives 1, 2, and 3 require minimal upgrades to the existing electrical system located in Parkman. The system impact study for interconnecting at this location is nearly complete and through extensive conversations with CMP and ISO NE, the Applicants have a solid understanding of the interconnection requirements for these Alternatives.

Alternative 4 is connecting into a congested and export constrained area of the ISO NE system, requiring substantial upgrades to the existing CMP system, which would likely result in a new generator lead line that is described in Alternative 5

Alternative 5 alleviates the congestion identified in Alternative 4 without concurrent upgrades to the existing CMP system, but results in a new 28-mile generator lead line.

Project Cost

Alternatives 1 and 2 would have approximately the same total cost for construction and operation. Alternative 3 would have the lowest cost of these three alternatives, primarily because of a shorter route, which would reduce construction, operation, and maintenance costs. Based on distance and grid constraints, Alternatives 4 and 5 would be expected to have the highest cost of construction, operation, and maintenance.

Table 1A-2. Bingham Wind Project Generator Lead Route Alternatives Comparison

	Alternative 1: Northern Route 1	Alternative 2: Northern Route 2	Alternative 3: Southern Route	Alternative 4: Southern Route[2]	Alternative 5: Detroit Route
Total Length (miles)	23.9	23.6	17.2	12.2	40.2
Landowner Impact	Low[1]	Low[1]	Low to Moderate	Low	High
Environmental Impact	Moderate to High *Substantial clearing in several large wetland complexes; Impacts to approximately 136 acres of wetlands; Potential impacts to 9.79 acres in 4 IWWHs, 13.01 acres in 2 DWAs and numerous streams; 2 crossings of Piscataquis River*	Moderate to High *Substantial clearing in several large wetland complexes; Impacts to approximately 126 acres of wetlands; Potential impacts to 9.79 acres in 4 IWWHs, 14.35 acres in 3 DWAs, and numerous streams; 2 crossings of Piscataquis River (1 crossing would use an existing bridge)*	Moderate *Less clearing than Alternative 1 and 2 in and adjacent to wetland and stream resources; Impacts to approximately 30 acres of wetlands; Less clearing in 1 IWWH than Alternatives 1 and 2 (3.13 acres); No Piscataquis River crossing; Clearing of 19.7 acres within 4 mapped DWAs*	Low *Less clearing than other alternatives – 0 acres of DWA and 0.87 acres of IWWH in 1 mapped area; Impacts to approximately 16 acres of wetlands; Potential impacts to 5 streams*	Moderate to High *Substantial clearing in several large wetland complexes; Potential impacts to 4.86 acres in 4 IWWHs and clearing within 15.6 acres in 4 DWAs*
Grid Connection Cost and Complexity	Low, minimal upgrades to existing system required	Low, minimal upgrades to existing system required	Low, minimal upgrades to existing system required	High, significant upgrades to existing system required	Low, minimal upgrades to existing system required
Generator Lead Cost	Moderate to High	Moderate to High	Moderate	Low	High

Notes:
[1]The moratorium and potential future local regulations related to construction of private utility corridors in Monson may preclude the possibility of Alternatives 1 and 2.
[2]The congestion on CMP Line 241 effectively removed the possibility of Alternative 4.

1A.5.5 Selection of the Practicable Generator Lead Route Alternative

Based on the analysis provided above, the Applicants selected Alternative 3 as the practicable alternative that minimizes overall environmental impacts. Alternative 1 was ruled out primarily based on landowner and environmental impacts associated with the Piscataquis River crossing in Monson, the moratorium on private utility corridors in Monson, and substantial environmental impacts associated with large wetland complexes and abundant perennial and intermittent streams. Alternative 2 resolved the landowner impact issues near the Piscataquis River crossing in Monson, but was still ruled out primarily based on the moratorium in Monson and the same environmental impacts as Alternative 1. Alternative 4 was eliminated from consideration because of the instability and lack of capacity in the existing electrical transmission system. Alternative 5 was eliminated because of its substantial length that would result in higher wetland impacts, landowner impacts and greater construction costs. Alternative 3 would require new ROW through large tracts of land actively used for timber management, resulting in a moderate degree of forest fragmentation. Alternative 3 is approximately 6 miles shorter than Alternatives 1 and 2, which equates to lower wetland impacts and lower cost of construction. As a result of these factors, the Applicants selected Alternative 3 as the generator lead that minimizes overall environmental impacts.

1A.6 AVOIDANCE AND MINIMIZATION

The Applicants undertook significant efforts to identify the alternatives that minimize overall environmental impacts both for the location and layout of the generating facilities, as well as the generator lead route for the project. Once these alternatives were established, planning and design focused on avoiding and minimizing impacts to wetlands and other natural resources to the maximum extent possible. The final design for the entire ridgeline project includes approximately 4.3 acres of wetland clearing, 1.3 acres (55,163 square feet) of permanent wetland fill, and 0 acres of temporary wetland fill. The final design for the entire generator lead project includes approximately 30.2 acres of wetland clearing, 3,346 square feet of permanent wetland fill, and 6.3 acres of temporary wetland fill.

1A.6.1 Avoidance

Efforts to avoid wetland impacts throughout the project were ongoing during project planning. This involved using existing roads and the associated culverts and placing roads and turbine pads outside of wetland areas to the maximum extent practicable. Project components avoided permanent wetland fill impacts except for some access roads and crane paths in the ridgeline area and utility poles associated with the generator lead. In addition, the majority of the collector line was buried under existing or proposed roads to avoid locating poles in wetlands, further reducing wetland impact. Overhead portions of the collector lines avoided wetland impacts through careful pole placement and will use existing roads for construction access. Lastly, spans between sections of the generator lead were balanced to avoid placing poles in wetlands while minimizing clearing in stream buffers.

The project was designed to avoid impacts to Significant Wildlife Habitats or rare, threatened, or endangered species, where possible. For example, streams with documented occurrence of northern spring salamander or those streams identified as potentially supporting northern spring salamanders were given a 250-foot buffer. Similarly, a 250-foot buffer has been applied to all perennial streams within the area mapped as critical habitat for Atlantic salmon. Construction activities will avoid all in-stream work on the project and will avoid disturbance within the 250-foot stream buffers whenever possible. Disturbance within buffers that cannot be avoided will be minimized by limiting access and clearing (Section 10).

Access Road Design

The project access roads, including crane paths, total approximately 25 miles, and were designed to avoid wetland resources where possible; however, the approximately 414 wetlands that occur within the project area could not be completely avoided. The road layouts generally avoid those larger and higher functioning wetlands, which helps to reduce direct functional losses. In many instances, proposed access roads were realigned to avoid wetland impacts. For example, the access road between Turbines 9 and 10 was realigned to the north from its original location to avoid wetland fill. Similarly, a proposed access road between the O&M building and Turbine 77 was realigned to the east to an existing forestry road to avoid wetland impacts. The road alignments were designed to avoid all in-stream work.

Turbine Pad, Collector Substation, and Permanent Met Tower Location

As is typical for wind power development, the initial turbine layout was designed to maximize energy output. Preliminary turbine layouts in Alternative 1 included up to 138 turbines and extended well beyond the current design involving additional ridgeline areas to the north of Route 16 (Figure 1A-3). These areas included an unnamed ridge adjacent to Townline Road in Moscow, Coburn Ridge in Mayfield Township, and Crockett Ridge in Kingsbury Plantation and Blanchard Township. This preliminary layout also included longer turbine strings in the area north of Withee Pond in Mayfield Township and west of Hilton Ponds in Kingsbury Plantation.

In 2012, the turbine layout was redesigned to minimize clearing within wetland resources, maintain stream and habitat buffers, and allow for reductions in impacts associated with new crane path construction that would be required to move from turbine to turbine. Advancements in turbine technology between 2009 and 2012 allowed fewer turbines to generate the same MW output. The Applicants reached out to stakeholders and, based on concerns raised, worked with them to reduce the number of turbines and reduce visual impacts with regards to scenic resources within proximity to the project area. Also, reduced impervious surface, turbine pads, additional crane path and access lessened the overall impact of the proposed project. The unnamed ridge adjacent to Townline Road in Moscow and Coburn Ridge in Mayfield Township were removed from the project area because construction and electrical connection in those areas was not cost effective. In addition, wetland impacts associated with the collector line would have increased project impacts. Crockett Ridge in Kingsbury Plantation was also removed from the project area in 2012 in part because of construction and connectivity costs, but also because of potential impacts to northern bog lemming, northern spring salamander, and SVP habitats. The turbine string north of Withee Pond was adjusted to reduce potential impacts to the many large wetland complexes present throughout that area. The turbine string west of Hilton Ponds was scaled back to eliminate impacts to buffer areas associated with

several nearby SVPs (Figure 1A-5). Individual turbine locations also were modified to reduce or avoid resource impacts. For example, grading associated with Turbine 16 was modified to maintain the 250-foot buffer associated with a stream where northern spring salamanders had been documented.

As a result of these efforts, there are no impacts to wetland and stream resources from turbine pads, permanent met towers. the collector substation, and nearby dynamic reactive device.

Electrical Design

Power from each of the 62 turbines needs to be collected by a 34.5-kV system that gathers the power from each machine and transmits the power to the collector substation. Much of the environmental impact associated with the collector lines will be avoided by burying the line in the ridgeline access roads and crane paths. The decision to bury the line was made to reduce wetland impacts and clearing. This approach eliminates the need to clear additional corridor widths to provide safe distances between overhead lines and nearby vegetation and avoids permanent fill and wetland conversion impacts associated with the line.

An aboveground collector system is needed to bring power from the southern turbine strings across Route 16 to the collector substation in Mayfield Township. Approximately 3.5 miles of the aboveground collector will parallel Route 16, which will limit habitat fragmentation. For this aboveground portion of the collector line system and a couple of other shorter stretches, fill impacts were avoided by locating poles in available upland areas and along existing roads or clearing areas as possible. As a result, there will be no permanent wetland fill impacts associated with the collector line.

Generator Lead

Construction access roads for the generator lead will utilize many of the existing roads present along the route. Most of the roads are currently maintained by timber management operations and private landowners and will require no upgrades for construction of the generator lead. Utilizing these existing roads limited the total length of improved or new roads to 2.1 miles, thus avoiding additional impacts to wetland and stream resources and limiting forest fragmentation (Exhibit 2, Civil and Electrical Generator Lead Design).

Operations and Maintenance Building Location

The Applicants considered several locations for the project O&M building. Originally the O&M building was located just south of Route 16 in Mayfield Township. This site was ideally located in the center of the project, but would have impacted a large forested wetland, and the majority of the surrounding area was determined to have hydric soils not suitable for building construction or subsurface wastewater disposal. An area adjacent to an existing gravel pit, also located just south of Route 16 in Mayfield Township, was selected as the O&M building location because it contained no wetland resources, is in an existing disturbed area (Borrow Pit), and was still in an easily accessible, central location (Figure 1A-6).

As a result of the modifications to the project design, large areas of wetlands were completely avoided. While all impacts could not be avoided, the total area of impact has been significantly reduced. Impacts to areas that could not be avoided are discussed in Section 7.

1A.6.2 Minimization

In areas where impacts could not be avoided, they have been minimized. For example, in multiple areas, roads and crane paths were generally aligned to cross wetlands at the narrowest point and thereby minimize effects on the wetland function (Figure 1A-7). Road designs in these crossing areas will contain rock sandwiches and stormwater controls to maintain existing groundwater conditions and eliminate runoff concerns. Road alignments will pass through the terrestrial habitat of one identified SVP. SVP_07AL has an existing gravel road within its critical terrestrial habitat. An access road for the project, near the proposed O&M building, will utilize this existing road with minor upgrades to minimize new impacts to the critical terrestrial habitat surrounding SVP_07AL. The proposed project will result in less than 25 percent impact to the critical terrestrial habitat (Figure 1A-8).

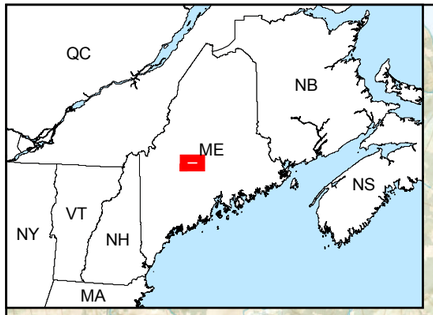
Electrical Design
Impacts associated with the collector line and generator lead will also be minimized. By locating approximately two miles of the generator lead adjacent to public roads in Parkman and Abbot, overall clearing and fragmentation will be minimized. Temporary mats rather than granular fill will be used to cross wetlands during construction, avoiding permanent wetland fill impacts. To minimize clearing impacts to DWAs along the generator lead, increased pole heights will be used. The proposed corridor will be located as near to the outer edge of the DWAs to the extent practicable to maintain integrity of the resources; however, landowner constraints have restricted shifting of the alignment in some of these areas. The design of the collector line also minimizes overall clearing and fragmentation by following existing roads, including Route 16, from the southern portion of the project to the project substation and burying it within the width of new roads. Vegetated buffers will minimize the impacts of the proposed project on natural resources. Vegetated buffer strips help maintain the water quality of surface waterbodies and provide habitat and travel corridors for wildlife between habitats. Selective clearing during construction, strategic placement of structures, and minimal cutting of vegetation during maintenance and operation of the collector line and generator lead provide minimization for portions of the project where impacts are unavoidable (see Section 10 for additional information on buffers).

1A.7 CONCLUSION

The final design of the turbine locations and collector lines was developed to minimize and avoid impacts to natural and scenic resources while meeting the project purpose and necessary design requirements. Turbine pads were sited in upland areas, away from wetland boundaries. The footprints of some turbine pads were reshaped or reduced to avoid impacts to nearby wetlands. The Applicants evaluated three alternatives for turbine locations based on environmental impacts and project cost and five alternatives for connecting the power generated by the turbines to the regional power grid based on landowner impacts, environmental impacts, and project cost. Based on this analysis, the Applicants selected the alternatives that were practicable and minimized overall environmental impacts. As a result of extensive efforts to avoid and minimize impacts, there are only 1.4 acres of wetland fill and 34.6 acres of wetland clearing and conversion associated with 62 turbines, collector lines, generator lead, and 25 miles of new and improved roads.

Figure 1

Project Location Map



Stantec Consulting Services Inc.
30 Park Drive
Topsham, ME USA
04086
Phone (207) 729-1199
Fax: (207) 729-2715
www.stantec.com

00539_1-1_Location.mxd

Legend

- Turbine Location
- Permanent MET Tower
- O&M Building
- Substation
- Edge of Gravel
- Electrical Generator Lead
- Overhead Collector
- Underground Collector

0 8,000
Feet

Client/Project
Bingham Wind Project

195600539

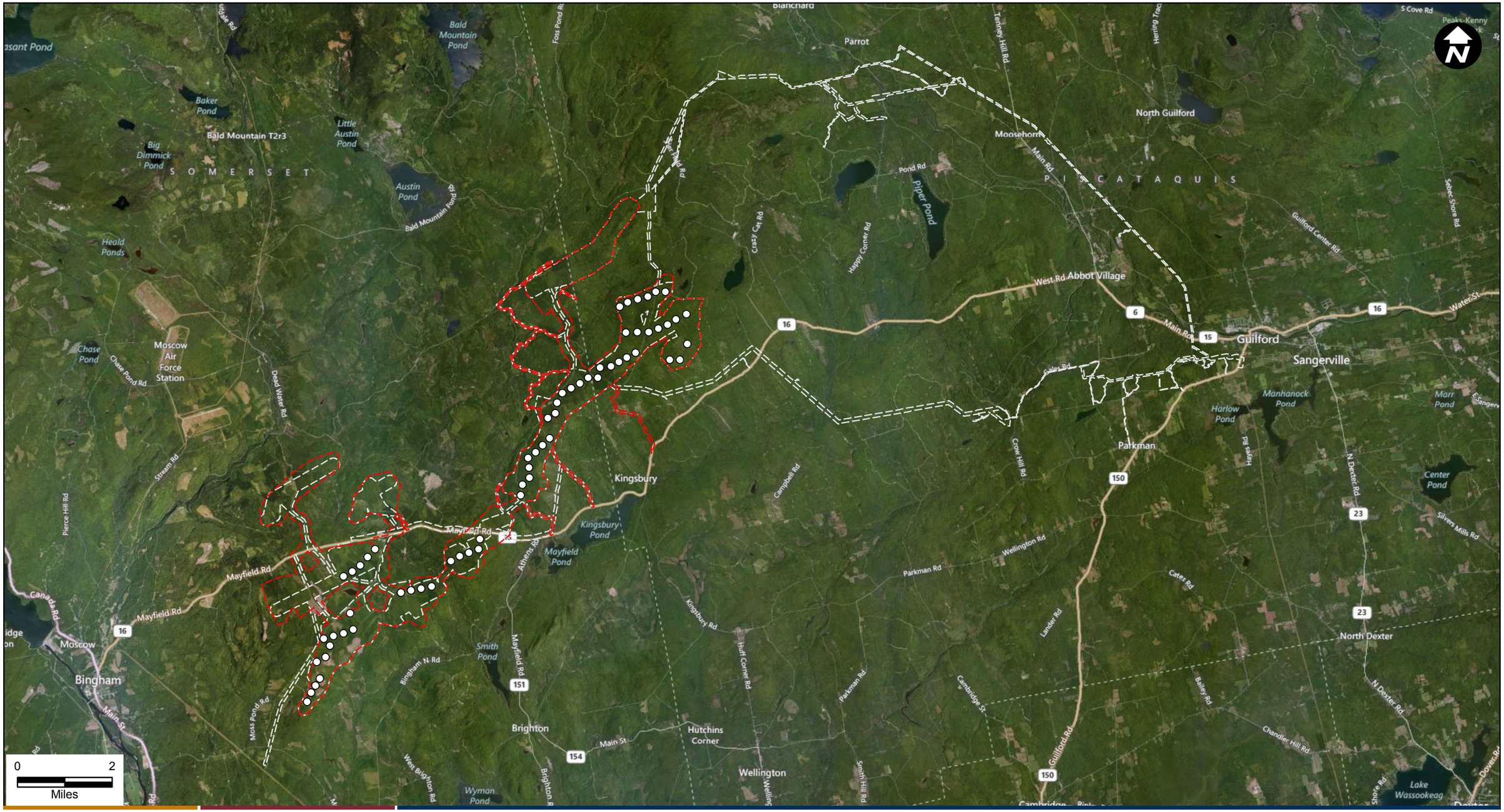
Figure No.
1

Title
Bingham Wind Project Location

4/16/2013

Figure 1A-2

Ridgeline Map



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04086
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Fax: (207) 729-2715
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Legend

- Proposed Turbine Layout (1/16/13)
- Vernal Pool Delineation Limits
- Natural Resource Delineation Limits

Notes

1. Aerial imagery provided by BING web mapping service.

Client/Project
Bingham Wind Project

195600539

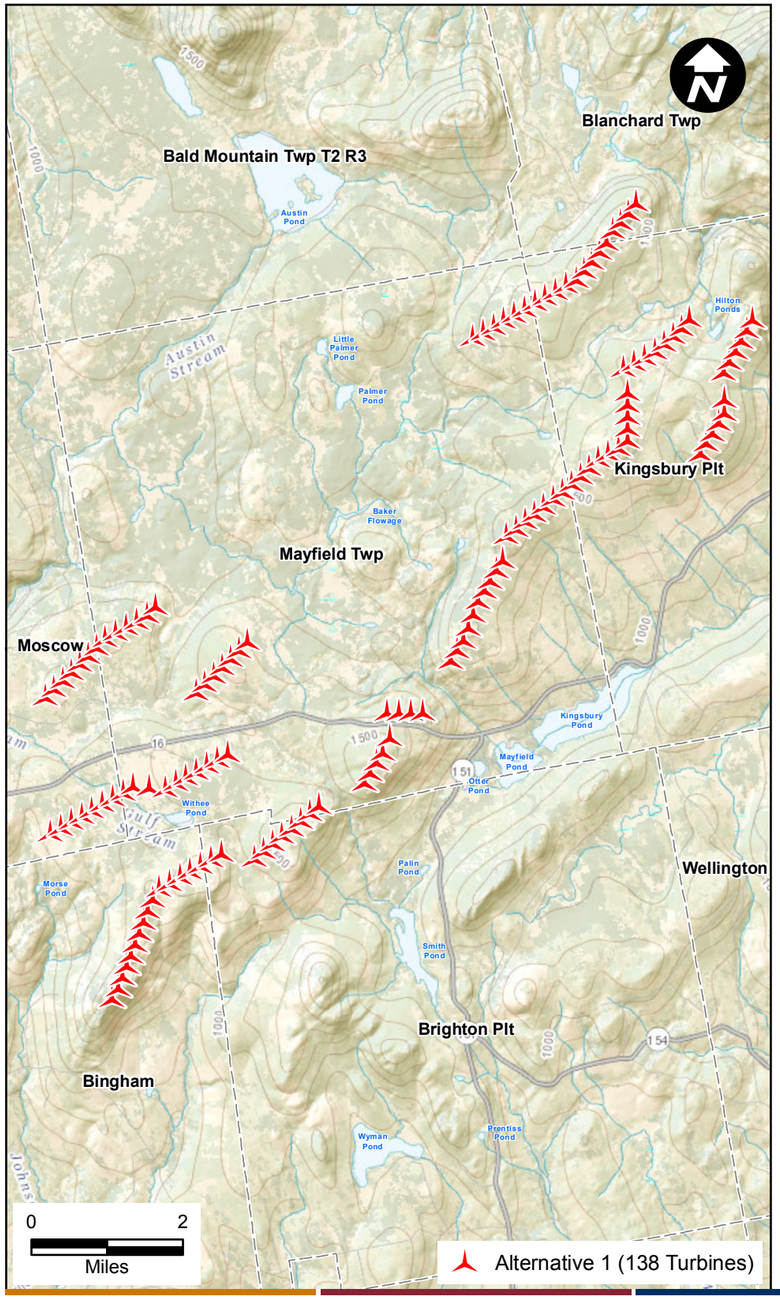
Figure No.
1A-2

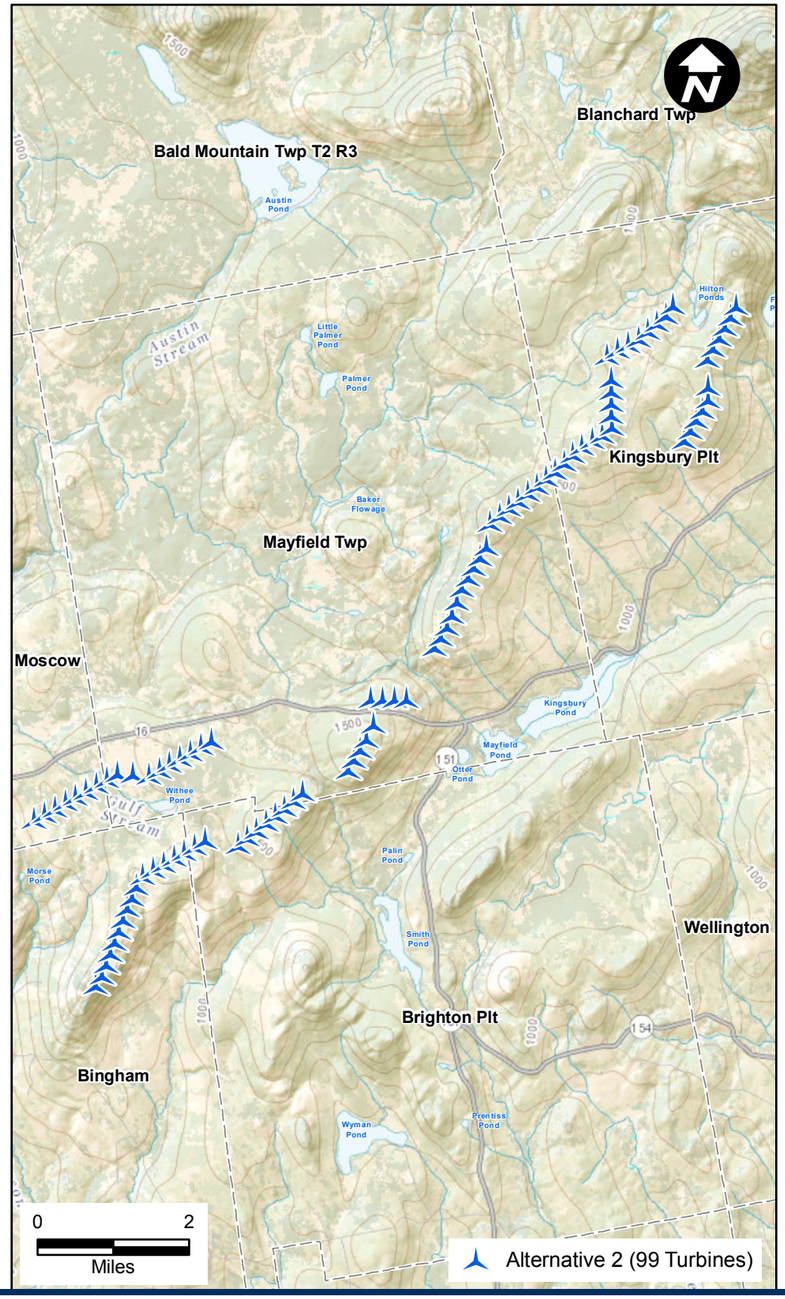
Title
Ridgeline Alternatives Analysis
4/2/2013

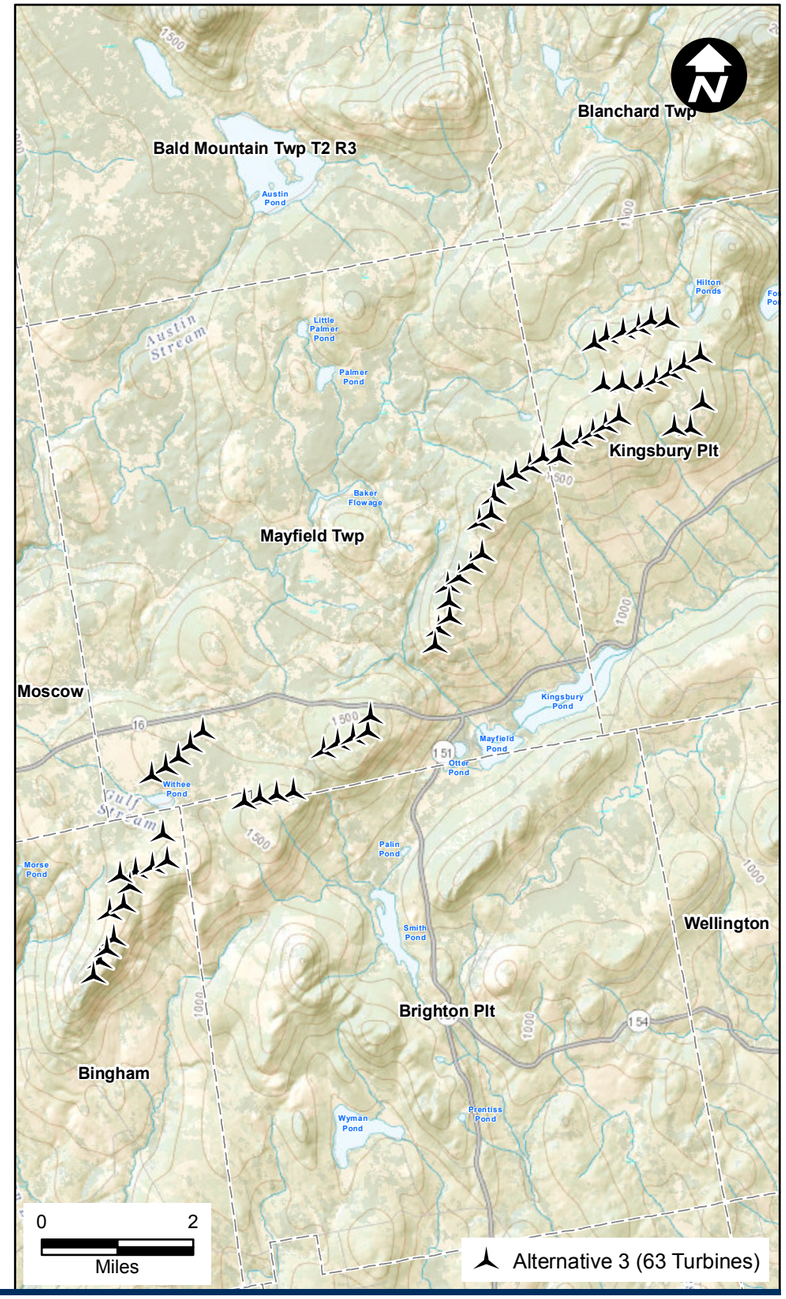
00539_1A-2_Ridgeline_Alternatives_Analysis.mxd

Figure 1A-3

Alternative Turbine Locations







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30 Park Drive
Topsham, ME USA
04086
Phone (207) 729-1199
Fax: (207) 729-2715
www.stantec.com

00539_1A-3_Alternative_Turbine_Locations.mxd

195600539

Client/Project
Bingham Wind Project

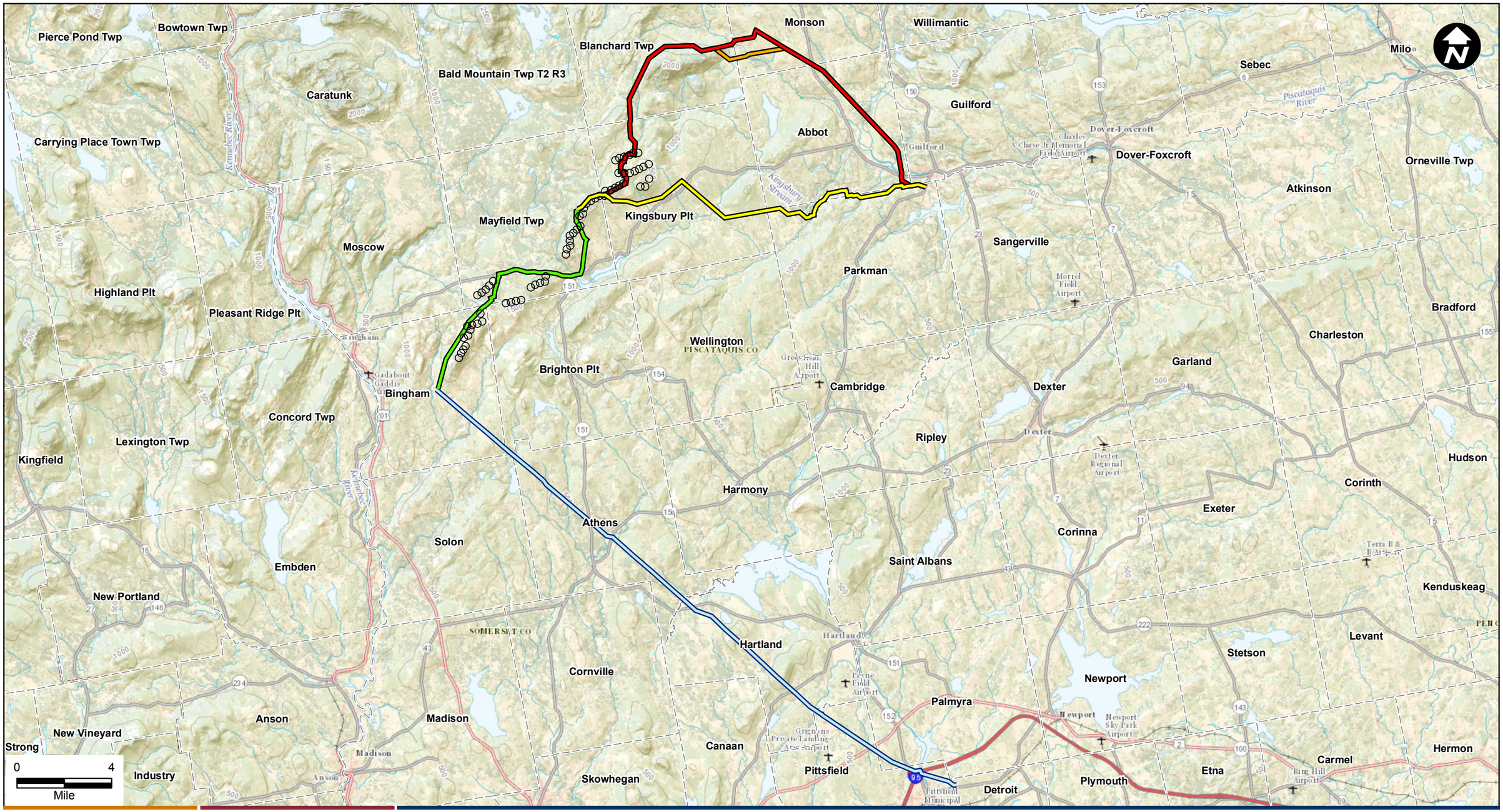
Figure No.
1A-3

Title
Alternative Turbine Locations

3/28/2013

Figure 1A-4

Electrical Generator Lead Alternative Analysis



Stantec Consulting Services Inc.
30 Park Drive
Topsham, ME USA
04086
Phone (207) 729-1199
Fax: (207) 729-2715
www.stantec.com

00539_1A-4_Electrical_Generator_Lead_Alternatives_Analysis.mxd

Legend

- Proposed Turbine Layout (1/16/13)
- Alternative 1 (23.9 miles)
- Alternative 2 (23.6 miles)
- Alternative 3 (17.2 miles)
- Alternative 4 (12.2 miles)
- Alternative 5 (40.2 miles)

Client/Project
Bingham Wind Project

195600539

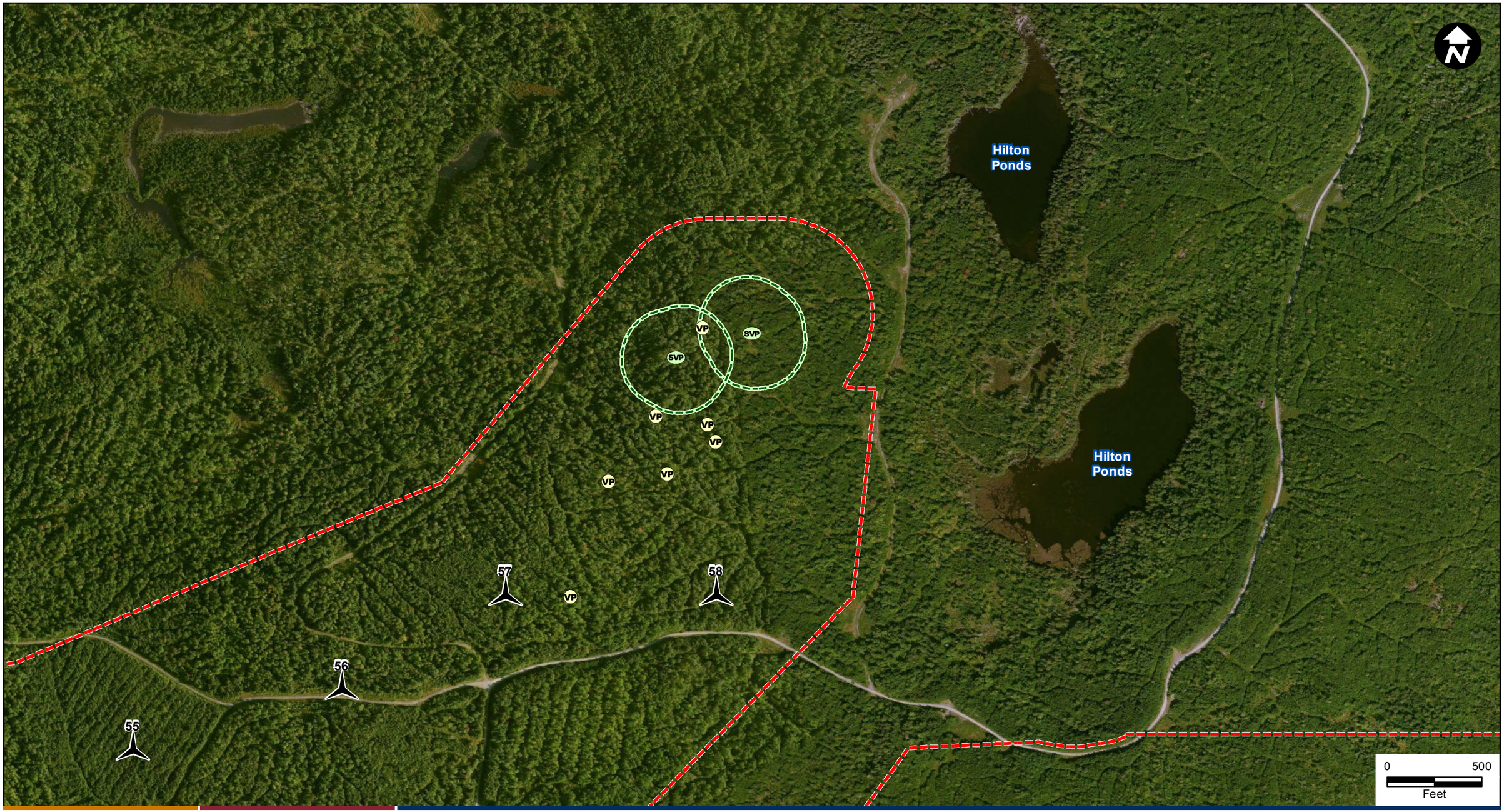
Figure No.
1A-4

Title
Electrical Generator Lead Alternative Analysis

3/29/2013

Figure 1A-5

Avoidance of Significant Vernal Pools and Natural Vernal Pools



Stantec Consulting Services Inc.
30 Park Drive
Topsham, ME USA
04086
Phone (207) 729-1199
Fax: (207) 729-2715
www.stantec.com

00539_1A-5_Avoidance_of_SVP_Natural_VP.mxd

Legend

- Proposed Turbine Layout (1/16/13)
- VP — Natural Vernal Pool
- SVP — Significant Vernal Pool
- Significant Vernal Pool 250' Habitat
- Vernal Pool Delineation Limits

Notes

1. Aerial imagery provided by BING web mapping service.

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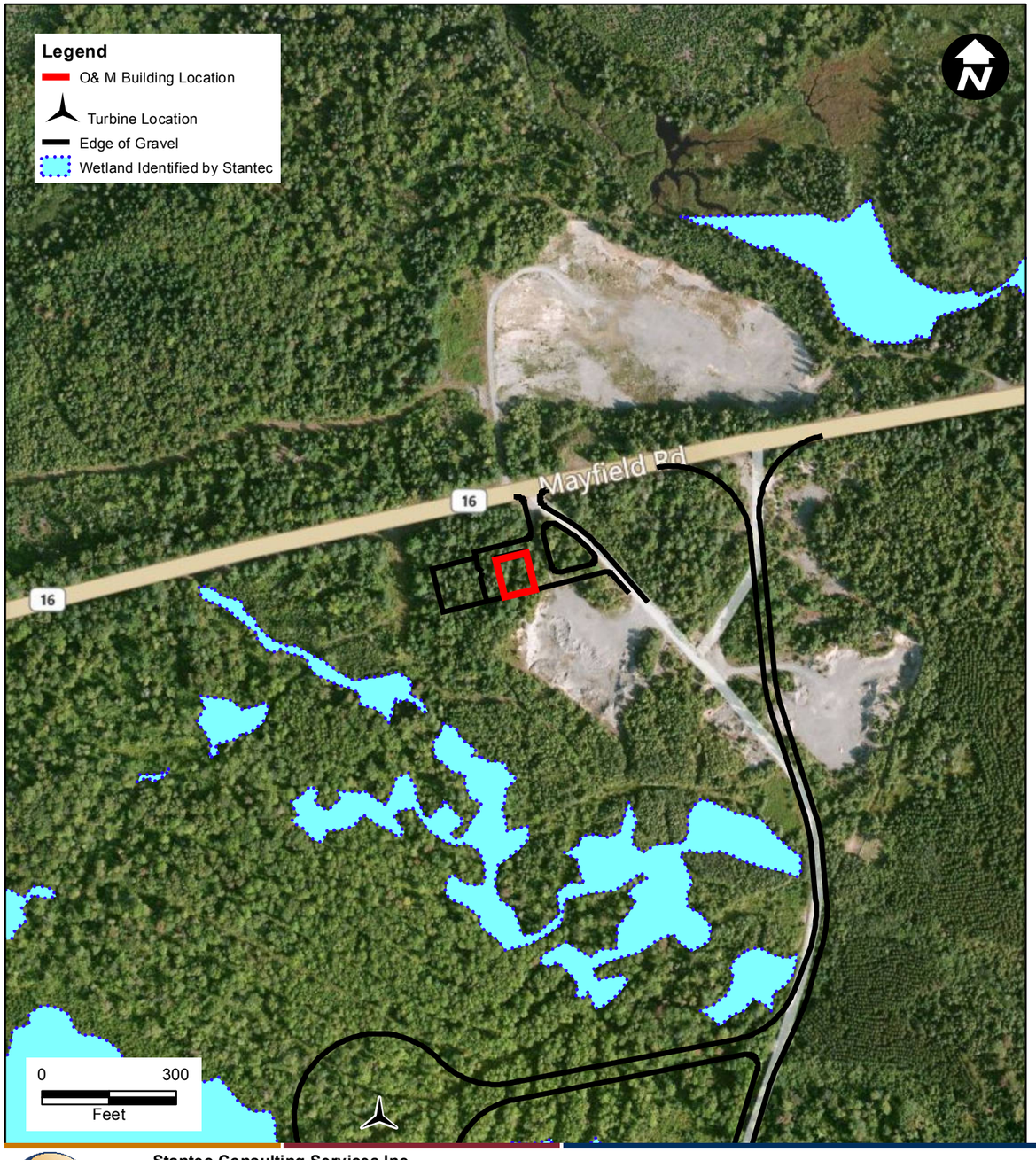
Figure No.
1A-5

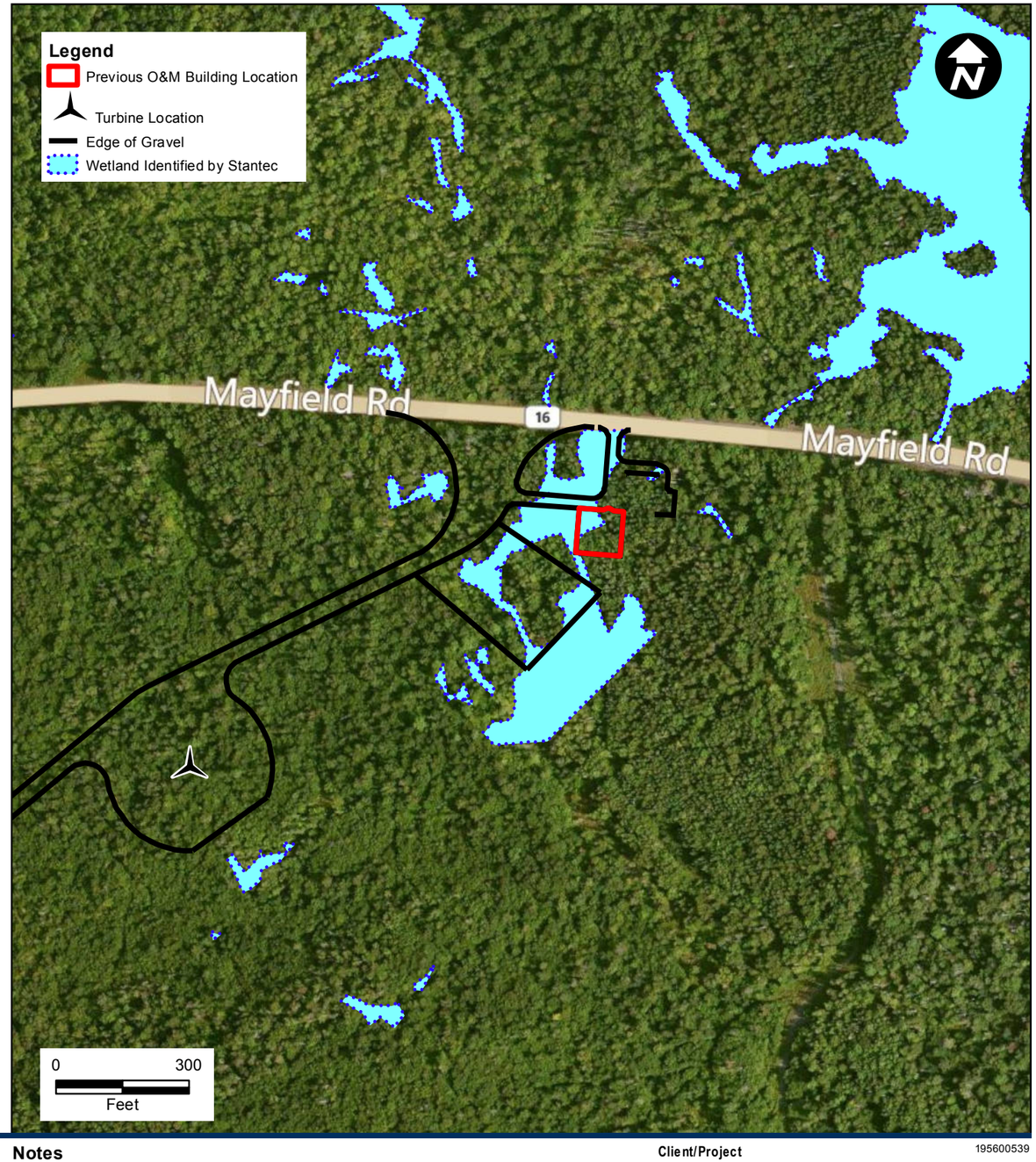
Title
Avoidance of Significant Vernal Pools and Natural Vernal Pools

3/26/2013

Figure 1A-6

Alternative Operations and Maintenance Locations





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Topsham, ME USA
04086
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00539_1A-6_OM_Options.mxd

Notes
1. Aerial imagery provided by Bing Maps aerial imagery web mapping service ((c) 2010 Microsoft Corporation and its data suppliers).

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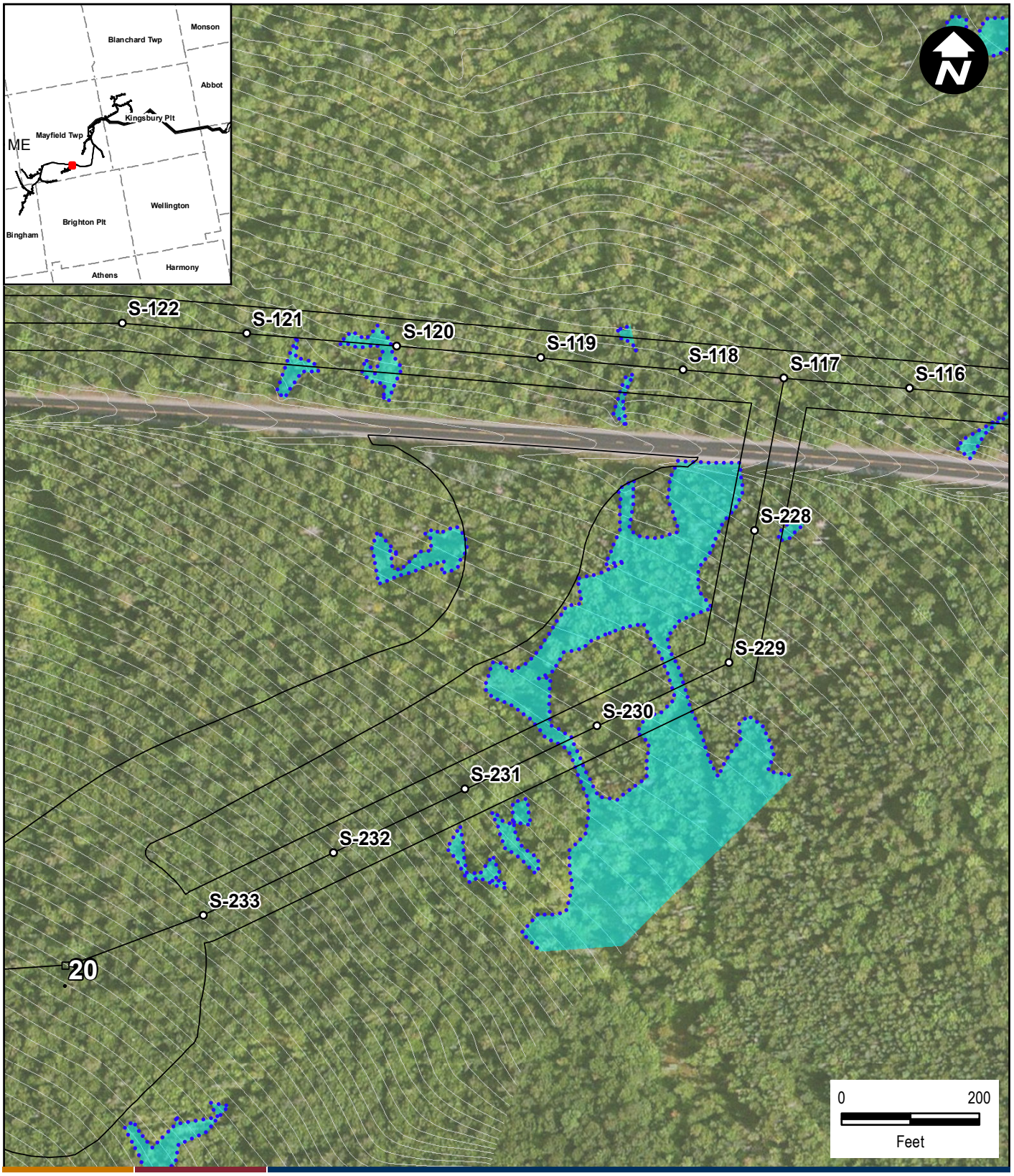
Figure No.
A1-6

Title
O&M Building Alternatives

3/26/2013

Figure 1A-7

Road and Crane Path Alignment



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30 Park Drive
Topsham, ME USA
04086
Phone (207) 729-1199
Fax: (207) 729-2715
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00539_1A-7_Road_Crane_Path_Alignment.mxd

Legend

- Wetland Identified by Stantec
- Utility Pole
- Site Plan
- Edge of Gravel
- 2' Contours
- Clearing Limits

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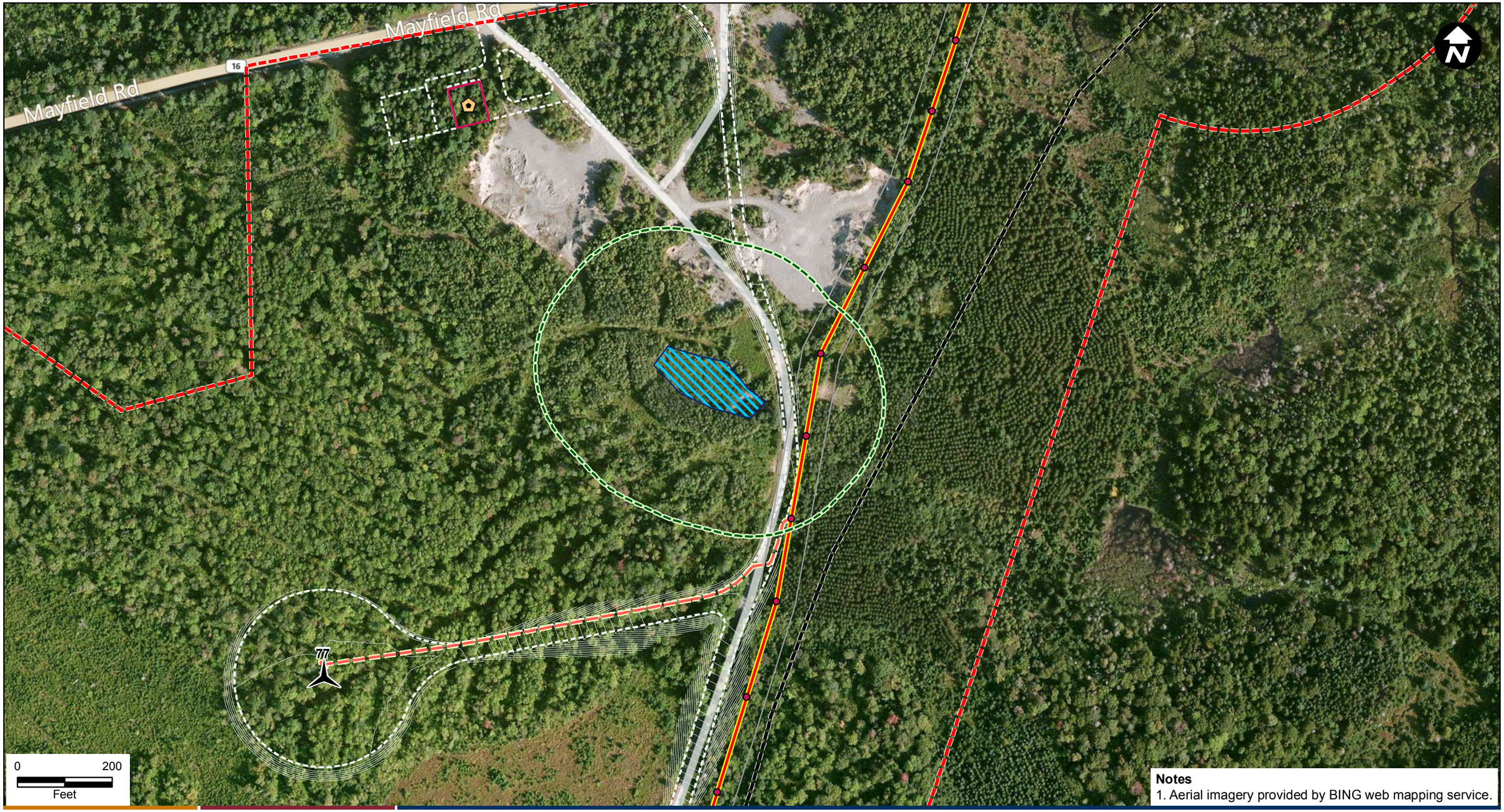
Figure No.
1A-7

Title
Road and Crane Path Alignment
4/10/2013

Figure 1A-8

Minimization of Disturbance around SVP 07AL



Notes
1. Aerial imagery provided by BING web mapping service.

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04086
Phone (207) 729-1199
Fax: (207) 729-2715
www.stantec.com

Legend

- Proposed Turbine Layout (1/16/13)
- Collector Structure
- O&M Building
- Clearing Limit
- Edge of Gravel
- Grading
- Overhead Collector
- Underground Collector
- Significant Vernal Pool 07AL
- Natural Resource Delineation Limits
- Vernal Pool Delineation Limits

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Figure No.
1A-8

Title
Minimization of Disturbance Around SVP 07AL

4/9/2013

00539_1A-8_Minimization_of_Disturbance_SVP_07AL.mxd