IBERDROLA RENEWABLES

December 12, 2013

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

RE: Docket 2013-____: Application of Atlantic Wind, LLC for a Certificate of Site and Facility for a Renewable Energy Facility for the Wild Meadows Wind Project, Grafton and Merrimack Counties, New Hampshire

Dear Chairman Burack:

Enclosed for filing with the New Hampshire Site Evaluation Committee in the above-captioned matter please find an original and 18 copies of the Application of Atlantic Wind, LLC for a Certificate of Site and Facility for a renewable energy facility proposed in the Towns of Danbury and Alexandria, Grafton and Merrimack Counties, New Hampshire. The proposed Wild Meadows Wind Project is a wind-powered electric generating facility with a nameplate capacity of 75.9 MW.

In addition to paper copies of the Application, a DVD containing the entire contents of the Application is being filed in accordance with Site 301.01(a). Please note, the Application contains plans which are, or have been folded to 8.5x11 inch sheets. In addition, we also have provided a full set of rolled design plans to accompany each copy and the original Application.

In accordance with RSA 162-H:6-a, I, the Application includes prefiled testimony, exhibits and sufficient information to satisfy the application requirements of each state agency having jurisdiction, under state law or federal, to regulate the construction or operation of the proposed facility, and each agency's completed application forms.

The Applicant is prepared to assist the subcommittee and state agency staff in any way that it can to provide for as expeditious a review of this Application as possible. RSA 162-H:6-a provides that within 30 days of this filing, the Committee Chairperson or designee must make a determination as to whether the Application is complete and whether to accept it. Assuming that the Application is determined to be complete and is accepted, we would respectfully request that a pre-hearing conference be held as soon as possible thereafter in order to establish a procedural schedule.

Atlantic Wind is being represented in this matter by Barry Needleman of McLane, Graf, Raulerson & Middleton, PA. If you have any immediate questions or concerns regarding this Application, please do not hesitate to contact him at 603-226-0400, or via email at barry.needleman@mclane.com, or Ed Cherian, Director, New England Development, at 603-440-3127 or via email at echerian@iberdrolaren.com.

Thank you for your assistance and attention in this matter.

Sincerely,

Rany Raviv
Vice-President
Business Development
Iberdrola Renewables, LLC

WILD MEADOWS WIND PROJECT

New Hampshire Site Evaluation Committee

Permit Application

December 2013

Application of Atlantic Wind, LLC

Docket No. 2013 -

Application of Atlantic Wind, LLC for a Certificate of Site and Facility

Wild Meadows Wind Project; Towns of Danbury and Alexandria, New Hampshire

Application Table of Contents

EXECUTIVE SUMMARY

Atlantic Wind, LLC submits this Application to the New Hampshire Site Evaluation Committee (SEC) for a Certificate of Site and Facility to construct and operate the Wild Meadows Wind Project in Danbury and Alexandria, New Hampshire. This executive summary provides information summarizing the contents of the application and its appendices, including information about the applicant, the site, the proposed facility, potential social and environmental effects, and proposed mitigation.

The Project is consistent with and advances a number important local and regional public policy goals such as those reflected in New Hampshire's renewable portfolio standard ("RPS") law, which requires that 25% of the electricity sold by retail suppliers in New Hampshire come from renewable sources by 2025. The Project will provide fuel diversity to the state and the region's generation supply through the use of a local renewable resource that is completely emission-free (i.e. the wind) which can displace and lower regional dependence on fossil fuels, thereby stabilizing volatile energy costs; the Project will aid the local and state economy by greatly enhancing the local tax base and by contributing substantial amounts to the state's general revenue fund; and because it will emit no air pollutants, it will help to reduce the amount of greenhouse gases, nitrogen oxides and particulate matter emissions generated in the state, thereby improving air quality, public health, and mitigating against the risks of climate change. In addition, the Project will help to meet the objectives recently announced in a joint statement by the six New England Governors, which highlights goals of accelerating regional cooperation to expand renewable energy in New England.

Because the Project will produce electricity without producing greenhouse gases, it is also consistent with the state's Regional Greenhouse Gas Initiative ("RGGI") which is aimed at reducing greenhouse gas emissions resulting from energy use in New Hampshire. The Legislature has determined that global climate change is a significant environmental problem that can be addressed through reducing greenhouse gases such as carbon dioxide, which is produced by electricity generators that combust fossil fuels.

By generating electricity without using fossil fuels, the Project will assist in addressing the issue of climate change and help to mitigate the negative effects that the residents of New Hampshire are already observing from the coastal regions to the mountains and on the state's ski and snowmobile industries.

Applicant information

Atlantic Wind, LLC, an Oregon-based Limited Liability Company registered to do business in New Hampshire with the New Hampshire Secretary of State, proposes to construct and operate the Wild Meadows Wind Project in the Towns of Danbury and Alexandria, Merrimack and Grafton Counties, New Hampshire. Atlantic Wind, LLC is a limited liability company organized for the development of projects in the eastern United States. It is 100% owned by Iberdrola Renewables, LLC (IR). IR is the U.S. renewables division of parent company IBERDROLA, S.A., an energy pioneer with the largest renewable asset base of any company in the world - more than 14,000 megawatts (MW) of renewable energy spread across a dozen countries.

IR is the second-largest provider of clean renewable electricity in the United States with more than 5,800 MW of wind and solar power in operation or under contract. It operates 53 wind energy facilities in 18 states, including the Lempster and Groton Wind Projects in New Hampshire. This extensive experience in wind energy ownership, construction, operation, and management will allow it to provide superior financial, managerial, and technical capabilities to assure construction and operation of the Wild Meadows Wind Project.

Atlantic Wind will arrange for the financing of the Wild Meadows Wind Project through various potential structures to provide the expected $150 million in capital for construction, equipment and operation of the Project. As the owner of Atlantic Wind, LLC, Iberdrola Renewables finances the construction costs of its wind farms through equity investments provided by Iberdrola S.A., one of the world's largest energy and utility companies. Iberdrola Renewables has the capability to provide adequate assurances, guarantees, financing and insurance for the Project's development, construction and operation. It currently funds all development activities for the Project, and through Iberdrola S.A., will arrange for the capital needed for construction finance, equipment orders, and long-term investment in the Project.

Atlantic Wind, with its parent companies, brings three critical aspects to this application and the proposed Project: (1) National and international technical experience and financial resources as the largest wind energy producer in the world; (2) An extensive process of community involvement and outreach in Danbury and Alexandria, neighboring towns, regional organizations, and state and local agencies and leaders. This outreach has involved many hundreds of NH citizens, discussing the Project in public meetings, many question and answer sessions, and visits to both the Groton and the Lempster Wind Farms; (3) Iberdrola Renewables' track record in New Hampshire through the successful development, construction, and operation of the Groton and Lempster Wind Farms.

There are three critical aspects that provide certainty in the company's capabilities and professionalism: careful and comprehensive examination of a wide range of issues; a widespread vetting of the proposal to the host and neighboring communities; and recent, successful examples of the company's successful approach to wind farm development and operation in New Hampshire.

Site information

The proposed Wild Meadows Wind Project is situated along ridge features in the towns of Danbury and Alexandria, New Hampshire in Merrimack and Grafton Counties. The area consists of three distinct ridgeline features known as Tinkham Hill and Braley Hill to the east, the Pinnacle in the central portion of the project area, and Forbes Mountain and Pine Hill to the west. All three ridges are oriented southwest-to-northeast and range in peak elevation from approximately 1,980 to 2,270 feet.

Renewable energy facility information

The Project consists of 23 modern 3.3 megawatt (MW) class wind turbines which will be situated along the ridge features described above. The project will provide a total installed capacity of 75.9MW and is expected to produce approximately 226,332 Megawatt hours (MWh) of electricity per year. Translated to homes, the Project is expected to produce electricity equal to the average annual consumption of approximately 30,000 to 32,000 average NH homes, and during periods of peak production would produce electricity equal to approximately 90,000 to 95,000 NH homes.

Thirteen (13) turbines would be oriented generally in a southwest-to-northeast direction along Tinkham and Braley Hill. Two (2) turbines would be similarly oriented on the Pinnacle and eight (8) additional turbines on Forbes Mountain and Pine Hill. The Project site will be accessible via a new gravel road originating from the existing Wild Meadow Road in Danbury. Access roads within the Project area will utilize existing logging roads, skidder trails and log landings and their associated clearings to the extent practicable, and traverse the slopes to access turbine locations. A connector road will be constructed between Tinkham Hill and Forbes Mountain to facilitate the movement of equipment and supplies around the site. From Forbes Mountain, a new overhead collector line will be constructed and run southeast of Pillsbury Hill before turning northeast towards the proposed collector and interconnection substation site off Bog Road in Alexandria. An Operations and Maintenance (O&M) building and laydown area are proposed to be located off the main access road in Danbury in a secluded hayfield.

The Project has had extensive and ongoing discussions with National Grid and ISO New England (ISO-NE) regarding interconnection of the Project. The Project is expected to deliver electricity via standard distribution system level, three-phase power (34.5 kV) to the substation. The power is expected to be conveyed via project overhead lines, on standard utility poles ranging from 35' to 65' to a substation location off of Bog Road in Alexandria, in immediate proximity to the existing National Grid 230 kV lines. These lines will be approximately 2 miles long, and are expected to interconnect the Project's output to the National Grid 230 kV system. A voltage step-up substation near the existing transmission lines will raise the voltage from 34.5 kV to 230 kV, for interconnection and delivery to the existing electrical grid.

Construction is currently planned to start in late 2014 beginning with access roads. Depending on winter and spring season conditions, construction will continue with turbine foundations, crane pads, turbine erection, electrical collection systems, an operations and maintenance building and a permanent meteorological tower. The expected Commercial Operation Date is late December 2015.

Site alternatives analysis

Based on Iberdrola Renewables' extensive experience in developing wind projects throughout the United States, Europe, and Central America, in combination with guidelines established by the National Wind Coordinating Committee, the American Wind Energy Association and the European Wind Energy Association, Iberdrola has developed a comprehensive and practical methodology for selecting wind project sites. This selection process indicates that the Wild Meadows Wind Project offers excellent potential for wind resources, environmental appropriateness and community acceptance.

The on-site alternatives analysis included a number of different potential turbine layouts, road configurations, electrical collector system designs, wind turbine types, and various potential locations for the O&M building, switchyard, and construction staging areas. Four primary alternatives were evaluated: larger Project sizes, different interconnection points, different turbine types and alternative road layouts.

Potential environmental impacts and proposed mitigation measures

Visual impacts

A Visual Impact Assessment (VIA) was prepared for the Wild Meadows Project and concluded that the proposed Project will not have an unreasonable adverse visual impact. The VIA determined that the Project is likely to be visible from only a small portion of the visual study area. In addition, views of the Project are likely to be fully screened by topography alone from approximately half of the identified historic sites, state parks, state forest, designated scenic areas, and other public resources of potential state or local significance within the 10-mile radius study area. Because forest land is the dominant land use within the study area, the Project's viewshed is largely restricted to areas within or directly adjacent to water bodies, agricultural fields and other clearings (e.g., utility corridors) that provide the opportunity for unscreened views. The VIA indicated that over 96% of the 10 mile study area will not have daytime or nighttime views of the proposed turbines when factoring in the screening from topography and mapped forest vegetation. Newfound Lake (approximately 3.8 miles to the northeast at its closest point) and its eastern shoreline, as well as some scattered higher elevation openings and larger open fields in valleys to the south and east of the proposed Project area, are the areas most likely to have views that include the majority of the proposed turbines. Visual simulations indicated that the Project's overall contrast with the visual/aesthetic character of the area will generally be moderate. Based on experience with currently operating wind power projects elsewhere, public reaction to the Project is likely to be highly variable based on viewer proximity to the turbines, the affected landscape, and the viewer's personal attitude regarding wind power.

Proposed mitigation measures include a significant reduction in the number of turbines as compared to initial project layouts, siting of turbines in predominantly forested areas to limit visibility from surrounding locations, minimizing FAA lighting and utilizing an approved radar-activated light system, minimizing forest clearing, and locating the substations, O&M building and other infrastructure in remote, partially to well-screened areas.

Shadow flicker

Predicted shadow flicker impacts of the Project were calculated using WindPRO 2.8.579 software, and associated shadow module. A total of 27 potential receptors within the 1,200 meter radius study area were identified and shadow flicker occurrence and duration was calculated at each location. The results of the analysis indicate that only one receptor is expected to receive greater than 30 hours per year of shadow flicker and this structure is a seasonally occupied residence that is owned by a Project participant. Three other receptors are predicted to receive over 10 hours of shadow flicker per year. Of these, only one receptor is not a participating landowner. Viewshed analysis conducted factors the screening of forest vegetation into the assessment of potential Project visibility indicates that this sole non-participating receptor would not have views of the Project and therefore is not expected to receive shadow flicker. The remaining 23 structures within the study area (86%) are predicted to receive no more than 10 hours of shadow flicker annually. Consequently, no significant adverse impacts from shadow flicker are expected as a result of the Project.

FAA lights

It is anticipated that FAA lights will be placed on 13 of the 23 turbines. The significance of lighting impacts from a given viewpoint will depend on the exact number of lights visible, what other sources of lighting are present in the view, the extent of screening provided by structures and trees, and nighttime viewer activity/sensitivity. Synchronized pulsing of the red FAA warning lights on the turbines (where visible) could have an adverse effect on rural residents and vacationers that currently experience very dark nighttime skies in the immediate Project area. It should be noted, however, that nighttime visibility/visual impact will be limited by the abundance of mature trees that screen the Project from many homes, and the concentration of residences in town centers and along highways where existing lights already compromise dark skies and compete for viewer attention. In addition, there are existing lighted communications towers in the area, including on Tenney Mountain, and a new cell tower is planned in Groton.

To mitigate for any potential visual affect, Atlantic Wind proposes the installation and implementation of a radar activated lighting system at the Wild Meadows Project, conditioned upon federal approval and successful testing and implementation of such systems at wind facilities in the United States. Implementation of this technology will substantially reduce the amount of time that the lights are activated, when compared with traditional warning light systems.

Historic sites

A Phase IA archaeological survey provided an initial review of the Project to assess areas of archaeological sensitivity and potential resource management issues. Overall, the majority of the Area of Potential Effect (APE) is considered to possess little potential to contain precontact archaeological resources; however, some areas are worth investigating for precontact resources, particularly those on relatively level terrain and near potable water. Based on the preliminary survey findings the Project will not have an unreasonable adverse effect on archaeological resources.

A historic architectural survey was performed to identify those historic properties listed on the National and State Registers of Historic Places within 3 miles of the project for visual effects or viewshed. The preliminary perspective of the historic architectural survey suggests that a number of potentially National Register-eligible properties may be located in the Project's area of potential effects (defined by the three-mile viewshed). However, based on the preliminary survey findings, this Project is not expected to have an unreasonable adverse effect on historic properties. No historic structures will be physically impacted, and at present it appears unlikely that the visibility of the Project would demonstrably diminish any aspects of setting that might contribute to the significance of such historic properties.

Air quality

The Wild Meadows Wind Project will not combust any fuels to produce electricity and therefore will not create any air emissions or have an adverse impact on air quality. Moreover, as a source of clean, renewable energy, the Project will add a new power supply to the region without adding any new air pollutant or greenhouse gas emissions. It will positively contribute to regional air quality during those times when its operation is displacing generation from fossil fuel electricity plants.

Unlike all forms of fossil fuel generated electricity, wind power has no air emissions associated with it. The Project's positive effects with respect to air quality should therefore be given significant consideration when balancing the issues of new facility siting, environmental protection and public health.

Water quality

The entire project area is located in the Pemigewasset sub-basin (HUC8) of the larger Merrimack River basin (HUC6). Northern portions of the project area, as well as the entire substation area, are located in the Newfound River watershed (HUC10) which drains to Bog Brook and eventually to Newfound Lake. The northern slopes of Braley Hill and Forbes Mountain drain into Patten Brook which leads to Bog Brook and eventually to Newfound Lake. All waters in the southern portions of the study area flow to the Smith River (HUC10) by way of Wild Meadows Brook, Taylor Brook, Hoyt Brook, and Pine Hill Brook. The Smith River as well as the Newfound River flow into the Pemigewasset River near Bristol, NH. There are no named lakes or ponds within the approximately 2,000 acre water resource study area, and most drainages are small headwater streams that are intermittent and/or ephemeral in nature. Wild Meadows Brook, Grant's Pond which is located along the brook just outside of the water resources study area, and Pine Hill Brook are the most significant surface water resources in the immediate study area.

Fourteen impaired waters are located within one mile of the project site. All impairments are generated from regional pollutants (mercury) as opposed to local pollutants. Wild Meadows Brook is considered impaired due to mercury in fish and caustic waters, defined by New Hampshire Department of Environmental Services (NHDES) as a pH value lower than 6.5. The proposed Wild Meadows Wind Project is not expected to be a source of *E. coli*, mercury or any other pollutant, and therefore will not unreasonably affect water quality in that regard. Moreover, a greater reliance on wind energy has the positive, long term potential to assist in improving water quality by reducing the reliance on energy sources that release mercury into the atmosphere and contribute to acid rain.

There should be no long term impacts to water quality and/or temperature in any local water resources as a result of the Project. Short term effects due to alteration of terrain have been minimized throughout the design of the project and are detailed in the Project design plans and the Alteration of Terrain Application. Frequent monitoring of the performance of such devices will occur.

Stormwater, soil erosion and sediment control

The proposed Project will involve construction of approximately 9 miles of new gravel road as well as the construction of the infrastructure for the support of the Project (turbine foundations, crane pads, material storage areas and operation & maintenance facilities), for a total estimated disturbance area of approximately 150 acres out of 4,930 acres. The Project has been designed to minimize changes to natural flow paths, to minimize impacts on the existing hydrology patterns, minimize erosive forces and to retain favorable conditions for localized treatment of stormwater. Post-construction impacts are generally related to the intensity of use and thus the very low intensity of use of the proposed features (travel by maintenance personnel), combined with low generation of surface water runoff, is anticipated to have minimal adverse effect on receiving waters.

The Project will not significantly change the peak stormwater runoff discharge rates between the pre and post development conditions for the 2, 10, and 50 year storm events. The Project has been designed to minimize surface water and stormwater runoff impacts by maintaining natural drainage patterns where possible through the use of culverts and subsurface stone drainage ways (stone mattresses). Design measures to protect surface water quality during construction of the Project have focused on control of erosion during construction through use of sediment barriers (such as siltsock and other permeable barriers consisting of bark mulch and stump grinding) and the use of soil stabilization measures including erosion control blankets, spray-on polymer emulsions, and prompt stabilization of exposed surfaces. Riprap aprons will be installed at the outlet end of proposed circular culverts to minimize the potential for erosion.

Wetlands

Wetlands within an approximately 2,000 acre study area were delineated by NH Certified Wetland Scientists (NHCWS). The majority of the approximately 70 acres of delineated wetlands are characterized as forested (47%), followed by emergent (21%) and various combinations of either emergent, forested or scrub-shrub (24%). Historically, a large percentage of the delineated wetlands have been impacted by logging, including the construction of haul roads and log yards, and log skidder operations. Despite the size and linear nature of the Project, careful design will result in unavoidable permanent impacts to only about 1.1 acres of wetlands and streams with an additional 0.8 acres of temporary impacts.

The Project's engineers have made design changes to avoid and minimize wetland impacts where possible. The proposed location of the turbines on ridge lines avoids impacts to some of the larger forested wetland complexes and perennial streams located in the valleys, which are some of the most ecologically important wetlands on the Project site. New access roads have been located to avoid wetlands entirely or to cross wetlands at or near their narrowest points if they cannot be avoided. The width of access roads has been limited to the minimum required for construction access and safety. Direct permanent impacts total only 1.3% of the total delineated wetland area. One of the most common impacts involves crossings of the numerous narrow forested drainages on the side slopes of the ridges associated with the Project. In these cases, the engineers have incorporated either small culverts or "stone sandwich" structures into the roadway which will allow water to continue to flow down the drainage as it currently does. This will help to minimize the potential effect on downslope wetlands.

As a part of the Project's compensatory mitigation package, Atlantic Wind is proposing to protect the 223-acre Patten Brook parcel through a conservation easement. The site includes many streams, wetlands, several significant wildlife features, and it abuts other conserved lands. The landowners, H & H Investments, Inc., have indicated their willingness to enter into negotiations to sell a conservation easement on the parcel. The New Hampshire Department of Resources and Economic Development's (NHDRED) Forest and Lands Division has indicated a willingness to hold the easement. The details of the easement have yet to be negotiated but will be based on the components included in the easement template provided by NHDES. Atlantic Wind has agreed to provide the deed research and a full ground survey of the parcel boundary. Atlantic Wind's goal is to have the easement in place by May 2014, as stated in the Preliminary Mitigation Agreement between Atlantic Wind and NHDES signed by both parties. Both the easement template and Preliminary Mitigation Agreement are included in the NHDES Dredge and Fill Application which is included in this submittal.

Natural environment

Based on aerial imagery it is evident that, even with extensive logging, the site remains primarily forested. However, due to the ongoing commercial logging, the pattern of forest canopy is continuously changing. Plant community types were identified using data associated with the 2006 New Hampshire Wildlife Action Plan (NHWAP). Four mapped communities are mapped within the roughly 1,610 acre envelope including and surrounding the Project

Footprint: Northern Hardwood Conifer Forests; Lowland Spruce-Fir Forests; Hemlock-Hardwood-Pine Forests; and Grasslands.

Birds

Iberdrola Renewables has implemented a corporate Avian and Bat Protection Plan (ABPP). This is the wind industry's first company-wide Avian and Bat Protection Plan and was released in conjunction with the USFWS in October 2008. Iberdrola Renewables' ABPP plan is modeled in part after the 2005 Avian Protection Plan template developed by approximately 30 electric utility companies, numerous electric cooperatives and rural utilities, and the USFWS to address impacts of transmission and distribution lines on birds. A project specific ABPP will be created for the Project and implemented according to the corporate ABPP.

A variety of bird and bat field surveys were conducted within the Project Area in 2009, 2010, and 2011, with additional studies performed in 2013. All of these surveys were conducted to inform Atlantic Wind and State and Federal agencies of potential effects on birds as a result of the construction and operation of the Project so that the Project could be designed in a manner that would minimize potential impacts to birds. A bird and bat risk assessment was prepared using the results of on-site field surveys, information from literature review, agency consultation, regional surveys and databases. This risk assessment sought to characterize bird and bat use of the Project Area and assess potential risk presented by the Project to raptors, nocturnally migrating passerines, breeding birds, and bats.

Rare, threatened, or endangered bird species that were documented in the Project area during these surveys include northern harrier (state- listed endangered) and bald eagle (state- listed threatened). In addition, one state special concern species was observed (American kestrel). No federally-listed threatened or endangered birds were observed during any of the field surveys.

Nocturnal migration

Overall, compared to other publically available radar surveys conducted on forested ridgelines in the northeast, fall radar surveys at the Project documented higher numbers of nocturnal migrants in the air space above the ridgelines whereas the spring radar surveys documented typical numbers of nocturnal migrants when compared to similar surveys. Although the seasonal mean passage rate during the fall survey was higher than similar surveys, the average nightly passage rates at the Project were within the range of those recorded for other publicly available studies. Project flight heights were similar to the results of nocturnal radar surveys conducted at other sites in New Hampshire.

The results of the Bird and Bat Risk Assessment, which followed a standardized weight of evidence approach and included a detailed information review as well as incorporated the results of on-site field surveys, predicted a low magnitude of potential impact to nocturnal migrants.

Breeding birds

In general, species documented in the Project area were typical of the moderate elevation northern hardwood forests that dominate the Project area. Among the most common species were dark-eyed junco, ovenbird, and chestnut-sided warbler. No state or federally- listed species were observed during the breeding bird surveys.

Generally, direct and indirect impacts to breeding birds at the Project are expected to be limited to a small amount of collision mortality and slight shifts in the distribution of breeding bird species within the Project area. The results of the Bird and Bat Risk Assessment predict a low magnitude of potential impact to breeding birds.

Raptor migration

Species observed most frequently during the spring and fall migration surveys were turkey vulture, red-tailed hawk, and broad-winged hawk. One state-listed endangered species and one state-listed threatened species were observed during the 2010 raptor migration surveys. These were the state-threatened bald eagle and state-endangered northern harrier. No federally-listed threatened or endangered species were observed during any of the on-site surveys. Although state-listed threatened and endangered species were observed in the Project area during the spring and fall 2010 raptor migration survey, they were observed infrequently and for brief periods of time indicating that they likely do not reside there.

On-site raptor surveys documented relatively low levels of raptor migration in comparison to other regional sites at which monitoring has taken place. Specifically, daily raptor observation rates at the Project were lower than the results from several years of monitoring at a local regional hawk watch site. Although raptors were observed flying at elevations below the maximum height of the proposed turbines within the Project area, data from publicly available post-construction monitoring surveys at operational wind projects in the eastern United States indicate that raptors are at low risk for collision with modern wind turbines. Based upon publicly available data, a total of five raptor fatalities have been documented at operational wind projects in New England, including one red-tailed hawk that was electrocuted by a power line.

Field surveys and literature review did not identify features of the Project that suggest an increased risk to raptors. Although small numbers of eagles appear to use the Project area during fall and spring, and limited telemetry data suggest that individual golden eagles may pass through the vicinity of the Project, eagles are not known to nest within the Project area, and eagle mortality has not been documented at any other existing facility in the eastern United States.

The results of the Bird and Bat Risk Assessment predict a low magnitude of potential impact to raptors.

Bats

On-site field surveys designed to assess bat presence and activity in the Project area consisted of acoustic bat surveys in the fall of 2009 and the spring/summer of 2010. In addition to acoustic bat surveys, mist net surveys were conducted in the Project area in 2011 to document the potential presence of endangered bat species within the Project area.

Patterns in acoustic bat survey results documented at the Project, including differing species composition and activity levels between ground-level and met tower detectors, variability in activity levels between detectors and nights, and seasonal patterns in activity levels, were similar to those documented in many acoustic bat surveys conducted in the northeast.

The bird and bat risk assessment concludes that potential impacts to bats at the Project likely will follow patterns similar to those documented at other facilities, particularly those in New England, and mortality is expected to be lower than that observed at wind projects in mid–Atlantic states. To the extent there are impacts to bats, the risk assessment concludes that those impacts likely will consist principally of collision mortality during the spring and particularly the fall migration seasons. Long-distance migratory species are expected to be the most vulnerable to collision mortality, as they appear more vulnerable to collision mortality than other species based on available post-construction survey results and were well represented in the results of acoustic surveys conducted at the Project. To date, post-construction studies at existing wind projects have documented very few fatalities of bat species listed in New Hampshire. Post-construction monitoring surveys at New England facilities including the Lempster Wind Project and Groton Wind Project have not documented mortality of eastern small-footed bat. The risk assessment ultimately concludes that the Project will not have an unreasonable adverse impact to bats.

Avian and bat mitigation

Atlantic Wind has proposed to conduct 2 years of post-construction monitoring at the Project, with a potential third year pending the results of Years 1 and 2. This Study Plan is based on the methods used at the Lempster and Groton Wind Projects in New Hampshire and outlines the protocol for the first and second years of monitoring after the project becomes operational (Years 1 and 2). The need for, timing, and scope of a third year of monitoring will be determined in consultation with the New Hampshire Fish and Game Department (NHFGD) and US Fish and Wildlife Service (USFWS).

A Study Plan for Post-Construction Monitoring Surveys has been prepared for the Project and submitted to applicable agencies for review and approval. The study will be performed by a qualified third party consultant with experience conducting transect based post-construction studies at wind facilities. The first and second year of post-construction monitoring will consist of a bird and bat fatality study, including weekly turbine searches, visibility class mapping, searcher efficiency trials, and carcass persistence trials. The results of the study will be summarized in an annual monitoring report for each monitoring year.

Other wildlife

After discussions with NH F&G and USFWS, a Wildlife Habitat Assessment was conducted to address the overall value of habitat in the project Area to wildlife in general. A remote camera survey was also conducted to determine specifically if American marten are present in the Project Area. The habitat present in and around the proposed Wild Meadows Wind Project is typical of New Hampshire's Central Highlands region, and consists of cover types that are common throughout this region of the state. The bird, mammal, amphibian, and reptile species observed on-site were also commonly occurring species, typical of forested habitats in central NH.

Because the Wild Meadows Wind Project will introduce new disturbance and permanent structures to the site, some level of impact to wildlife habitat would likely occur. However, because the Project does not involve any development that will significantly increase traffic to the area or increase use by humans, habitat fragmentation will be relatively minor, and there should not be a substantial change in the patterns of wildlife habitat use and movement around the site.

Per written correspondence received from the NH Natural Heritage Bureau and field surveys, there are no known state or federally-listed species within the Project limits, nor are there any exemplary natural communities occurring within or in close proximity to the Project area. However, the Natural Heritage Bureau data does indicate there are populations of a sensitive state-threatened plant species and an area of sensitive wildlife habitat in the vicinity of the site. Both habitats are over 2,000 feet from the nearest project-related disturbance and neither will be affected by the proposed project.

Vernal pools

For four consecutive field seasons, beginning in May of 2010 and concluding in May of 2013, the study area was surveyed for vernal pools in a systematic manner by a team of field biologists during the spring, typically between mid-April and May 30. After field data collection was completed, all of the vernal pool resources were ranked according to habitat value.

The majority of the vernal pools are man-made (48 pools, or 49%) or influenced by anthropogenic activities (22 pools, or 23%) with 27 pools (28%) considered natural. This is consistent with the level of disturbance observed within the study area associated with current and historical logging activity. Twelve (12%) of these pools are ranked as highest value (A) pools, 43 (44%) are ranked as intermediate value (B) pools, and 42 (43%) are ranked as least value (C) pools. Wood frogs, spotted salamanders and Jefferson/blue-spotted salamander hybrids were the only primary vernal pool indicators identified. Several secondary indicators were also observed within many pools, including caddisfly, true fly and aquatic beetle larvae. American toads, red efts and green frogs were other amphibians encountered in the vernal pools that are not regarded as vernal pool obligate species.

Direct impacts to 96% of the delineated vernal pools were avoided, and unavoidable impacts were minimized as described above for surface waters and wetlands. Direct and secondary impacts to all of the highest value (A) pools were successfully avoided, while some direct or secondary impacts to three intermediate value (B) and three least value (C) pools were unavoidable. Proposed direct permanent impacts to vernal pools total only 1,251 SF, or 0.029 acres and the effects of the project on vernal pool amphibians are expected to be relatively low, given the project design and operation and the available surrounding habitat.

Public health and safety

Iberdrola Renewables is a responsible renewable energy developer and owner and works very hard to prevent any negative environmental, health or safety effects on the communities and residents where it constructs and operates its wind farms. Iberdrola Renewables strives to proactively deal with all concerns during the development, siting, permitting and construction process. The company also operates its wind facilities under prudent wind practices. Iberdrola Renewables has received many accolades from communities around the country recognizing the company's good working relationships with these communities and residents to develop, construct, and operate wind plants, and its responsiveness to concerns. As an example of the Iberdrola Renewables' safety record, the injury rates for both construction and operation of our plants are significantly below industry averages and are trending downward. This is due to a fully supported training and integrated safety program.

Atlantic Wind will work with local fire departments to notify them of construction plans, provide site visits to review the location of and access to Project facilities and emergency response procedures, and mutual assistance in the case of fire or other emergency in or around the Project area. Atlantic Wind will establish a 911 addresses during construction, and work with local responders to identify access points. In addition, Atlantic Wind has proposed agreements with the Towns of Danbury and Alexandria that address public health and safety issues during both construction and operations.

Ice shed

Icing conditions have been known to occur during certain winter conditions of temperature and precipitation. On all Iberdrola Renewables turbines sited in cold weather climates, nacelle-mounted anemometers are heated and provide accurate wind speed information during all weather conditions. Ice build-up on the blades degrades the airfoil profile and causes a reduction in aerodynamic lift, and thus, a reduction in power, even in adequate wind conditions. The turbine power curve program identifies an inconsistency between the wind speed, expected power production and RPMs, and automatically switches the turbine into standby mode, thus potential ice shedding does not pose a public safety risk.

Project access roads will have visible signs warning of the danger of potential falling ice.

Lightning strikes

Due to the height of the turbines and their metal/carbon components, lightning strikes can occur. The Vestas V112 turbines proposed for the Wild Meadows Wind Project include lightning protection systems which protect against blade damage. The turbine monitoring system provides documentation of all critical lightning events and if a problem is detected, the turbine will shut down automatically or, at a minimum, be inspected to assure that damage has not occurred.

Iberdrola Renewables has an extensive grounding system installed at all wind farms that includes embedded copper rods. The grounding system typically includes a grounding grid at the base of each turbine. Upon completion, there will be an underground collector system that serves to dissipate the effects of lightning.

Tower collapse/blade throw

Atlantic Wind will construct and operate the Project consistent with its corporate commitment to meeting all applicable state and Federal OSHA safety regulations. In addition to compliance with the design specifications and construction standards noted in section F.5.a, each turbine is certified according to international engineering standards. All electrical equipment will be inspected by Iberdrola Renewables under rigorous commissioning procedures, as well as by the local utilities (for grid and system safety), prior to being brought on line. Once turbines are commissioned, qualified personnel routinely inspect and repair them as necessary pursuant to preventive maintenance schedules. The Vestas V112 turbines proposed for the Wild Meadows Wind Project have state-of-the-art braking systems, pitch controls, sensors and speed controls that operate to reduce the risk of overspeed which can lead to blade and or tower failure. Additionally, the turbines cease operation if significant vibrations or rotor blade stress is sensed by the blade monitoring system. In the extremely unlikely event that tower collapse or blade failure occur, site personnel would immediately call appropriate local emergency response personnel.

Stray voltage

As discussed above, the Wild Meadows Wind Project's collection system will be properly grounded in accordance with national and international standards. In addition, because interconnection lines and switchyards are designed in accordance with local utility regulations, it is unlikely that the Project poses any risk to the public's health or safety as the result of stray voltage.

Fire

The Vestas V112-3.3 MW turbines have been carefully designed with multiple engineering and technological features specifically designed to minimize the risk of fire, and furthermore, have advanced systems built-in to detect and extinguish any that do occur. In addition to the on-site staff, the Project is continually monitored 24 hours a day 7 days a week by the Iberdrola Renewables National Control Center located in Portland, Oregon. Other applicable fire laws and regulations will be followed in accordance with state and local requirements. The Project will coordinate with all applicable Fire Departments regarding the Project.

Aviation safety

Atlantic Wind received FAA Determination of No Effect letters for turbines in October 2010. The Project has since been revised, and the overall number of turbine locations was reduced. The Project re-filed the new locations in September 2013.

FAA requires lighting the Project as one large obstruction with lights spaced approximately 3,000 feet apart. The FAA has determined that the standard turbine color is sufficient daylight marking and therefore white strobe lights will not be required. As a result, wind farms typically are lit with synchronized red flashing lights at night and only a subset of the turbines are lit. As designed, approximately 13 of the 23 turbines will be lit. During the various meetings that Atlantic Wind has held with Towns, stakeholders, and non-government organizations, the concept of radar activated lighting to offset or eliminate nighttime visual lighting aids has been raised. In response to these concerns, Atlantic Wind proposes the installation and implementation of a radar activated lighting system at the Wild Meadows Project.

Sound

Atlantic Wind conducted a sound level assessment which included a sound-monitoring program to determine existing sound levels in the vicinity of the Project, computer modeling to predict future sound levels when the wind turbines are operational, and a comparison of the maximum operational sound levels associated with the wind turbines to relevant criteria.

Sound effects associated with all 23 proposed wind turbine generators were modeled at 741 of the closest structures using Cadna/A noise calculation software. Maximum operational sound levels at all of the closest year-round occupied residential receptors are predicted to be equal to or less than 40 dBA. The results of this sound level impact assessment show that the Project will easily comply with recent NH SEC approvals for comparable wind turbine projects in New Hampshire, (including the Lempster and Groton Wind Farms), community noise guidelines published by the World Health Organization, and noise guidelines put out by the US Environmental Protection Agency. In addition, low frequency sound levels at all receptors are also well below the recommended criteria to avoid disturbance indoors as well as any potential vibration and rattle.

Orderly development of the region

The Project engaged economic experts at the University of New Hampshire to evaluate the potential economic effects of the Project. These studies demonstrate that the Project will not have an unreasonable adverse impact on the orderly development of the region insofar as local land use, the local economy and local employment are concerned. Moreover, the study demonstrates that the Project will have substantial positive effects upon the region's development and economic well-being.

Local land use

The Project's impacts on local land use during construction and operation of the Project are expected to be minimal. The Project Site is used primarily for timber harvesting and this existing use is expected to continue indefinitely after the project is operational.

Local economy

The benefits to the state are clear. The positive economic impacts will be large and continue throughout the life of the project. These impacts are found first in the construction phase which will create the full time equivalent of 404 jobs, $21.77 million dollars in earnings and $42.35 million dollars in increased economic activity, and second in the operations phase with the creation of 13 full time equivalent jobs, $770,000 in annual income and $2.31 million dollars of increased economic activity each and every year for the life of the project.

The benefits to the host communities are equally impressive. With a small commercial tax base, both Alexandria and Danbury will receive substantial payments in lieu of taxes that can be used to reduce already high property taxes or improve/expand municipal services. While alternative investments may exist in some parts of the state, for these two municipalities, it is one of the best opportunities for reducing the tax burden on already stressed homeowners.

Given the results of studies conducted at existing wind farms across the country, and in New Hampshire, the Wild Meadows Wind Project is not expected to have an adverse impact on local property values.

While there are no empirical studies of which the Project is aware which measure regional tourism expenditures before and after a wind farm development, there is considerable evidence that wind projects in a number of U.S. and international sites have become tourism draws, including the Lempster Wind Project and the Green Mountain Power facility in Searsburg, Vermont. This evidence is supported by a study commissioned by Atlantic Wind to investigate the Lempster Wind Project's impact on local and regional tourism. The results and findings of this report provide quantitative, objective support to the many studies that used survey-based techniques and demonstrate that were will be no negative impacts to tourism from the presence of a wind farm.

Local employment

The Economic Impact study estimates a total of 417 total full-time equivalent (FTE) jobs (including direct employment, indirect jobs, and induced jobs) will be created as a result of the Wild Meadows Wind Project during construction and operations. These economic benefits include direct expenditures on labor, materials, and services during construction and operations, payments to landowners, payments to the Towns of Alexandria and Danbury, and to the State of New Hampshire.

Conclusions

The Wild Meadows Wind Project will provide a clean and emission-free source of renewable electricity to help meet the energy needs of the region, and a new source of revenue for Danbury and Alexandria, local landowners, and the State. The proposed site is ideal due to its current use for timber harvesting, excellent wind resources, good access, close proximity to the existing electrical infrastructure, and the lack of sensitive environmental features.

WILD MEADOWS WIND PROJECT

New Hampshire Site Evaluation Committee Permit Application

APPLICATION OF ATLANTIC WIND, LLC

DOCKET NO. 2013-

Atlantic Wind, LLC
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100 Matsonford Road
Radnor, PA 19087
610-254-9800

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Table of Contents

List of Figures

Page

List of Tables

Page

List of Acronyms

ABPP:	Avian and Bat Protection Plan
ACI:	American Concrete Institute
AoT:	Alteration of Terrain
APE:	Area of Potential Effect
AWEA:	American Wind Energy Association
BMP:	Best Management Practice
CEDS	Comprehensive Economic Development Strategy
COD	Commercial Operation Date
CPR:	Cardiopulmonary Resuscitation
CSI:	Construction Standards Institute
cu. yd.	cubic yard
dBA:	decibels A-weighted
EDR:	Environmental Design and Research
EHS:	Environmental Health and Safety
EFH	Essential Fish HabitatFAA: Federal Aviation Administration
FERC:	Federal Energy Regulatory Commission
FS	Feasibility Study
GCEDC:	Grafton County Economic Development Council
GIS:	Geographic Information System
GPS:	Global Positioning System
GSU:	Generator Step-Up
HVDC	high-voltage direct-current
HVAC:	Heating, Ventilating, and Air Conditioning
IR:	Iberdrola Renewables, LLC.
IEEE:	Institute for Electrical and Electronic Engineers
ISO-NE:	Independent System Operator – New England
JISEA	Joint Institute for Strategic Energy Analysis
kV:	kilovolt (one thousand volts)
kVA:	kilovolt-ampere
kWhr:	kilowatt hour
LBG:	The Louis Berger Group
LBNL	Lawrence Berkley National Laboratory
LIDAR	Light Detection and Ranging
LLC:	Limited Liability Company
LSZ:	Landscape Similarity Zone
m/s:	meters per second
m:	meter
mph:	miles per hour
MW:	megawatt (one million watts)
MWhr:	Megawatt hour
NCF	Net Capacity Factor
NEC:	National Electric Code
NECA:	National Electrical Contractors Association
NEWIS	New England Wind Integration Study
NFPA:	National Fire Protection Agency
NLRA:	Newfound Lake Region Association
NHDES:	New Hampshire Department of Environmental Services
NHDHR:	New Hampshire Division of Historical Resources
NHDOS:	New Hampshire Department of Safety
NHDOT:	New Hampshire Department of Transportation
NH F&G:	New Hampshire Fish and Game Department
NHNHB:	New Hampshire Natural Heritage Bureau
NHPA:	National Historic Preservation Act
NRHP:	National Register of Historic Places
NHWAP:	New Hampshire Wildlife Action Plan
NRDC	Natural Resources Defence Council
NSAA	National Ski Areas Association
NWI:	National Wetlands Inventory
O&M:	Operations and Maintenance
OSHA:	Occupational Safety and Health Administration
PAF	Project Area Form
PILOT:	Payments-in-lieu-of-Taxes
POW	Protect Our Winters
PPA:	Power Purchase Agreement
PSNH:	Public Service of New Hampshire
RECs	Renewable Energy Credits
RGGI:	Regional Greenhouse Gas Initiative
rpm:	revolutions per minute
RPS:	Renewable Portfolio Standard
SCADA:	supervisory control and data acquisition
SEC:	Site Evaluation Committee
SPCC:	Spill Prevention, Control, and Countermeasure
SWOT	Strengths, Weaknesses, Opportunities, Threats
SIS	System Impact Study
SWQPA	Shoreland Water Quality Protection Act
UNH:	University of New Hampshire
USACE:	U. S. Army Corps of Engineers
USDOE:	U.S. Department of Energy
USDOT	U.S. Department of Transportation
USEPA:	U. S. Environmental Protection Agency

USFWS:	U. S. Fish and Wildlife Service	VHB:	Vanasse, Hangen, Brustlin, Inc.
USGS:	U. S. Geological Survey	VIA:	Visual Impact Assessment
UWIG:	Utility Wind Integration Group		

A. Signature of Applicant

Certification of Applicant

In accordance with New Hampshire RSA 162-H:8, I, Erik Lallum, Vice President, Engineering and Construction, Iberdrola Renewables, LLC, hereby do swear and affirm that the information contained in this Application is true and accurate to the best of my knowledge and belief.

I also certify that, as an Applicant to the New Hampshire Site Evaluation Committee, Atlantic Wind LLC agrees to provide such information as the Committee shall require to carry out the purposes of RSA 162-H.

Atlantic Wind, LLC

Name: Erik Lallum

Title: Vice President, Engineering and Construction, Iberdrola Renewables, LLC

Date: December 11, 2013

State of: ~~Oregon~~ Pennsylvania

County of: ~~Multnomah~~ Delaware

On this day 11 of Dec. 2013, personally appeared before me the above-named Erik Lallum, Vice President, Engineering and Construction, and swore and affirmed that the information contained in this Application is true and accurate to the best of his knowledge and belief.

Notary Public

Commission expires on 9-26-15

COMMONWEALTH OF PENNSYLVANIA
NOTARIAL SEAL
JAMIE WHITE, Notary Public
Radnor Twp., Delaware County
My Commission Expires September 26, 2015

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B. Applicant Information

B.1. Name of Applicant

Atlantic Wind, LLC (referred to as "Atlantic Wind" or "Applicant")

B.2. Applicant's mailing address, telephone and fax numbers, and e-mail address

Atlantic Wind, LLC
2 Radnor Corporate Center, Suite 200
100 Matsonford Road
Radnor, PA 19087

Telephone: 610-254-9800
Fax: 484-654-1069

B.3. The name and address of Applicant's parent company, association or corporation, if Applicant is a subsidiary

Applicant is a limited liability company which is 100% owned by and sole-member managed by:

IBERDROLA RENEWABLES, LLC.
1125 NW Couch St., Suite 700
Portland, OR 97209

B.4. If the Applicant is a corporation

B.4.(a) The state of incorporation

N/A (Applicant is NOT a corporation, it is a limited liability company)

B.4.(b) The corporation's principal place of business

N/A (See above)

B.4.(c) The names and addresses of its principal directors, officers and stockholders

N/A (No directors, officers, or stockholders; Applicant is a limited liability company, sole member-managed by IBERDROLA RENEWABLES, LLC.

B.5. If the Applicant is an association, the names and addresses of the members of the association.

Applicant is not an association.

B.6. Whether Applicant is the owner, lessee of the site or facility or has some legal or business relationship to it

Atlantic Wind, LLC is the owner and developer of the Wild Meadows Wind Project (or "Project") that is the subject of this Application and, if the Project is certificated, will be the owner and operator of the Project. Atlantic Wind, LLC has leases with the owners of the land where the Project is proposed to be built.

B.7. Statement of Applicant's assets and liabilities

Please refer to Figure 1, which contains a copy of Iberdrola SAs (parent company of Iberdrola Renewables, Inc.) financial statement (see Appendix 4).

IBERDROLA

Balance Sheet
June 2013 (Unaudited)

ASSETS	June 2013	Dec. 2012*	Change
NON-CURRENT ASSETS			
Intangible assets	**17,680**	**19,403**	**-1,723**
Goodwill	7,792	8,309	-517
Other intagible assets	9,888	11,094	-1,206
Investment properties	**516**	**520**	**-3**
Property, plant and equipment	**52,509**	**53,423**	**-914**
Property, plant and equipment in use	47,297	48,924	-1,627
Property, plant and equipment under construction	5,212	4,499	713
Non current financial investments	**2,531**	**2,548**	**-17**
Investments accounted through the equity method	428	438	-10
Non-current financial investments	710	675	34
Other non-current financial investments	1,037	1,031	6
Derivative financial instruments	356	403	-47
Non-current receivables	**502**	**468**	**34**
Deferred tax assets	**6,606**	**4,515**	**2,091**
Total non-current assets	**80,345**	**80,877**	**-532**
CURRENT ASSETS			
Assets held for sale	**516**	**216**	**300**
Nuclear fuel	**384**	**310**	**73**
Inventories	**2,013**	**1,896**	**117**
Current trade and other receivables	**5,513**	**6,426**	**-913**
Income Tax receivables	388	253	135
Other tax receivables	617	487	131
Trade and other receivables	4,508	5,686	-1,178
Current financial assets	**3,212**	**4,047**	**-836**
Current financial investments	5	130	-126
Other current financial investments	2,739	3,401	-662
Derivative financial instruments	468	516	-48
Cash and cash equivalents	**2,116**	**3,044**	**-928**
Total current assets	**13,754**	**15,939**	**-2,186**
TOTAL ASSETS	**94,098**	**96,816**	**-2,718**

44 First Half Results 2013

Figure 1: Iberdrola Renewables Balance Sheet (figures are in Million Euros (€))

IBERDROLA

EQUITY AND LIABILITIES	June 2013	Dec. 2012*	Change
EQUITY:	**35,153**	**34,085**	**1,068**
Of shareholders of the parent	**34,363**	**33,760**	**603**
Share capital	4,598	4,604	-6
Unrealised asset and liability revaluation reserve	-347	-493	146
Other reserves	30,264	28,748	1,517
Treasury shares	-185	-500	316
Translation differences	-1,696	-1,364	-331
Net profit of the year	1,728	2,765	-1,037
Hybrid Capital	**532**	**-**	**532**
Of minority interests	**258**	**325**	**-67**
EQUITY INSTRUMENTS WITH CHARACTERISTICS OF A FINANCIAL LIABILITY	**314**	**370**	**-56**
NON-CURRENT LIABILITIES			
Deferred income	**5,827**	**5,786**	**41**
Provisions	**4,301**	**3,928**	**372**
Provisions for pensions and similar obligations	2,000	1,902	98
Other provisions	2,300	2,026	274
Financial Debt	**27,221**	**28,851**	**-1,630**
Financial Debt - loans and others	26,898	28,428	-1,531
Derivative financial instruments	324	423	-99
Other non-current payables	**544**	**516**	**28**
Defferred tax liabilities	**8,661**	**9,093**	**-433**
Total non-current liabilities	**46,553**	**48,175**	**-1,621**
EQUITY INSTRUMENTS HAVING THE SUBSTANCE OF A FINANCIAL LIABILITY	**105**	**107**	**-2**
CURRENT LIABILITIES			
Liabilities held for sale	**181**	**84**	**97**
Provisions	**314**	**435**	**-120**
Provisions for pensions and similar obligations	16	7	10
Other provisions	298	428	-130
Financial Debt	**4,268**	**5,101**	**-833**
Financial Debt - loans and others	3,764	4,456	-692
Derivative financial instruments	504	645	-141
Trade and other payables	**7,210**	**8,461**	**-1,251**
Trade payables	3,994	6,113	-2,119
Tax payables	1,013	618	396
Other tax payables	924	394	530
Other current liabilities	1,278	1,336	-58
Total current liabilities	**11,973**	**14,080**	**-2,107**
TOTAL EQUITY AND LIABILITIES	**94,098**	**96,816**	**-2,718**

* Restated

(continued)

C. Site Information

C.1. Location and address of the site of the proposed facility

The proposed Wild Meadows Wind Project is situated along three ridge features in the towns of Danbury and Alexandria, New Hampshire in Merrimack and Grafton Counties (Figure 2). Turbines are proposed to be located on parallel ridges located south of Washburn Road in the Town of Alexandria, east of Wild Meadow Road in the Town of Grafton, west of Cass Mill Road in Alexandria, and north of Bohonnon and Taylor Hill Roads in the Town of Danbury and State Route 104 in Alexandria. The Project site is approximately 2 miles north of U.S. Route 4, 2 miles north of State Route 104, and 9 miles east of Interstate Route 93 (as measured to the nearest proposed turbine). The area consists of three distinct ridgeline features known as Tinkham Hill and Braley Hill to the east, the Pinnacle in the central portion of the project area, and Forbes Mountain and Pine Hill to the west. All three ridges are oriented southwest-to-northeast and range in peak elevation from approximately 1,980 to 2,270 feet. A site area map can be found in Figure 2.

The Project consists of 23 modern 3.3 megawatt (MW) wind turbines which will be situated along the ridge features described above. As indicated in Figure 3, thirteen (13) turbines would be oriented generally in a southwest-to-northeast direction along Tinkham and Braley Hill. Two (2) turbines would be similarly oriented on the Pinnacle and eight (8) additional turbines on Forbes Mountain and Pine Hill. The Project site would be accessible via a new gravel road originating from the existing Wild Meadow Road in Danbury. Approximately 9 miles of new gravel roads will be constructed to access the remainder of the site, including a connector road that will be constructed between Tinkham Hill and Forbes Mountain to facilitate the movement of equipment and supplies around the site. From Forbes Mountain, a new overhead collector line will be constructed and run southeast of Pillsbury Hill before turning northeast towards the proposed collector and interconnection substation site off Bog Road in Alexandria. An Operations and Maintenance (O&M) building and laydown area are proposed to be located off the main access road in Danbury in a secluded hayfield.

C.2. Site acreage, shown on an attached property map and located on a U.S. Geological Survey or GIS map

Figure 2 depicts the site acreage that Atlantic Wind has leased from five private landowners for this Project. The total amount of property leased by Atlantic Wind, LLC for construction of the Project is approximately 4,930 acres. As is the case with other wind projects, after construction, only a very small fraction of this total acreage will be retained for use by the Project. More specifically, it is estimated that after construction, only about 3% of this acreage will be retained by Atlantic Wind under lease. This is consistent with the Groton and Lempster Wind Projects. The Groton Project leased approximately 4,180 acres from three landowners and, upon completion of construction, retained leases on only approximately 116 acres (i.e.

approximately 2.77% of the initially leased acreage). Similarly, the Lempster Project leased approximately 1,600 acres from three landowners and, upon completion of construction, retained leases on only approximately 43 acres (i.e. approximately 2.68% of the initially leased acreage). Groton Wind and Lempster Wind conducted post-construction, certified land surveys to document the retained leasehold area, and Atlantic Wind intends to do the same for this Project.

The proposed wind turbine locations are separated from other nearby developments. The southern tip of Newfound Lake is approximately 4 miles south of the Project area. The closest residence owned by a party that has not entered into

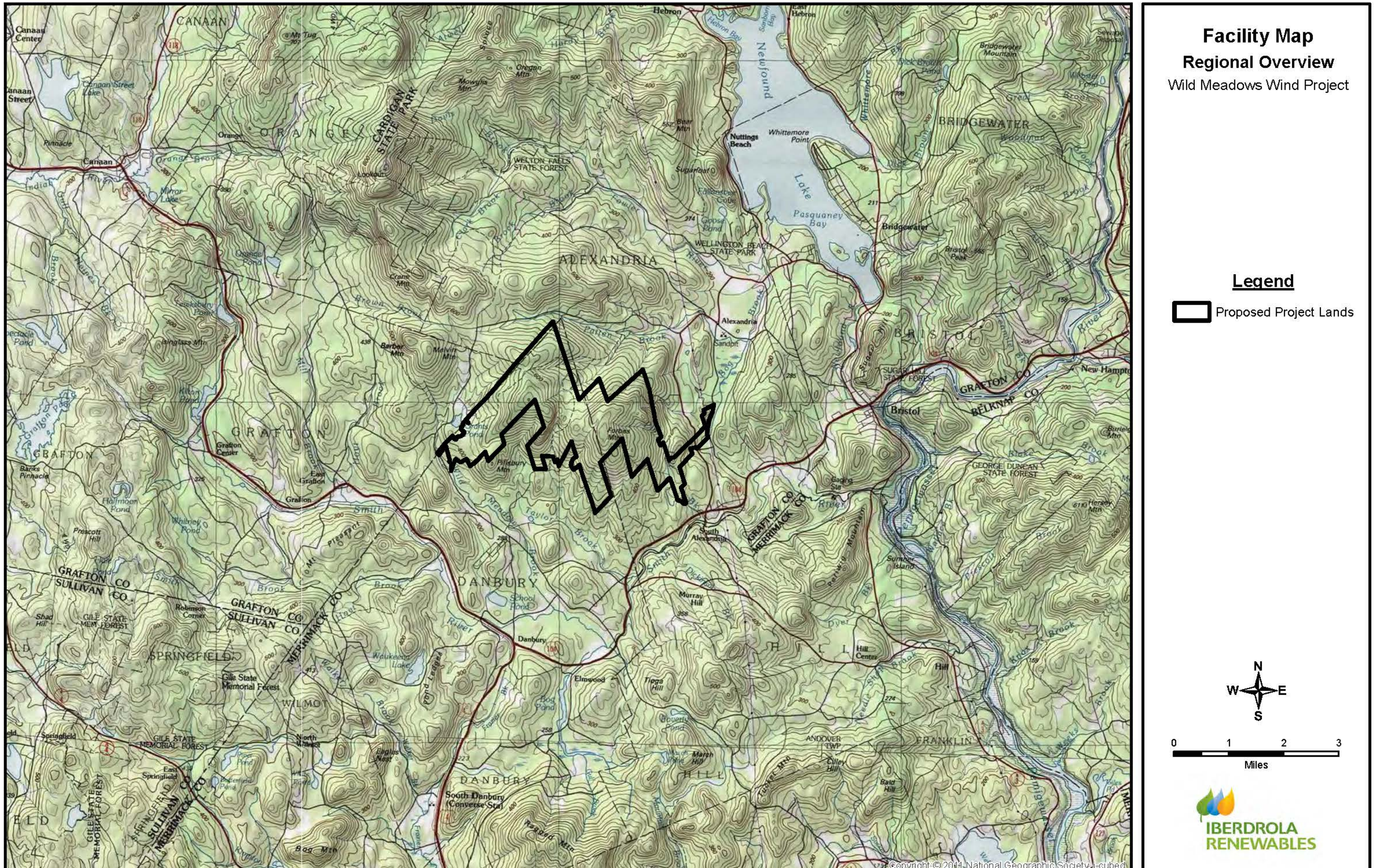


Figure 2: Map of Wild Meadows Wind Project Area

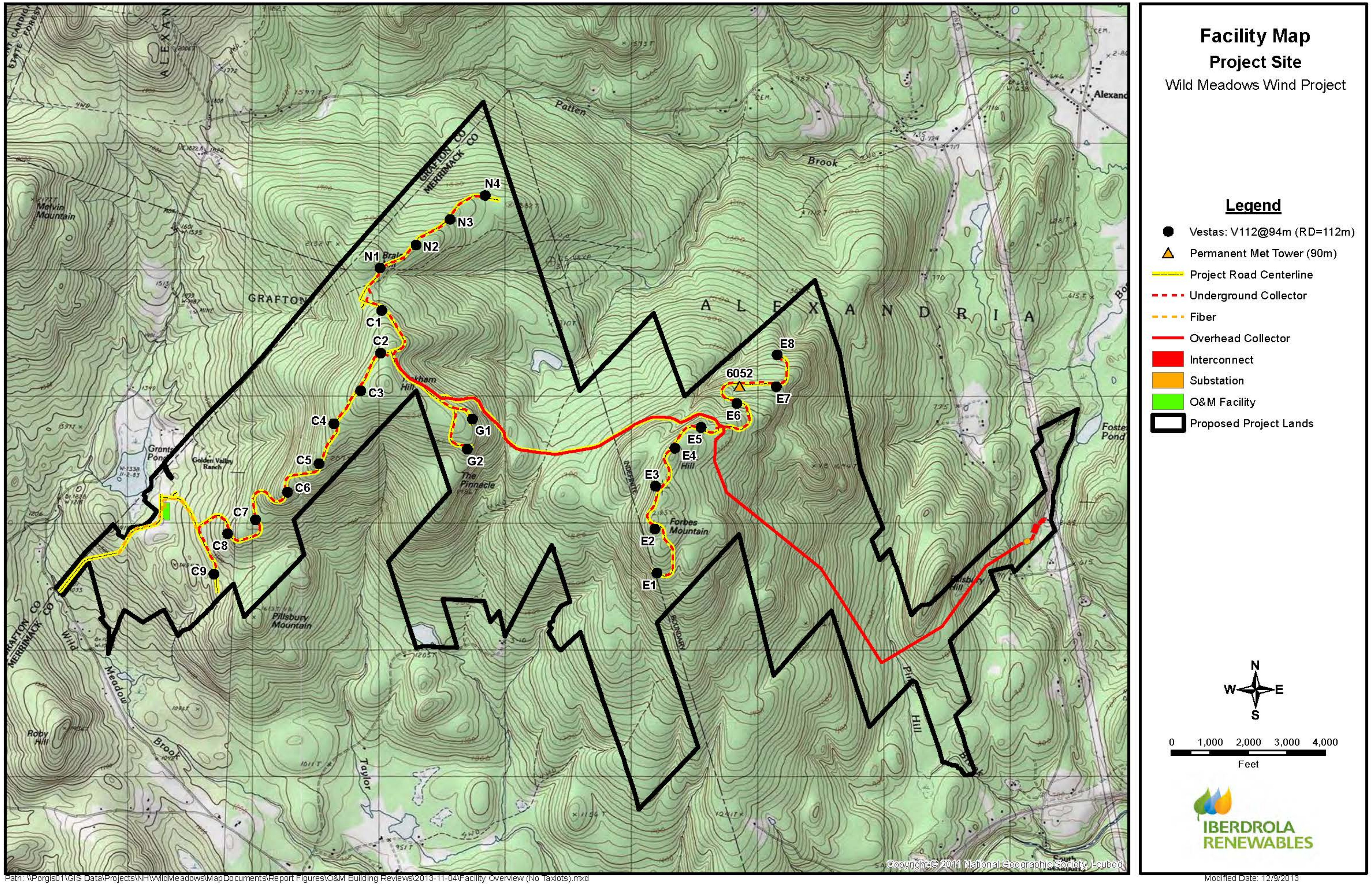


Figure 3: Wild Meadows Wind Project Map

an agreement with Atlantic Wind, LLC (i.e. a "non-participating residence") is approximately 2,656 feet away from the nearest turbine. Additional information can be found in the Sound Level Assessment Report (Appendix 50).

C.3. The location of residences, industrial buildings, and other structures and improvements within or adjacent to the site

The project site is located in a rural section of northern Merrimack County and southern Grafton County. The area is characterized by a low density residential development pattern with widely scattered small commercial properties and associated structures and many seasonal and/or non-residential structures (e.g. camps, barns, outbuildings, RVs, etc.). The majority of the residential development is located along the existing public roads that encircle the project site. Much of the leases lands are utilized for commercial forestry purposes and agriculture (Figure 4).

A detailed residence survey was conducted in and around the leased project area. 79.5 percent of the structures were determined to be residential, 9 percent were seasonal, 6.8 percent were non-residential, and 4.7 percent were unknown due to limitations associated with access permission.

C.4. Identification of wetlands and surface waters of the state within or adjacent to the site

The entire project area is located in the Pemigewasset sub-basin (HUC8) of the larger Merrimack River basin (HUC6). Northern portions of the project area, as well as the entire substation area, are located in the Newfound River watershed (HUC10) which drains to Bog Brook and eventually to Newfound Lake. The northern slopes of Braley Hill and Forbes Mountain drain into Patten Brook which leads to Bog Brook and eventually to Newfound Lake. All waters in the southern portions of the study area flow to the Smith River (HUC10) by way of Wild Meadows Brook, Taylor Brook, Hoyt Brook, and Pine Hill Brook. The Smith River as well as the Newfound River flow into the Pemigewasset River near Bristol, NH. The many ephemeral and intermittent streams identifierd during water resource delienations around the site are minor tributaries to the larger brooks and streams listed above.

Wetlands on the project site have been delineated by certified New Hampshire wetland scientists. Approximately 455 wetlands totaling nearly 70 acres were field delineated within the boundaries of the 2,000 acre wetland study area. The majority of the wetlands are "forested," which is the most common wetland type in the northeast.

Wetlands and surface waters of the site are described in detail in the application forms, design plans, and maps provided in support of New Hampshire Department of Environmental Services (NHDES) Standard Dredge and Fill Permit Application, NHDES Alteration of Terrain Application, and NHDES Section 401 Water Quality Certification Request, all referenced in section D of this Application, and included as Appendices 1, 2 and 3.

C.5. Identification of natural and other resources within or adjacent to the site

The Project site is home to an active commercial forest and logging operation. While portions of the site are undeveloped and primarily forested, the site has historically functioned as commercial woodland. Other than timber harvesting operations, the site does not contain commercial development. The site generally contains substantial wildlife habitat, however this has been modified substantially by the timber harvesting operations that have occurred on this site since the 1940s and earlier. Evidence of well-established wildlife trails indicates both historical and continuing moderate to heavy use by a variety of common wildlife species. Both the logging roads and established trails provide travel corridors through the property's interior and to adjacent properties and their respective habitats.

Most of the adjoining land is also undeveloped which contributes to and increases the wildlife habitat value of the Project Site. Fragmented and on-going development areas are located along the existing public road corridors that surround the site. The area's natural resources have been documented and discussed with the applicable agencies. A description of these discussions/contacts is included in section H.4 of this Application. Sections I.5 and J of this Application provide more specific information about the natural and other resources at the Project site and surrounding areas.

C.6. Information related to whether the proposed site and facility will unduly interfere with the orderly development of the region having given due consideration to the views of municipal and regional planning commissions and municipal governing boards

The Project will promote the orderly development of the region. The Project as proposed is consistent and complimentary to existing land uses, promotes economic development and expands the local tax base, utilizes key existing infrastructure, in particularly existing electrical transmission lines.

Atlantic Wind has carefully considered the views of local, regional, and state planning and governing bodies in developing the Project in a manner that will not interfere with the orderly development of the region. Over the past two years, Atlantic Wind has proactively engaged in numerous discussions about the Project with municipal governing boards and other local and regional organizations, including those in the Towns of Alexandria, Danbury, Grafton, and others. Appendix 5 contains a list of the primary meetings and contacts made by the Applicant to discuss the Project with public officials and other organizations.

One of the overarching goals of most towns and regional and state planning agencies is lessening the dependence on residential property tax revenue by encouraging environmentally sound commercial and industrial development. As an energy resource that will provide 100% renewable, emission-free electricity, the Project is environmentally sound. It has been designed to minimize the footprint of the project, while adding markedly to the tax bases of the towns, providing new revenues to the state, and reducing the regional reliance on fossil fuels. Additional information relating to the environmental attributes and aesthetics of the Project are discussed elsewhere in this Application. The Project will provide an important new source of revenue for the towns, with minimal new demands for town services. The commercial timber harvesting and agricultural uses that have occurred within the Project area would continue after completion of the Project. Another common goal is conservation. The Project will contribute to, and be compatible with area conservation easements by protecting a 223-acre parcel through a conservation easement with the NHDRED as a part of the Project's compensatory mitigation package. The Patten Brook parcel includes several perennial, intermittent and ephemeral streams, wetlands, at least one vernal pool, and several significant wildlife features. When combined with other abutting conserved parcels, the conservation of the Patten Brook parcel will result in approximately 1,500 acres of adjacent conserved lands. The combination of continued forestry and conservation easements ensures land protection while allowing for sustainable uses such as timber harvesting and wind power. All of the above-mentioned factors, when taken together, demonstrate the Project's consistency with area planning documents, and its contributions to the orderly growth and development of the region. The Project will make tangible progress towards economic development in the region, using in-state renewable energy resources, and at the same time, assisting in land conservation.

The Project is consistent with the land uses and development patterns in the area. Other uses in the nearby area include agriculture, dairy farms, sand and gravel mining, and logging and wood products (chips, pellets, whole logs). Recreational resources in the area include skiing (at Ragged Mountain Resort), seasonal camping, hunting, fishing, snowmobiling, and hiking. The primary commercial enterprises in the immediate area include the Indeck Energy biomass plant in Alexandria, the Ragged Mountain Resort in Danbury (which recently has been approved for a major expansion), a Carroll Concrete plant, a major electrical transmission corridor that includes two 230 kV National Grid lines and a Hydro Quebec Direct-Current (DC) line, and smaller companies including sand and gravel companies, general stores (two in Danbury) and assorted small businesses. Residential development is primarily low density, with a wide variety of housing stock ranging from seasonal basic camps, trailer homes, and manufactured housing to high-end luxury second-homes. Remaining areas are primarily undeveloped forest lands, wetlands and water courses, state and local parkland, and some lands under conservation easements (Figure 4).

The Project is also consistent with the results of recent public polling in New Hampshire. The 2013 results of the independent "Granite State Poll" conducted by the University of New Hampshire (UNH), clearly show that New Hampshire residents support the development of wind farms in the state (78% support), support the development of wind energy turbines on ridgelines (60% support), and give higher priority to renewable energy development over increased exploration and drilling for oil by a margin of more than two-to-one[1] (see Appendix 6 for the results of the recent polls). More than half (54%) of the respondents also believe that global climate change is happening now and that it is caused mainly by human activities[1]. High percentages of respondents also say that "ecosystem services including clean water, scenic values, outdoor recreation, and trees for wood products or climate benefits are very important to their own quality of life," all of which the Project has been designed to protect or minimize impacts to.

Public Outreach

The Project held a series of public open house meetings in the Towns of Alexandria, Danbury, and Grafton, on November 13-15, 2012 at which company representatives and Project consultants provided written and visual information to numerous attendees and answered questions about the Project. Visual aids, boards, large-size photo simulations, and a wide variety of other materials were provided, as well as opportunities for the public to ask questions of each of the individual issue area experts. More than ten (10) other public meetings, including multiple question and answer sessions have been held in Alexandria and Danbury and elsewhere, in 2012 and 2013. All materials from these meetings have been publicly provided via the project website (www.wildmeadowswind.com). These meetings have been very well attended, at times in excess of 100 people. The Project has also engaged in many small group and individual discussions and provided responses to questions via phone calls, emails, and letters from area residents.

The Project also held two separate bus tours to operating wind farms. Each of these tour opportunities were noticed through flyers, direct mailings to all residents of the towns, the project website, and were announced at public meetings. The November 17, 2012 tour of the Lempster Wind Farm included 68 attendees from three towns. The November 1 and 2, 2013 tours of the Groton Wind Farm included over 150 attendees from a number of towns. At each tour, participants were afforded the opportunity to visit an operating wind turbine, and to ask questions of company representatives. Participants were also provided tours of each facility's Operations and Maintenance building, and a further opportunity to ask questions of the wind technicians.

During early development activities associated with the Wild Meadows Wind Project, a group of Alexandria residents submitted a warrant article to be considered for Town vote. The 2013 warrant for the Town of Alexandria contained the following:

"Article 9: To see if the Town will vote to support the following resolution: WHEREAS development of one or more large scale wind farms along the mountain ridge lines visible from Town will negatively impact the Town's rural nature and scenic beauty, not be it

[1] UNH Carsey Institute. 2013. *Granite Staters Weigh in on Renewable Energy Versus Drilling.* Accessed online at: http://carseyinstitute.unh.edu/publication/789. Date accessed: 12/5/13. (Appendix 6)

RESOLVED that the Town strongly opposes the development of large wind turbines along the mountain ridge lines visible from the Town of Alexandria."

This warrant article passed on a 273 to 101 vote. According to the 2010 US Census, there are a total of 1,613 residents of Alexandria, of which 1,279 are of voting age[2]. It should be noted that that the wording of the warrant article is not provided in a neutral fashion, potentially affecting the outcome of the vote, and that the total vote (yes and no votes) was 29.2% of the town voting age population. While this certainly does not invalidate the warrant article or the voting results, it does provide some useful context.

Agreements with the Towns of Alexandria and Danbury

The Project has discussed potential agreements with the towns to address use of roads, construction timing, decommissioning, and other related issues. Draft proposals for an agreement with the Towns of Alexandria and Danbury have been provided as a baseline for consideration and further discussion (Appendices 7 and 8). At the many public meetings, a number of town agreement issues have been discussed, including decommissioning, likely road routes, site security, blasting protocols, hours and days for construction, lighting, and other issues. Formal agreements with the towns on these issues are not complete at this time, but the Project is committed to finalizing such agreements, consistent to our approach with both the Lempster and Groton projects. As with both Lempster and Groton, the Project will seek to have such agreements attached to any SEC certificate, thereby making the agreements state requirements as well.

Consistency with Danbury Master Plan

The Project is consistent with a number of the goals articulated in the Town of Danbury Master Plan (dated June 28, 2011, at Appendix 9). The Vision Statement of the Master Plan articulates a desire for "*controlled residential, commercial and industrial growth*" and estimates that 43.5% of the Town's acreage is capable of development. The Danbury Master Plan Survey Results indicated a strong preference by residents to reduce property taxes and improve the Town's tax base. The Spring 2012 survey also asked respondents views on this question: "What type of energy development should be encouraged in Danbury?" 51% of respondents expressed a desire to encourage wind energy development in the town, with 41% seeking to encourage solar energy development, 5% hydro, 2% wood, and 1% other.[3]

The Ragged Mountain development ("RMR Pacific, LLC") is noted as a significant economic development in the town. That project has recently received state and local approvals for an up to 890 unit development, ski area expansion, and golf course renovation.

[2] http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=DEC_10_DP_DPDP1

[3] Town of Danbury Master Plan, 2011, (Appendix 9, p.10)

The Town of Danbury has zoning regulations, and the Project appeared multiple times before the Zoning Board of Adjustment and the Planning Board during the local permitting of meteorological test towers.

The Danbury Master Plan also states that Danbury residents "have voiced their desire that Danbury continues to retain its "small town country atmosphere within a rustic setting well into the 21st Century.""

Consistency with Alexandria Master Plan

The Alexandria Master Plan[4] Vision Statement expresses concerns regarding growth management and preservation of natural resources (Appendix 10). The Project is consistent with a number of the goals stated in the Master Plan. The Plan describes overarching goals of managing development in a manner that is consistent with the Town's ability to provide services, and a commitment to "well-balanced" growth. The Plan states a goal of "keeping the rate of development in proportion to the Town's ability to provide services. We must make a commitment to a future that includes development that is healthy and well-balanced."

In addition, the Master Plan highlights a focus on preservation of the rural character of the area while expanding the Town's tax base. A goal of encouraging businesses and local job opportunities is also stated. The Master Plan also states "a keen interest in preserving the quiet and rural character of the Town".

An accompanying survey indicates a desire for more local job opportunities, more industrial businesses in the town, and offering incentives to green businesses.

The Master Plan also expresses a desire to protect conserved lands in Alexandria, and maintain a high level of land in Current Use status. The Project will convert a very small amount of land from Current Use status, estimated at less than 150 acres out of a total of over 4,930 acres under lease (across multiple towns).

The Project is consistent with the Master Plan, through the growth of the town's tax base, without expanding demands on the Town's services, such as a new subdivision development would.

Consistency with Regional Planning Initiatives

Atlantic Wind has met with, coordinated with, or requested meetings with the following regional organizations: Grafton County Economic Development Council (GCEDC), Capital Region Development Council, Lakes Region Planning Commission, Lakes Region Tourism Association, Newfound Lake Region Association (NLRA), and other non-profits and business groups. The Project has coordinated with these local and regional planning organizations (in addition to others), by providing information and updates on the proposed Project, responding to questions, and reviewing planning documents.

[4] Alexandria Community Master Plan, October 2010, (Appendix10)

In addition, newsletters and mailings have been provided to a wide range of organizations, providing the project website link and links to other information.

County Economic Development Councils

The Grafton County Economic Development Council includes the Town of Alexandria within its service territory. The Capital Regional Development Council (CRDC) includes the Town of Danbury in its service territory.

The Project is consistent with and complementary to the goals of the GCEDC and the CRDC), which seek to encourage and support new business growth. The project will promote the goals of the counties in a number of important ways.

- *Development Phase*. During the development period, the Project has made and will make significant expenditures within New Hampshire, employing New Hampshire personnel for civil engineering, legal, environmental, survey, site support, and field work. The Project has expended more than $2,000,000 thus far in New Hampshire, contracting with in-state vendors.
- *Construction Phase*. The construction and operation of the Project will bring much-needed economic benefits to the region. During construction, the Project is expected to spend approximately $42.35 million in the local area (Grafton, Merrimack, Belknap, Carroll, Coos, and Sullivan counties) economy for construction workers, materials, local vendors, restaurants and hotels, fuel, and other services. The construction work force at the Project is expected to be as high as 200 personnel at peak times. A significant portion of that labor is expected to be provided by New Hampshire companies. For more details please see Appendix 11, the economic impact study conducted by UNH.
- *Operations*. During operations, the Project is expected to employ up to six full-time employees. It is expected that one or two senior, experienced wind technicians will be transferred from other projects, and that up to four new employees will be hired. Iberdrola Renewables operates its own wind farms, and hires, trains, and certifies employees. During operations, significant payments to the Towns of Alexandria and Danbury will greatly expand the towns' revenue bases. The Project is discussing Payment-in-lieu-of-Taxes (PILOT) agreements with the Towns. Royalty payments to landowners will also provide economic benefits, as the landowners are New Hampshire residents.

Lakes Region Planning

The Project provides a number of benefits that address key planning and development goals of the Lakes Region Planning Commission. The Commission includes both the Town of Alexandria and the Town of Danbury within its service area. The Lakes Region Comprehensive Economic Development Strategy (CEDS) "*is a roadmap for increased economic opportunities in the region…promote a more stable and diverse regional economy, and improve the overall economic wellbeing of the region*" (Appendix 12).

- The CEDS identifies goals that include attracting new investment, and building on the sustainability of regional economic development.
- The CEDS also includes a detailed SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis of the region. The analysis identifies an over-reliance on tourism as the #1 weakness in the region, and questions the sustainability of tourism growth in the region, and the need for economic diversification.
- A second key goal is the promotion of alternative energy and "green" industry. CEDS states that "Renewable energy development also needs to be balanced by responsible stewardship of the region's natural resources."
- The project is consistent with the goals of the CEDS, by providing a substantial local investment, using renewable and sustainable fuel to generate electricity, expanding the tax base, and providing new employment opportunities.
- The Lakes Region Planning Commission also provides summaries of various energy sources, including wind power:

> "*Wind turbines can be built on farms or ranches, thus benefiting the economy in rural areas, where most of the best wind sites are found. Farmers and ranchers can continue to work the land because the wind turbines use only a fraction of the land. Wind power plant owners make rent payments to the farmer or rancher for the use of the land. Although wind power plants have relatively little impact on the environment compared to other conventional power plants, there is some concern over the noise produced by the rotor blades, aesthetic (visual) impacts, and sometimes birds have been killed by flying into the rotors. Most of these problems have been resolved or greatly reduced through technological development or by properly siting wind plants.*" [5]

Orderly Development of Electric Infrastructure

The electrical infrastructure of New Hampshire is limited and primarily older. One of the challenges of any proposed new energy facility is identifying and evaluating the ability to efficiently access the regional electric power grid, and to the greatest extent possible using existing infrastructure instead of building new transmission lines.

The Project reviewed and evaluated potential options available in the region, but the close proximity of the Project to the existing 230 kV primary transmission lines is a significant opportunity to use existing facilities to support new renewable energy generation.

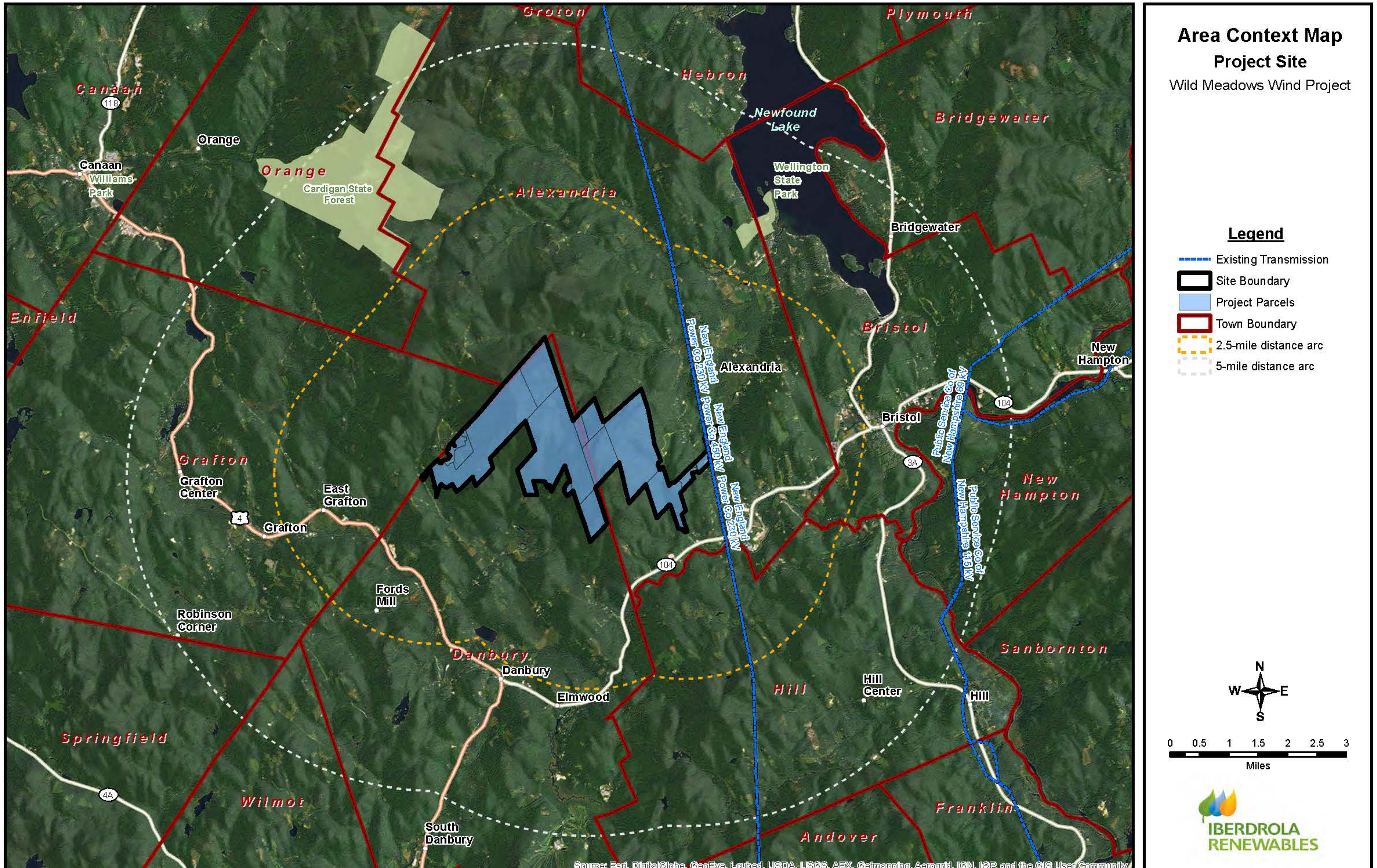
The dual 230 kV lines were built in the 1930s to transmit electricity from Comerford and Moore hydroelectric facilities on the Connecticut River. A DC line in the middle of the corridor was later added to provide bulk energy from the Hydro Quebec system.

[5] http://www.lakesrpc.org/energy_wind.asp

The Project proposes to connect to the A201 Comerford – North Litchfield 230 kV line owned by National Grid, with a collector substation and interconnection substation located next to the existing transmission line. A Feasibility Study (FS) for the Project was completed and currently the System Impact Study (SIS) is underway, with an expected completion date of February 2014.

Because the Project proposes to interconnect with the electrical grid by utilizing existing transmission system rights-of-way, the Project will not impede orderly development of the region by not triggering any new transmission or distribution system line requirements. Overhead collector lines from the project site to the substation location, an approximately 2 mile distance, will be at standard 34.5 kV distribution voltage, attached to project-owned wooden poles of standard height.

All of the foregoing information demonstrates that the Project is consistent with the orderly development of the region and that due consideration to the views of municipal and regional planning commissions and municipal governing boards has been given. The Project as proposed is consistent and complimentary to existing land uses, promotes economic development and expands the local tax base, utilizes key existing infrastructure, in particularly existing electrical transmission lines.



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Modified Date: 12/10/2013

Figure 4: Area Context Map

D. Other Required Applications and Permits

D.1. Identification of all other federal and state government agencies having jurisdiction, under state or federal law, to regulate any aspect of the construction or operation of the proposed facility

State Permits

- Certificate of Site and Facility (NH Site Evaluation Committee)
- New Hampshire Department of Environmental Services, Water Division, Wetlands Bureau (authority under state and federal law over wetlands impacts)
- New Hampshire Department of Environmental Services, Water Division, Alteration of Terrain (AoT) Program (authority under state and federal law over alteration of terrain and pollutant discharge)
- New Hampshire Department of Environmental Services, Water Division, Water Management Program (authority under federal law related to U.S. Army Corps of Engineers (USACE) Programmatic General Permit and water quality certification)
- New Hampshire Department of Transportation (NHDOT) (authority under state law over highway safety /transportation of oversized loads and driveway permits)
- New Hampshire Department of Safety (NHDOS) (blasting permit)
- New Hampshire Division of Historic Resources (NHDHR) (authority under federal and state law to consult with USACE regarding historic properties potentially affected by the Project)

Federal Permits

- U.S. Army Corps of Engineers, Section 404 of the Clean Water Act (authority under federal law to assess wetlands and other environmental impacts)
- U.S. Army Corps of Engineers, Section 106 of the National Historic Preservation Act (NHPA) of 1966
- Federal Aviation Administration (FAA) (regulation of turbine lighting in connection with determination of "no hazard" to air navigation)

D.2. Documentation that demonstrates compliance with the application requirements of such agencies

Information satisfying the application requirements of such agencies has been included within the agency application forms contained in the Appendices to this Application which are referenced in Section D. 3, below.

An application for an Oversize/Overweight Vehicle Permit will be submitted to the NHDOT by the trucking contractor who will be responsible for transporting turbine equipment and other oversized loads. The contractor will be selected once the Project is certificated and turbine equipment is ordered.

Atlantic Wind will comply with all rules and permit requirements relative to blasting that may be necessary in the construction and decommissioning of the Project.

D.3. A copy of the completed application forms for each agency

Appendix 1:	Joint USACE/NHDES Standard Dredge and Fill Permit Application
Appendix 2:	NHDES Alteration of Terrain (AoT) Permit Application
Appendix 3:	NHDES Section 401 Water Quality Certification Request
Appendices 13/14:	FAA 7460-1 determination applications

D.4. Identification of any requests for waivers from the information requirements of any state agency or department whether represented on the committee or not

The Applicant has requested waivers of certain newly-adopted NHDES rules that are not applicable to the Project. More specifically, waivers have been requested for the following rules, see Table 1. Additional detail is included within several memorandums located in the AoT Permit Application (Appendix 2).

Table 1: List of Requested Waivers from NHDES Rules

Rule	Which Seeks Information About
Env-Wq 1504.09(b)(2)b	Soil Mapping Standards
Env-Wq 1504.09(e)	Drainage Area Plan Scale
Env-Wq 1504.09(e)(3)	Drainage Area Plan Contour Intervals
Env-Wq 1504.09(g)(3)	Hydrologic Soil Group Plans - Color Coding
Env-Wq 1507.03(e)	Stormwater Treatment Practice Sizing
Env-Wq 1508.19(b)-(h)	Earthen Slope Benching

E. Energy Facility Information

The Applicant notes that the statutory definition of "Energy Facility" has recently been amended to include a "renewable energy facility." See RSA 162-H:2, VII. (f). However, the definition of "energy facility" contained in N.H. Admin. Rule Site 102.09 is based on an outdated statutory definition which does not apply to Atlantic Wind, LLC. Although this information is not now required as a result of the statutory change, the Applicant is providing it since the rules have not changed.

E.1. The type of facility being proposed

Atlantic Wind, LLC proposes to construct and operate a wind energy facility.

E.2. A description of the process to extract, produce, manufacture, transport or refine the source of energy

The source of energy to be used by this facility to produce electricity is wind. Thus, there is no extraction, manufacture, transport or refinement of this clean, renewable energy source.

E.3. The facility's size and configuration

Facility size:

The facility's size in terms of its generating capacity is 75.9 MW. Its size in terms of overall leased acres via defined tax parcels is described above in Section C.2.

Project configuration:

The generating facility will be comprised of 23 wind turbines, each having a capacity of 3.3 MW. The turbines will be installed along three ridge features. As indicated in Figure 3, above, 13 turbines would be oriented in a northeast-southwest direction along the Tinkham Hill ridge, 2 turbines would be similarly oriented on the Pinnacle to the east of Tinkham Hill and 8 turbines would be situated on the Forbes Mountain ridge. In addition to the turbines, the Project will consist of access roads, an electrical collection system composed of underground and overhead power lines, an electrical substation, an O&M building, a single meteorological tower, and associated support facilities.

Turbine configuration:

Each wind turbine consists of three major components: the tower, the nacelle, and the rotor. The height of the tower, or "hub height" (height from the base of the tower to the center of the rotor hub on top of tower) will be approximately 308 feet. The nacelle sits atop the tower, and the rotor hub is mounted on a drive shaft that is connected to the gearbox and generator contained within the nacelle. The total turbine tip height (i.e., height at the highest blade tip position) will be approximately 492 feet. Manufacturer's product brochure can be found in Appendix 15. More information about each component is described below.

Tower –The tubular towers proposed for Wild Meadows are conical steel structures manufactured in four sections, each of which is transported separately to the site. Tower sections are bolted together using internal flanges, and have a base diameter of approximately 13 feet and a top diameter of approximately 10 feet. Each tower has an access door, internal lighting, and an internal ladder to access the nacelle. The towers will be painted off-white to make the structure less visually obtrusive, and in accordance with FAA regulations.

Nacelle – The main mechanical and electrical components of the wind turbine are housed in the nacelle. The nacelle is mounted on a sliding ring that allows it to rotate or "yaw" into the wind to maximize energy capture. The nacelle components include the drive train, gearbox, and generator. The nacelle is housed in a steel reinforced fiberglass shell that protects internal machinery from the environment. The housing is designed to allow for adequate ventilation to cool internal machinery, and is approximately 42 feet long, 22 feet tall, and 13 feet wide. It is externally equipped with an anemometer and a wind vane to measure wind speed and direction.

Rotor – A rotor assembly is mounted on the drive shaft, and operated upwind of the tower. Each rotor consists of three fiberglass composite blades approximately 179 feet in length (for a total rotor diameter of approximately 367 feet). The rotor attaches to the drive shaft at the front of the nacelle. Electric motors within the rotor hub vary the pitch of each blade according to wind conditions to maximize turbine efficiency at varying wind speeds. The wind turbines begin generating energy at wind speeds as low as 3 meters per second (m/s) (6.7 mph) and automatically shut down at wind speeds above 25 m/s (55.9 mph).

E.4. The ability to increase the capacity of the facility in the future

At this time, Atlantic Wind has no plans to increase the capacity of the facility in the future. The interconnection line capacity limits future expansion without upgrading electrical cables. Potential technical improvements in the future are possible, including replacement blades and/or nacelles as turbine improvements are introduced. Such improvements could serve to increase the net capacity and power production.

E.5. Raw materials used, as follows:

E.5.(a) An inventory, including amounts and specifications

Due to the unique nature of a wind farm, most details regarding specifications of raw materials used for construction are not known until a Balance of Plant construction contract is bid and awarded after the permitting process has been completed. However, Iberdrola Renewables has constructed multiple facilities across the country and can comment generally on the types of raw materials used to construct a wind facility.

The nacelle is made of a fiberglass exterior with structural steel framing to hold the internal components. The blades are made of glass fiber reinforced plastic and/or carbon fiber reinforced plastic. The blades are bolted to the cast aluminum hub. The tower is made of structural steel and is bolted to a concrete and steel foundation. A full description of the turbine and tower and components can be found in section E.3 and a description of the foundation can be found in section F.5.a. Other materials expected to be required include utility poles, electrical cable, fiber optic cable, stone aggregate, concrete, and rebar steel. Additional details are provided in the Alteration of Terrain Permit in Appendix 2 and its associated design drawings and specifications.

E.5.(b) A plan for procurement, describing sources and availability

Iberdrola Renewables has constructed 53 wind farms in 18 U.S. states, and has many existing procurement control mechanisms and vendors in place for such key materials as turbine components, electrical cable, fiber optic cable, and other electrical equipment. These long-term vendor relationships ensure availability of materials during construction. For Wild Meadows turbine components, Iberdrola Renewables will have a turbine supply agreement with Vestas for provision and delivery of turbine components for the project. The primary turbine components (nacelles, rotors, blades) are expected to be constructed in Vestas' manufacturing facilities in Colorado. Other materials, such as concrete, rebar, electrical materials, and utility poles are expected to be sourced locally, subject to bidding processes, using the Iberdrola Renewables' existing vendor database and experience gained during the Groton and Lempster projects.

E.5.(c) A description of the means of transporting

The initial transportation of components to the site is expected to be via rail from the manufacturing facilities to near the Maine/New Hampshire border. All components will then be transported to the site via truck or other vehicle as described in section F.5.e.

E.6. Production information, as follows:

E.6.(a) An inventory of products and waste streams

During construction small amounts of waste materials are generated. Typically these are limited to packaging materials, lumber used for forms, and general trash generated by workers. Atlantic Wind will contract with a local hauler during construction for proper handling and removal of waste materials. During operation, there are no air or water waste streams generated by the Project.

E.6.(b) The quantities and specifications of hazardous materials

Although exact specifications are not yet fully quantified, during operations the Vestas V112 turbines that are proposed for the Project will utilize small amounts of lubricant oil and other chemical materials for the routine operation of the generators. Each turbine contains approximately 150 gallons of oil for lubrication and cooling in the gearbox and operation of the hydraulic systems. The containment of these oils will be prescribed in a Spill Prevention, Control and Countermeasure (SPCC) plan, which will be prepared prior to commercial operation. The SPCC plan outlines the procedures, methods and equipment used at the facility to comply with the U.S. Environmental Protection Agency's (USEPA) oil spill prevention, control, and countermeasures standards and must comply with the inspection, reporting, training and record keeping requirements. Among other things, the SPCC plan will note that gear boxes are equipped with low level alarms to detect leaks. Active containment measures will be employed upon discovery for small spills that may occur from the nacelle. In the event of a leak, the oil is contained inside the nacelle. The O&M facility will be equipped with spill response equipment for both large and small spills. Should a larger spill inside the nacelle occur, it will be contained by the closed tower base, as EPA recognized in federal SPCC regulations. 72 FR 58422 (Oct. 15, 2007& November 13, 2009). All oil-handling employees will be trained on such matters as the SPCC plan, laws and regulations regarding spills, releases and pollution control, and operation and maintenance of equipment to prevent discharges. If a spill were ever to contact soils, it would be remediated by qualified and properly licensed contractors. Iberdrola Renewables, LLC's Director of Environment Health and Safety oversees all programs to ensure environmental protection and full compliance with all applicable state and federal law. A site-specific Environmental, Health and Safety Plan will be developed by Atlantic Wind for the Wild Meadows Wind Project with the purpose of summarizing Iberdrola Renewables' program relating to environmental, health and safety in order to meet the requirements of the Town of Danbury and Alexandria agreements. The plan will include details relating to hazard communication, emergency response, fire prevention, other programs and training. A copy of the Groton Wind Plant Environmental, Health and Safety Plan is included in Appendix 17. As previously mentioned, Iberdrola Renewables has 53 wind farms in 18 states, including New Hampshire and has safely and successfully managed all issues associated with SPCC plans at wind projects.

E.6.(c) Waste management plans

During construction, Atlantic Wind will contract with local waste haulers for removal of solid waste and construction debris. Any waste generated during construction will be transported and disposed of by licensed contractors. During operations, the facility SPCC directs waste management and ensures compliance with USEPA regulations. There are no wastewater emissions as a result of the Project.

F. Renewable Energy Facility Information

F.1. Make, model and manufacturer of the unit

Atlantic Wind proposes to install wind turbines manufactured by Vestas Wind Systems. The turbine model type is the 3.3 MW V112. Blade length is 54.65 meters (179 feet). The V112 nacelle and blades are typically manufactured in Colorado. The turbines will be installed on a four-section tower with a 94 meter (308 feet) hub height.

F.2. Capacity in megawatts, as designed and intended for operation

The total nameplate capacity of the Wild Meadows Wind Project is proposed to be 75.9 MW.

F.3. Type of unit

Atlantic Wind proposes to install 23 Vestas V112 turbines. Each of these state-of-the-art wind turbines will have a nameplate capacity of 3.3 MW. Details on the Vestas V112 turbines are found in Appendix 15.

F.3.(a) Fuel utilized (Not Applicable)

The Wild Meadows Wind Project will use wind to produce electricity. The Project does not combust fossil or other fuels and therefore has no emissions and requires no pipelines or fuel deliveries.

F.3.(b) Method of cooling condenser discharge (Not Applicable)

Not applicable. No cooling water is required nor are there any discharges.

F.3.(c) Whether the unit will serve base, intermediate or peaking loads

The Project contributes to meeting demand for new energy sources in New England, and adds to the diversity of power generation sources in New Hampshire and the overall Independent System Operator – New England (ISO-NE) region. The Project is proposed to serve base loads. While wind farms do not operate continuously, and are by nature intermittent, they serve base load when operating and therefore offset power production from other sources, which are typically fossil fueled. Since the marginal cost of generation from the Project is very low due to zero cost of fuel, it is advantageous to utilize all the generation available from the Project when the wind is blowing. Therefore, wind is typically dispatched after must-take generation resources (such as nuclear plants) along with run-of-river hydro generation, followed by dispatchable hydro generation and then fossil-fueled generation.

Power from the Project would provide clean, renewable energy to utility customers through a power sales agreement, often referred to as a power purchase agreement (PPA) and are entered into between the owner of the wind energy Project and a Federal Energy Regulatory Commission (FERC)-licensed wholesale power purchaser, such as an energy company or an electric utility.

Energy produced by the Project will be sold via a PPA to a consortium of utilities, including NStar and Northeast Utilities (the parent company of PSNH), Unitil, National Grid, and the Western Massachusetts Electric Company.

Fuel for a wind farm project is renewable and free. In addition, the capital expenses and operation expenses are predictable for wind farms. Therefore, wind farm owners are able to offer stable, predictable energy prices for the long-term PPAs they sign with power purchasers. This is a significant advantage over most other long-term power purchase agreements from fuel-based generation, where the electricity price typically will vary significantly over time as the price of fuel changes. The PPA for Wild Meadows will deliver the electricity and Renewables Energy Credits (RECs) generated by the Project at a combined cost of a little over 7.5 cents per kWhr. Average prices for power from renewable energy facilities, including wind were detailed in a recent article in the Boston Globe[6]. Specifically, it was determined that over the life of the a 15- to 20-year wind power purchase agreement, utilities would pay an average price of less than 8 cents per kWhr, compared with projected prices of about 10 cents for coal, 11 cents for nuclear, and 14 cents for solar[6].

A PPA is typically entered into for a 10 to 25 year period, thereby ensuring the stability and longevity of the Project. The Project may also utilize shorter term sales for a portion of the power depending on market or customer demands.

F.3.(d) Unit efficiency

The process of designing a wind project and determining the expected net capacity factor is a long, iterative process which takes several years to complete. The meteorological data collection process takes several years and occurs throughout the life-cycle of the incipient wind project. The initial meteorological towers are strategically located throughout the project area to determine the scope and breadth of the wind resource in representative locations, not just at the locations which are expected to have the strongest mean winds. This is done to estimate the production of typical wind turbine locations, not just at the peak performing turbines. After at least a year of meteorological data collection, a turbine layout is designed by the lead meteorologist. The turbine layout is optimized for energy efficiency according to available land, wind direction, and wind speed. Stringent setbacks are applied to prevent detrimental wake effects on nearby turbines. The layout is optimized utilizing state of the art wind modeling computer software to obtain the highest possible energy yield while respecting the setbacks in place. Additional meteorological towers are then deployed to fill in holes within the high resolution monitoring network of meteorological towers and remote sensing devices to reduce

[6] Ailworth, E. "Wind power now competitive with conventional sources: Contracts would bring savings." *The Boston Globe.* September 23, 2013. Accessed online at: http://www.bostonglobe.com/business/2013/09/22/suddenly-wind-competitive-with-conventional-power-sources/g3RBhfV440kJwC6UyVCjhl/story.html. Date accessed: 12/9/13.

uncertainty in the estimation of any turbines not immediately adjacent to an existing meteorological tower. Meteorological data from nearby airports is compared to the onsite data and weather model data to determine if the measured period of record onsite is representative of the long-term climate, to best estimate power production throughout the expected lifespan of the wind project. As additional data is compiled, the turbine layout is often adjusted to ensure the most energy efficient wind project possible.

Wind data has been collected on-site at the Wild Meadows site since 2009 from three 60 meter meteorological towers. Four additional meteorological towers were added in 2012. Additionally, three LIDAR (Light Detection and Ranging) remote sensing units have been deployed throughout the project site. LIDAR uses a laser to detect wind speed and direction up to 200 meters above the surface. With 5 years of on-site wind resource data, there is a high confidence in the strength and viability of the wind resources on the site. The turbines are sited to optimize exposure to wind from all directions, with emphasis on exposure to the prevailing wind direction (wind rose inserted below) in the Project area. Modern wind turbines are designed to operate efficiently, through the use of modeling software, meteorological data, topographic data, and tailored computer control programs. Atlantic Wind estimates that the Wild Meadows Project will have an average annual net capacity factor (NCF) of approximately 34.04%. The Net Capacity Factor is a calculation of the percentage of the estimated average annual production versus the total possible average annual energy production if the project were to operate at full-rated capacity throughout the year. The factors that influence the NCF is the variability of the wind speed, turbine availability, electrical line losses, ice accretion related underperformance, wind speeds exceeding turbine shutdown (greater than 25 m/s), wake loss, and turbine manufacturer relegated curtailment due to close turbine spacing. The calculated net energy production of the Wild Meadows project is 226,332 MWh/year. The maximum possible energy production is 664,884 MWh/yr. The resulting NCF is calculated to be 34.04%.

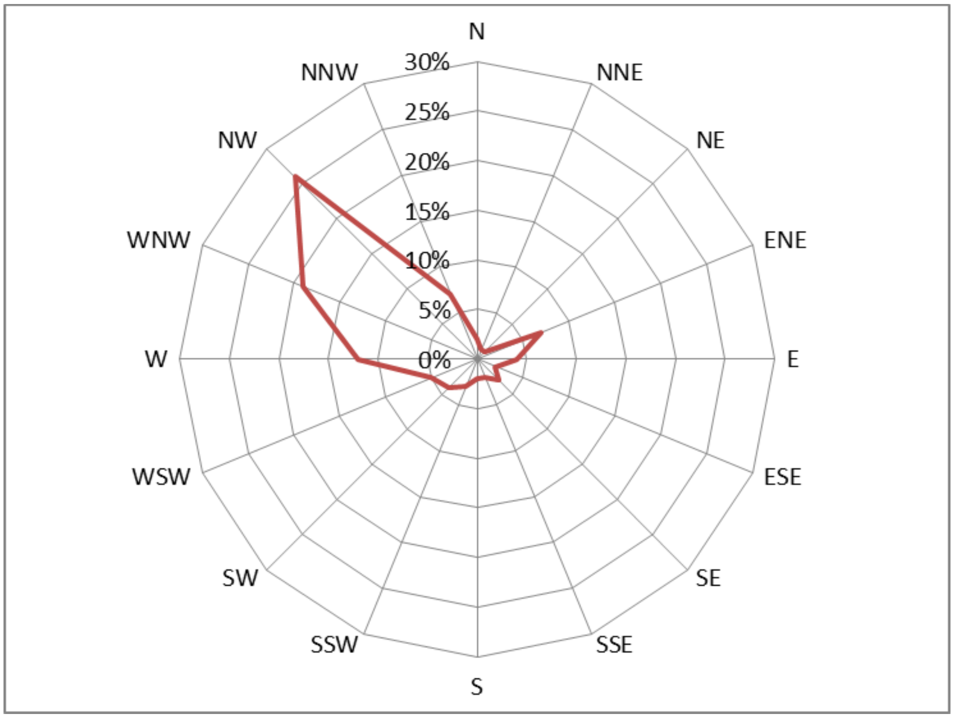

Figure 5: Wild Meadows Wind Energy Rose: Percent of Energy Production from Given Wind Direction

Based on this projected capacity factor, the Project is expected to produce approximately 226,332 Megawatt hours (MWh) of electricity per year. Translated to homes, the Project is expected to produce electricity, equal to the average annual consumption of approximately 30,000 to 32,000 average NH homes, and during periods of peak production would produce electricity equal to approximately 95,000 NH homes. These estimates are based on data from a January 2009 report issued by the U.S Department of Energy (USDOE), Energy Information Administration, which states that electricity usage per year for the average New Hampshire home is 7,584 kilowatt hours (kWhr).

F.3.(e) *Impact on system stability and reliability*

In general, wind power has been found to maintain the reliability and integrity of the electric system without impacting system operating costs. In 2010, the New England Wind Integration Study (NEWIS) was finalized and presented to ISO-NE (Appendices 18 and 19). The goal of NEWIS was to evaluate the operational impacts of a range of hypothetical large-scale wind-integration scenarios[7]. The study resulted in several major findings and recommendations,

[7] ISO-NE. 2010. New England Wind Integration Study: Summary. November 2010. Accessed online at: http://www.iso-ne.com/committees/comm_wkgrps/prtcpnts_comm/pac/mtrls/2010/nov162010/newis_iso_summary.pdf. Date accessed: 11/27/13/

including that New England could integrate even the highest amount of wind studied (approximately 24% of the region's energy being provided by wind power by 2020) assuming a number of transmission upgrades and no significant retirement of supply-side and demand-side resources able to provide flexibility to the system (see Section H.6. for more information). A comprehensive 2006 analysis released by the Utility Wind Integration Group (UWIG), Edison Electric Institute, American Public Power Association and National Rural Electric Cooperative Association found that there are no fundamental technical barriers to wind penetrations of up to 20 percent of the system peak demand. The analysis further stated that the consensus view is that wind power impacts can be managed with proper design and operation of the system. A similar study authored by staff from the National Renewable Energy Laboratory and published in 2012 by the Joint Institute for Strategic Energy Analysis (JISEA) titled "*Integrating Wind and Solar Energy in the U.S. Bulk Power System: Lessons from Regional Integration Studies*" cited that integrating penetrations of renewable generation at 20-35% were technically feasible in regional grids, with added transmission and operational changes, some of which are already underway or being studied in the east[8].

The Project, originally assuming the use of Gamesa wind turbines, filed a generation interconnection request with ISO New England (ISO-NE) in September 2011 requesting interconnection to the National Grid 230 kV line. A combined Feasibility/System Impact Study was performed by ISO-NE and National Grid and was completed in September 2013. The results of that study indicated the Project does not show any significant adverse impact to the New England Transmission System. The Project design has since been changed from Gamesa to Vestas wind turbines, however, requiring a new generation interconnection request with ISO-NE and a new combined Feasibility/System Impact Study to be performed. This study is currently in progress and is expected to be completed by February 2014.

Once the study has been fully reviewed and completed, the Project will enter into an interconnection agreement. The interconnection agreement will document all the requirements the Project must follow to be allowed to interconnect with the electrical grid. Only after completion of these requirements to the satisfaction of National Grid and ISO-NE will the Project be allowed to interconnect, thus ensuring the Project will not adversely impact system stability and reliability.

F.4. Any associated new substations and transmission lines

The proposed Project will have an electrical system that consists of 1) a system of buried and above-ground 34.5 kilovolt (kV) cables that will collect power from each

[8] Bird, L and D. Lew. 2012. Integrating Wind and Solar Energy in the U.S. Bulk Power System: Lessons from Regional Integration Studies. Accessed online: http://variablegen.org/wp-content/uploads/2012/11/55830-LessonsfromEWITSandWWSIS.pdf. Date accessed: 12/3/13.

wind turbine, 2) a collector substation that collects power generated by the Project and steps-up the voltage from 34.5 kV to the interconnection voltage of 230 kV, and 3) a point of interconnection substation that connects to the regional power grid via the existing overhead 230 kV transmission line. Within the wind farm, the collection lines will run along the proposed access roads and will require no additional clearing (beyond that necessary to accommodate the roads and turbines). Power from the wind farm will be carried by an approximately 2 mile long 34.5 kV overhead line to the proposed collector substation located east of Bog Road in the Town of Alexandria. The maximum cleared corridor for this line will be approximately 75 feet wide. Other than the crossing of Cass Mill Road, the above-ground collection lines are sited in a remote forested location and poles (ranging from 35-65 feet tall) will be lower in height than most of the surrounding trees.

Both the collector and point of interconnection substations will be located east of Bog Road, next to the existing transmission line corridor. The main functions of the substations are to step up the voltage from 34.5 kV to 230 kV, to switch and meter the electricity delivered, and to protect the system (the wind turbines, the collection lines, and the power grid) so that the electricity can be reliably interconnected to the existing 230 kV transmission line. Each station will be less than an acre in size. The stations will include a control house, power transformers, outdoor medium-voltage and high-voltage breakers, relaying and protection equipment, high-voltage bus work, steel support structures, overhead lightning suppression conductors, and dead end steel support structures. Because the collector station and point of interconnection station will be located in a wooded area, approximately 720 feet and 350 feet off of Bog Road, respectively, they are not anticipated to be highly visible, and are consistent with the transmission lines.

F.5. Construction schedule, including start date and scheduled completion date

Construction of the Wild Meadows Wind Project will begin after all required approvals and permits have been obtained. Construction is currently planned to start in late 2014, depending on SEC certification. Depending on winter and spring conditions, the expected Commercial Operation Date (COD) is December 2015.

Iberdrola Renewables maintains a full-time scheduling staff to aid in the planning and implementation of the various construction projects and construction related activities that may be ongoing at any given time. Primavera is used as the scheduling tool to maintain consistency between projects. A “standard” scheduling template is utilized as the basis for a particular project schedule. In addition, high-level schedules are maintained for future construction cycles to balance resources and anticipate wind turbine availabilities from manufacturers for allocation to particular projects.

A project schedule to establish milestone dates and track progress toward completion of the Wild Meadows Wind Project has been developed to aid during the construction process. This Project schedule is maintained in conjunction with other Iberdrola

Renewables wind power projects to make adjustments as necessary to reflect present and projected development status, availability of resources, scheduled deliveries of major equipment, and the regional variability of climate, construction seasons, and labor resources.

The project-specific activities and the anticipated timeframe for each are established to create the Project schedule. The Project schedule for the proposed Wild Meadows Wind Project is attached as a Gantt Chart in Appendix 20.

F.5.(a) Construction process

Iberdrola Renewables has constructed and operates 53 wind farms in the United States, and has a full in-house construction management staff, including Project Managers, Site Managers, and Project Engineers and Quality Assurance inspectors. This level of experience and technical depth is supported by a number of standardized construction sequence plans to ensure efficiency, shorter timelines, and minimized disruption to area communities during construction. Using all of the data gathered for the Project (including geotechnical information, environmental conditions, site topography, logistics, etc.), Atlantic Wind has developed a set of site-specific construction specifications for the various components of the Project. The design specifications comply with construction standards established by various industry practice groups, including:

- American Concrete Institute (ACI)
- Institute for Electrical and Electronic Engineers (IEEE)
- National Electric Code (NEC)
- National Fire Protection Association (NFPA)
- Construction Specifications Institute (CSI)

The Project engineering team ensures that all aspects of the specifications, as well as the actual on-site construction, comply with all applicable federal, state, and local codes and good industry practice. The Project developer and/or contractor will coordinate directly with the local code enforcement officers in order to assure that all aspects of Project specifications/inspections are properly communicated and understood.

Initial field work

The initial field work during equipment mobilization is site flagging and marking to establish clearing areas, avoidance areas and buffer zones. Flagging using survey markers and a Geographic Positioning System (GPS) will guide subsequent logging and clearing. A licensed logging company will clear and remove large lumber and trees where necessary, to clear for staging areas (if any clearing is necessary), new or expanded road areas, and turbine locations. Coinciding with logging, initial road construction will begin.

Clearing and grading

Construction staging areas will be developed by stripping and stockpiling the topsoil, and grading and compacting the subsoil. A minimum of 6 inches of gravel will then be installed to create a level working yard. If there is a soil base, geotextile fabric may be used below the gravel. Electric and communication lines will be brought in from existing distribution poles to allow connection with construction trailers. At the end of construction, utilities, gravel, and any geotextile fabric will be removed from temporary staging areas and the sites restored to their preconstruction condition.

In order to clearing the construction areas so that the land can be worked, vegetation is removed along the roads, collector system, and around turbine locations. For access and crane roads, clearing will be required to accommodate a temporary road width, plus additional areas required for grading and drainage. The underground portion of the collection system has been located within road limits. Portions of the overhead collection system will be located immediately adjacent to proposed roads. The overhead collection system that leads to the point of interconnection will require up to a 75-foot clearing for construction and installation of poles and wires, with additional clearing for danger trees, where deemed necessary and appropriate based on field observations. These corridors will also provide the necessary clearances during operation. In cases where large timber is present, local loggers will clear the area prior to mechanical clearing methods being employed. Clearing will be done by mechanical means, using heavy equipment to remove debris in the corridors so that the area is ready for road construction, collection system trenching or crane walking as needed. Typically, marketable logs are sold, with smaller diameter trees and brush usually chipped and used on site for stabilization. Topsoils are stockpiled and later used during reclamation, so that native, site soils (and the organic matter and seeds contained therein) are kept on the site. Clearing along the overhead collection line that leads to the point of interconnection will not involve any grubbing or related ground disturbance.

Approximately 31,400 square feet of total cleared area surrounding each turbine location is required to allow for grading and the construction of the foundation, crane pads and component off-loading. A significant portion of this amount will have been cleared as part of preparation for road construction. Beyond the immediate area of the turbine foundation and crane pads, stumps are typically left in place to minimize earth disturbance.

Due to the shallow ledge that is predominant in New England, in many areas of the Project site blasting or use of a hoe ram will be necessary in order to construct roads and foundations. All blasting is done in strict conformance with a project blasting plan, which is provided to the applicable Towns, and which is reviewed and approved by the New Hampshire Department of Safety (NHDOS) as applicable, and for Groton Wind was conducted in accordance with proposed blasting Best Management Practices, as applied by the New Hampshire Department of Environmental Services (NHDES). Blasting will be conducted by state-licensed contractors that offer experience and complete qualifications. Typical blasting plan provisions include advance notification through area newspapers and notices posted at the Town Hall or other required locations. All blasting plans require a detailed site control plan to ensure that only licensed workers are in the vicinity, and to document safety and control measures tailored to the site. These measures include warning signs, warning sounds (air blasts), and physical site control, including in wooded areas, for an appropriate diameter around each blast site.

Grading and drainage

As part of the site design and as required in the Project's Alteration of Terrain permit application, the Project has produced a grading and drainage plan with details on approved construction measures and Best Management Practices for controlling stormwater and drainage for the site. A stormwater pollution prevention plan will be prepared for the Project and submitted for review and approval by the NHDES and maintained onsite. Typically, culverts are constructed as part of road construction to maintain or improve the drainage of the area without increasing erosion of topsoil. Culverts, level spreaders and any additional retention areas that may be needed based on the Project's impacts would be maintained during operations in accordance with state and local requirements. Atlantic Wind has consulted with NHDES, and the USACE on site-specific drainage and stormwater control measures. During construction, the Project will install and maintain temporary sediment and stormwater control devices, as requested by NHDES, such as silt fences, hay bales, wood chips, swales, and/or water bars. In addition, the Project will re-seed and restore areas to ensure that exposed soils are not subject to erosion.

Road construction

A new access road will be constructed for Project entry. However, within the Project site, access roads will be constructed using the existing logging roads and other access ways to the greatest extent practicable and have been designed to minimize impacts resulting from clearing as well as wetland/stream areas. Primary access roads will be constructed to support the Project, including improving the gravel surface, grading, and drainage. Crane roads within the Project site will be graveled surface, 40 feet in width during construction, and reduced to approximately 16 feet in width during the restoration phase of the Project. Other access roads will be gravel surfaced, and 22 feet wide during construction and reduced to 16 feet wide during restoration. In steeper areas or in turns, the areas of disturbance will be wider due to required cuts and/or fills to achieve design grades or to accommodate delivery truck turning radii. It is expected that nearly all gravel materials required to construct roads will be generated on-site with rock crushers to generate the specified gravel materials.

Road construction involves topsoil stripping and grubbing of stumps, as necessary. Stripped topsoil will be stockpiled along the road corridor for use in site restoration. Any grubbed stumps will be removed, chipped, or buried. New access roads during construction shall be constructed by grading and compacting to meet the specifications required for construction equipment. In many areas cut and fill will be required so that the road can meet transport specifications.

If there is a soil base, a permeable, geotechnical fabric that acts as a barrier between the rock and soil, may be placed over the compacted area. Gravel is then spread to accommodate a width of approximately 16 to 22 feet and further compacted to provide a permanent gravel road. Typical gravel depths vary from 6 to 12 inches. Upkeep and maintenance will be performed, as needed.

Drainage ditches/swales, culverts, and appropriate sediment and erosion control measures (e.g., silt fencing) will be installed in the locations where access roads are adjacent to, or cross wetlands or streams. Culverts have been designed as per NHDES standards.

Turbine foundation construction

The start of turbine foundation construction is expected to occur after initial portions of the access roads are completed. Foundation construction occurs in several stages including excavation, outer form setting, rebar and bolt cage assembly, casting and finishing of the concrete, backfilling, drilling and setting rock anchors, tensioning of the bolts and finally and site restoration. Similar to Lempster and Groton, rock anchor foundations will be utilized due to the shallow depth of bedrock along the ridgelines where the turbines will be located. Excavation and foundation construction will be conducted in a manner that will minimize the size and duration of excavated areas required to install foundations. Rock anchor foundations consist of a reinforced concrete cap that is secured to rock in the subgrade by 18 to 24 steel anchor bolts. The site is excavated and a level work surface is poured at the bottom of it so that the structure of the cap can be made. The cap consists of approximately 90 to 130 cubic yards (cu. yd.) of concrete, rebar and the bolt cage which connects the tower to the foundation. After the cap is poured, holes are drilled through conduit in the cap to a depth of 40 to 50 feet. The anchor bolts are grouted into place and all of the bolts are tensioned, securing the cap to the rock below. Rock anchor foundations require verification to ensure that the rock anchor bolts are properly tensioned to the rock. Typically this is checked after installation of the turbine, at six months after completion of the Project and every two years through the life of the Project. Rock anchor foundations use considerably less concrete than traditional spread foot foundations and have a significantly smaller footprint.

The foundation will require an excavation approximately eight (8) feet in depth and up to 35 feet in diameter, depending on depth to competent rock. Following excavation, drilling and installation of the rock anchors take place, the foundation is formed, and reinforcing steel and anchor bolts are installed prior to pouring concrete. The finished concrete foundation will be approximately 24 to 26 feet in diameter. Once the foundation concrete is sufficiently cured, the excavated area around the foundation is carefully backfilled with the excavated on-site material. The tower is secured directly to the top of the foundation and the 24 to 26 foot diameter cap that typically extends 6 to 12 inches above grade. The finished grade around the foundation and base of the tower will be surfaced with a graveled area approximately 8 to 16 feet in width.

Crane pads

Crane pads will be installed adjacent to each turbine foundation to provide the cranes a stable, well compacted, level base from which to accomplish heavy lifting. Crane pad dimensions are typically 60 feet wide and 90 feet long. A crane pad is constructed in a manner similar to the construction of access roads. Trees, vegetation, and compressible, organic soils and topsoil are removed as part of initial site preparation. Following the initial site preparation, geotechnical filter fabric is installed if necessary, followed by successive layers (6 to 12 inches) of well compacted crushed aggregate. After the initial construction phase, the crane pads will only be used periodically during the operations phase of the facility. Nevertheless, leaving the crane pads intact will facilitate future operations and maintenance activities. Such activities could include replacement of a blade, maintenance tasks and equipment replacement, and post-construction environmental monitoring, which are facilitated by cleared areas around turbines.

Removal and disposal of construction debris

Debris will be removed from the site during construction by the Project's general contractor. Typically, sites do not produce large amounts of waste during construction. Due to cut and fill methods and foundation excavation, some spoil piles may be made on site. In those instances, all spoil material will be natural to the site and provisions will be made for large organic material (such as stumps and logs) to be hauled away or ground on site. These areas will be re-vegetated with native mix at the conclusion of Project construction.

Post construction and reclamation

At the conclusion of the construction phase of the Project, the areas that have been cleared and do not contain a permanent structure will be re-vegetated with native seed mixes, as approved by NHDES. This helps to reduce erosion and restore the site's natural condition. Restored areas will include road edges and shoulders, crane paths, temporary roads, and temporary staging areas. This process will generally involve the following sequence of activities:

- Removal of larger gravel or other temporary fill;
- Placing or spreading of stock piled native top soil (loam);
- Discing; and
- Seeding with a native mix and mulching topsoil.

At the final conclusion of construction and restoration, silt fences and temporary sediment and erosion control measures will be removed as necessary, in accordance with all applicable permit conditions.

F.5.(b) Substation, switchyard, laydown yard, and maintenance building

A collection substation will be constructed and will be the terminus of the Project electrical collector system. The substation will include switching equipment, protective relay and control equipment, transfer trip equipment, disturbance analyzer equipment, transducers, Remote Terminal Unit, and telemetry equipment, and meters. Dedicated phone and data lines will be included, for data and communications between local utility facilities, and Iberdrola Renewables, LLC's operations center in Portland, Oregon. The substation will be enclosed within a fenced area.

A primary laydown yard will be located within the Project site to be used to accommodate construction trailers, storage containers, project components, and parking for construction workers. This yard will be approximately 5 acres in size. This yard will be temporary in nature, and will be restored to pre-construction conditions following completion of Project construction activities.

Secondary laydown yards will be located along roadways and other portions of the Project site where necessary to support construction activities and stockpiling of materials.

An O&M facility will be constructed in the Project area. This location provides for easy access to the site by operations personnel. The O&M facility will be comprised of a single story building suitable for operating personnel, operations and communication equipment, parts storage and maintenance activities. A vehicle parking area will be located in close proximity to the building. There will also be an area for outdoor storage of larger materials and equipment, and a secondary storage building for track vehicles for winter use.

The O&M building will be approximately 5,500 square feet and will include offices and associated facilities (bathrooms, kitchen, and storage) for technicians, a garage for spare parts and supplies, and a computer server room. The O&M building is expected to have a potable water well, sewage tank and either holding tank or leach field, hot water heater, HVAC, plumbing, electrical, computer, fiber optic, and telephone connections, and will be alarmed for fire, heat, and intrusion, in cooperation with local fire departments. The O&M building will be within a larger fenced area.

F.5.(c) Turbine installation

In addition to the tower sections, nacelle, hub and rotor blades, other smaller wind turbine components include: nose cones, cabling, control panels, switch gear and internal facilities such as lighting, ladders, etc. All turbine components will be delivered to the Project site on common and/or specialized transport trucks. Turbine erection is performed in multiple stages including installation of the tower sections, nacelle, hub, and blades, connection and termination of the internal cables, and inspection and testing of the electrical system prior to energization.

Turbine assembly and erection mainly involves the use of large track mounted cranes, smaller rough terrain cranes, boom trucks, and rough terrain fork-lifts for loading and off-loading materials. The tower sections, rotor components, and nacelle for each turbine are delivered to each site by trucks and unloaded by crane. A large erection crane will set the tower segments on the foundation, place the nacelle on top of the tower, mount the hub on the nacelle, and individually attach the rotor blades onto the hub.

F.5.(d) Collection system installation

Underground Collection Lines

The individual turbines are connected to a 34.5 kilovolt (kV) collection system to form an integrated power collection system. The turbines operate in parallel. Each turbine is connected to a 3,750 kVA, 650-34,500 Volt Generator Step-Up (GSU) transformer and connection cabinet. Several turbines are loop connected through underground 34.5 kV collection circuits and then to 34.5 kV junction boxes to form a string loop. The junction boxes are then connected to the wind farm's substation via main-line collector circuit cables.

The installation of the underground collection system, including the accompanying fiber optic communications cable and plant grounding system, will be completed in accordance with prudent construction practices and in accordance with the contract specifications, drawings, and applicable industry standards.

Trenches for electrical cables and fiber optic cables will be installed within the road width. The trench is typically excavated to a depth of approximately 4 feet and at least 8 inches of clean sand fill is used to line the trench bottom. After the cables are installed, another 8 inches of clean sand tops the cable. The remainder of the trench is backfilled with native soil.

The installed location and depth of the cables are verified and recorded. Utility markers are placed on each side of roadway crossings and at pipeline, telephone and communication easements.

Overhead Collection Lines

The underground collection system transitions to an overhead collection system for longer stretches through the site. The overhead collection lines run between the central and east ridges and then continue to the collector substation, adjacent to the interconnection substation where the Project is connected to the regional transmission grid.

The overhead collection lines will consist of approximately 170 wooden poles that are 30 to 65 feet high, with medium voltage spacer cable, and an optical ground wire for grounding and fiber optic communications. The poles will be freestanding except at some turns where guying will be used.

F.5.(e) Heavy/oversize trucking loads

Heavy/oversized truck loads will follow routes and procedures approved by the NHDOT, and will be accomplished by licensed haulers experienced in wind turbine component transport. A route survey has been performed for the Wild Meadows Project (See Appendix 21). Typically, haulers perform route surveys and propose route(s) to NHDOT, which then confirms and/or modifies the routes prior to issuing permits. The permits identify the days of the week and hours of the day when hauling may occur and escort vehicle requirements, including State Police, private oversized-load escorts, and county and/or local police.

For the Wild Meadows Wind Project, there are 23 proposed turbines. Since each turbine is composed of 4 tower sections, 1 nacelle and 3 blades, it is anticipated that there will be a total of approximately 184 oversized wind turbine component loads delivered to the site. Typically groups of components are delivered on multiple trucks at a single time, to reduce the number of separate trips.

The identified likely transport route is not expected to cause undue delays or disruptions along local roads. A copy of the Route Survey can be found in Appendix 21. All other transport routes will follow state and local roads.

F.6. Decommissioning

Modern wind turbine generators typically have a life expectancy of 20 to 25 years. The current trend in the wind energy industry has been to replace or “re-power” older wind energy projects by upgrading older equipment with more efficient turbines. However, if not upgraded or if the turbines are non-operational for an extended period of time (such that there is no expectation of their returning to operation), they will be decommissioned.

Decommissioning will consist of the following activities. Based on Iberdrola Renewables’ experience, and consistent with its other projects, the decommissioning process for the Project would be as follows:

1. Prior to initiating decommissioning activities, provide decommissioning schedule to the Towns of Danbury and Alexandria
2. Mobilize crane(s) to the site.
3. Dismantle and remove the rotor, nacelle and towers and transport entire Wind Turbine Generator off site.
4. Use an excavator to dig an 8-foot deep hole about 2/3 of the way around each foundation. Then with an air hammer or comparable equipment, the concrete foundations shall be removed to 18 inches below the surrounding grade in compliance with all applicable state and federal environmental regulations.
5. All the metal and cable shall be cut off below 18 inches at each foundation site so that there is nothing left in the ground above 18 inches below grade level. Where possible, the metal and cable items shall be separated and recycled.
6. Backfill the holes with the soil that was excavated and re-grade the foundation areas to as close as reasonably possible to the original ground contours. These areas shall be returned as close as reasonably possible to pre-construction conditions.
7. Remove all substation equipment from the site. Remove all concrete foundations, gravel and fencing, and re-grade area as close as reasonably possible to the original ground contours. Again, this area shall be returned as close as reasonably possible to pre-construction conditions.
8. Acquire approvals for transport of oversized/overweight loads from Project site. Coordinate with NHDOT prior to transport to confirm routes.

In addition to the foregoing, all decommissioned gearboxes, transformers, and hydraulic systems shall be drained of fluids and put into appropriate containers before tower dismantling, and shall be transported and disposed of in accordance with all state and federal environmental regulations. Moreover, to the extent that it is determined that it is more cost-effective to remove the turbine foundations using blasting techniques, a Blasting Plan shall be developed and prior approval shall be obtained from appropriate state and local regulators. Areas where subsurface components are removed will be graded to match adjacent contours, stabilized with an appropriate seed mix, and allowed to re-vegetate naturally. The Project has proposed agreements with the Town of Danbury and the Town of Alexandria, to address road use, safety, emergency response, decommissioning, site access, and other issues, and plans to enter into such agreements prior to commencement of construction. (Appendices 7 and 8).

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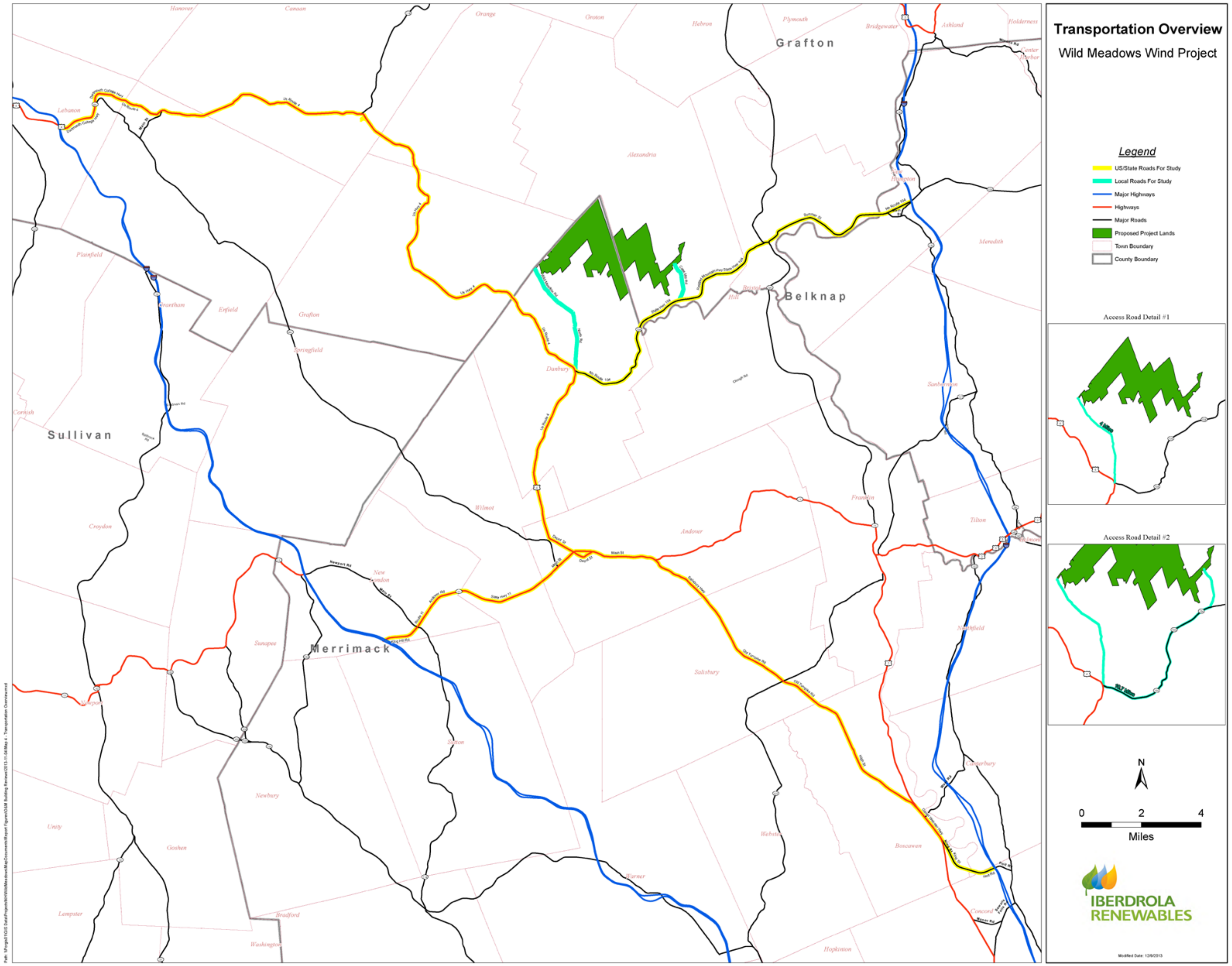

Figure 6: Wild Meadows Transportation Overview Map

G. Electrical Interconnection Line Information

The Wild Meadows Wind Project does not require an electric transmission line (as that term is used in RSA 162-H, i.e. a line of design rating of 100 kilovolts or more). Rather, it will rely on a new approximately 2 mile long 34.5 kV collector line which will deliver the power from the turbines to the collector substation.

G.1. Location shown on U.S. Geological Survey Map

Please see Figure 2.

G.2. Corridor width

G.2.(a) New route

The new 34.5 kV overhead collector line will follow a new alignment that will be 75 feet wide.

G.2.(b) Widening along existing route

Not applicable. The proposed collector line will follow an entirely new alignment.

G.3. Length of line

The new 34.5 kV overhead collector line will be approximately 2 miles long and extend from near turbine E5 to the collector substation.

G.4. Distance along new route

The new 34.5 kV overhead collector line will be approximately 2.4 miles long

G.5. Distance along existing route

Not applicable. The interconnection line is expected to run entirely on a new route.

G.6. Voltage (design rating)

The interconnection line will be standard distribution level three-phase lines (34.5 kV).

G.7. Any associated new generating unit or units

The generation units consist of 23 3.3 MW wind turbines described in detail in sections E.3, F.1 and F.3.

G.8. Type of construction (described in detail)

The overhead collection lines run between the central and east ridges and then continue to the collector substation, adjacent to the interconnection switchyard where the Project is connected to the regional transmission grid.

The overhead collection lines will consist of approximately 170 wooden poles that are 30 to 65 feet high, with medium voltage spacer cable, and an optical ground wire for grounding and fiber optic communications. The poles will be freestanding except at some turns where guying will be used.

Tree clearing width along the overhead lines will be 75 feet in total. Danger trees that pose a risk to fall on to the overhead line may also be cleared as deemed necessary.

For portions of the overhead line that follow the access roads, additional clearing may be required on only one side, since the roadway portion is already being cleared. Tree clearing along this corridor is such that the stumps shall remain. These stumps that remain will be cut flush to the ground, to the extent practicable, such that tracked equipment can traverse during clearing activities and for future line maintenance.

All wetlands and stream crossings will be crossed on timber mats. The placement of the poles and guying will be such that sensitive resources such as wetlands and streams are avoided to the extent possible.

G.9. Construction schedule

G.9.(a) Anticipated start date

Collector line, collector substation, and point of interconnection substation construction is planned to commence in 2015, pending receipt of all necessary regulatory approvals.

G.9.(b) Scheduled completion date

Collector line, collector substation, and point of interconnection substation construction is planned to be completed by fall of 2015, depending on weather. Inclement weather and/or winter ice storms can affect the construction schedule.

G.10. Impact on system stability and reliability

Please see section F.3.e

H. Additional Information

H.1. Description in detail of the type and size of each major part of the proposed facility

Access roads

The primary site access road will be constructed off of Wild Meadow Road in Danbury. The road will be approximately 0.5 miles long from the access off of Wild Meadow Road to the proposed O&M site and laydown/staging area as depicted in Figure 3. The primary access roads to the remainder of the project site and a temporary contractor road will be accessed from this location. Approximately 9 miles of new or improved roads will be constructed.

Access roads leading up to the turbine strings will be gravel surfaced, and up to 22 feet wide. During the construction period, some of the access roads along the ridge will be widened up to 40 feet to accommodate movement of the turbine erection cranes. In steeper areas or in turns, the areas of disturbance may be wider due to required cuts and/or fills to achieve design grades or to accommodate delivery truck turning radii. After completion of construction, roads will be reduced to approximately 16 feet in width, with the reclaimed shoulder areas restored and reseeded using approved New Hampshire native seed mixes.

Turbines

The Project will consist of 23 wind turbines, each having a generating capacity of 3.3 MW. The height of each turbine from the base of the tower to the center of the rotor hub on top of the tower will be approximately 308 feet. The total turbine height measured from the tower base to the tip of the blade at its highest position will be approximately 492 feet. Additional information about the turbines is found in sections E.3 and F.1, F.2 and F.3 of this Application.

Crane pads

Crane pads will be installed adjacent to each turbine foundation and are typically 60 feet wide by 90 feet long. Although the pads will be primarily used during construction, they will be left intact for periodic post-construction use which may include maintenance, blade replacement and environmental monitoring activities.

Electrical collection system

The individual turbines are connected to a 34.5 kV collection system to form an integrated power collection system. The turbines operate in parallel. Each turbine is connected to a 2,350 kVA, 690-34,500 Volt GSU transformer and connection cabinet. Several turbines are loop connected through underground 34.5 kV collection circuits and then to 34.5 kV junction boxes to form a string loop. The junction boxes are then connected to the wind farm's substation via main-line collector circuit cables.

The electrical collection system will utilize both underground cable and overhead cable between the main-line collection circuits and the individual turbine locations. The collection system will generally be routed to follow the access roads developed for the Project, where practical. Electrical lines are designed to have as direct a route as possible. Underground cables will be installed in a trench approximately 4 feet in depth and will be accompanied by a fiber-optic cable for communication purposes. Overhead cable will be installed on single poles approximately 35-65 feet in height.

Junction boxes will be installed to connect portions of the electrical collection system and to make connections to the main-line collection circuits. Pull-boxes will be located along the roadway, to allow for installation of the fiber optic network, and to allow for maintenance.

A collection substation will be the terminus of the Project electrical collector system, and will include required switching equipment, meters, and other equipment. Dedicated phone and data lines will be included, for data and communications between local utility facilities, and Iberdrola Renewables, LLC's operations center in Portland, Oregon.

Operations and maintenance building

An O&M building will be constructed within the Project area as depicted in Figure 3. This location provides for easy access to the site by operations personnel, as well as for access by utility personnel to the substation. The O&M building will be comprised of a single story building, approximately 5,500 square feet, suitable for operating personnel, operations and communication equipment, parts storage and maintenance activities. The site will also include a 1,296 square foot snow cat storage building. Both the O&M building and the snow cat storage building will be surrounded by a gravel surface approximately 200-feet wide by 450-feet long which will be suitable for vehicle parking and outdoor storage of larger materials and equipment. The building will include offices and associated facilities (bathroom, kitchen, storage, HVAC) for wind farm technicians, a garage for spare parts and supplies, and a computer server room. The O&M building is expected to have a potable water well, sewage tank and leach field, hot water heater, HVAC, plumbing, electrical, computer, fiber optic, and telephone connections, and will be alarmed for fire, heat, and intrusion, in cooperation with local fire departments.

Construction Laydown Yard

A laydown yard will be located adjacent to the O&M facility which will be accessible off of Wild Meadow Road. The laydown yard will consist of approximately 5 acres that will be graded and surfaced for use during the construction and commissioning of the project. The area will be used to accommodate construction trailers, storage containers, project components and parking for construction workers. The O&M facility will provide additional construction office, material storage, and staging areas during construction. In addition, several staging areas for components are strategically located close to turbine locations.

Permanent meteorological tower

One 295 foot (90 m) permanent meteorological tower will be installed on the Project site's eastern ridge (between turbines E6 and E7) to collect wind data and support performance testing of the turbines. Atlantic Wind anticipates that this tower will be a self-supporting, steel lattice structure. A red aviation warning light may be mounted at the top of the meteorological tower, if required by the FAA. It will replace the existing temporary meteorological towers on the site.

H.2. Identification of the Applicant's preferred location and any other options for the site of each major part of the proposed facility

Iberdrola's senior management team has extensive experience developing wind projects throughout the United States, Europe, Mexico, and Central America. Based on this experience, in combination with guidelines established by the National Wind Coordinating Committee, the American Wind Energy Association and the European Wind Energy Association, Iberdrola has developed a comprehensive and practical methodology for selecting proposed wind project sites. In applying this methodology in New Hampshire, Iberdrola's main selection criteria are as follows:

Adequate Wind Resources – Adequacy of wind is a detailed, iterative process that includes evaluation of wind maps, detailed modeling, and on-site data generated from meteorological towers. Adequacy of wind is not merely a function of wind speeds, but also of wind speed stability and consistency, wind direction and directional variability, seasonal and daily variability, wind shear, and turbulence potentially imparted by topographical features. Many areas that exhibit adequate wind speeds (quantity) prove to be inadequate due to the quality of the wind resource. A calculation used in the wind industry, called the Net Capacity Factor, calculates the percentage of the estimated average annual production versus the total possible average annual energy production if the project were to operate at full-rated capacity throughout the year.

The process of evaluating a potential site and determining the expected net capacity factor of a wind project is a long process which often takes several years to complete. The meteorological data collection process takes several years and occurs throughout the life-cycle of the incipient wind project. The initial meteorological towers are strategically located in the project area to determine the scope and breadth of the wind resource throughout the area in representative locations, not just the locations which are expected to have the strongest mean winds. This is done to estimate the production of typical wind turbines, not just the peak performing turbines. After at least a year of meteorological data collection, a turbine layout is designed by the lead meteorologist. The turbine layout is optimized for energy efficiency according to available land, wind direction, and wind speed. Stringent setbacks are applied to prevent detrimental wake effects on nearby turbines. The layout is optimized utilizing state of the art wind modeling computer software to obtain the highest possible energy yield while respecting appropriate setbacks.

Because the strength of the wind resource in New Hampshire is strongly correlated with topographic elevation and orientation, Tinkham Hill and Forbes Mountain initially appeared to have excellent potential for cost-effective and efficient wind-generated electricity in New Hampshire. Meteorological data collected at multiple locations on the various ridgelines over a 4 year period have demonstrated that the net capacity factor for the site is approximately 34%.

Environmental appropriateness – A wind project should fit into the entire local environment. The project location should be consistent with existing land uses on the prospective site as well as on neighboring lands; it should not unduly compromise sensitive conservation lands or unique wildlife habitats. The project should seriously and carefully consider potential effects on local wildlife and vegetation, as well as on the region's scenic and recreational resources.

Community outreach – Community involvement in project development is very important. The active participation of the local community in the development process is essential for a successful wind project. Community outreach is necessary to explain a proposed project, respond to questions, and engage in a conversation about wind power in general, and with respect to a particular site.

Grid-interconnection – Wind farms generally need to be sited in reasonably close proximity to the grid (utility transmission lines and/or 3-phase utility distribution lines), and preferably not on the periphery of the grid where local voltage stability can be a problem (e.g., at the end of smaller radial distribution circuits). It is also preferable to be close to an existing substation, which could simplify the grid-interconnection.

Transmission access – As part of the site selection process, Atlantic Wind performed background transmission and load-impact modeling in order to determine the feasibility of a grid interconnection at the proposed project location with the nearby HVDC transmission line owned by National Grid. Atlantic Wind utilized various models and analytical methods to assess impacts to utility transmission and distribution systems. The Independent System Operator – New England (ISO-NE) conducted a Feasibility Study to confirm available capacity, and an initial System Impact Study (for an earlier turbine type and layout) to identify any potential curtailment scenarios, and whether any line upgrades might be necessary.

During the subsequent engineering and design phase, Atlantic Wind will continue to work with ISO-NE, National Grid, and their consultants to complete the revised System Impact Study, including more detailed load-flow, impact, and stability studies. The host utility will then, in cooperation with Atlantic Wind and its consultants, complete the design engineering needed to interconnect the Project into the transmission system. The final design must comply with the respective host utility requirements and other applicable ISO-NE, IEEE, National Electrical Contractors Association (NECA), and Occupational Safety and Health Administration (OSHA) requirements.

Accessibility – The site must be accessible to construction equipment and heavy machinery, such as 400 ton-cranes, and the special-purpose trailers which transport tower sections, nacelles and other components. In order to limit the construction of new roads, and to minimize environmental impacts, sites with existing road access are usually favored. Often existing secondary private roads, such as logging roads, log landings, and skid trails are utilized through upgrades.

Competitive economics – Competitive project economics will be achieved with sites that have the best combination of key attributes such as a strong wind resource, which is a requirement. Economic feasibility also depends on the presence of interested landowners who are willing to provide rights to the site at reasonable costs. In addition, suitable soil conditions - and in some cases the potential for expansion - are among other considerations. There are a number of fixed costs for a wind farm that do not vary with size, i.e. whether there are 10 turbines or 100 turbines, some costs remain the same for both small and large projects. Such costs include most of the baseline environmental surveys, interconnection filing fees and studies, foundation design, and project engineering. Accordingly, projects must be sized appropriately to spread these fixed costs over a large enough number of turbines to make the project economic.

Other key factors that Atlantic Wind considered during preliminary and final Project placement/configuration include the following:

Distance from residences – The turbine locations maintain a minimum setback of over 2,600 feet between a turbine tower and the nearest non-participating residence. This turbine setback minimizes potential sound effects of the turbines on Project neighbors.

Distance from roads – The turbine locations will also maintain a minimum setback of at least 2,400 feet from all public roads.

Wetlands and waterbodies – Project structures including the O&M Facility, temporary construction staging areas, substation, and turbine foundations have been configured so as to avoid delineated federal jurisdictional or state regulated freshwater wetlands, to the maximum extent possible. In areas where this is not possible, all efforts to minimize the impact have been taken. The Project has worked actively with the USACE and NHDES to review and minimize wetland impacts, including multiple on-site field reviews.

Communication interference– Turbines are sited outside of known microwave pathways and Fresnel zones (area around a line-of-site used to determine obstruction loss to communication signals) to minimize the effect that they may have on local communications. The Project completed all communications studies (Microwave and Enhanced Structures Reports) and details are located in Section I.6.

Cultural resources – All Project components will be sited and Project construction will be conducted in such a way that does not cause any adverse physical effects on prehistoric or historic archeological resources, as recommended by the Project's Cultural Resources Specialists.

Wildlife habitat – During final turbine siting, the Project worked to avoid critical wildlife habitat to the maximum extent practicable and will continue to work closely with the U.S. Fish and Wildlife Service (USFWS), New Hampshire Fish and Game (NH F&G), and other appropriate agencies and entities to minimize the effect the Project may have on critical habitats through minimization, avoidance and/or mitigation measures. The Applicant has consulted with the New Hampshire Natural Heritage Bureau (NHNHB) and has determined that there are no critical habitats within the Project area. The project site is primarily commercial logging and agricultural lands.

H.2.(a) Alternatives analysis

In addition to the above-mentioned factors that influenced the selection of the Wild Meadows Project site, the Applicant considered a wide range of project alternatives, including different sizes and configurations, alternative turbine types and locations, access road options and configurations crane road alignments, O&M building locations, and alternative staging areas.

Alternative 1 – Up to 50 turbine project

One alternative that was carefully considered was a larger project, potentially up to 50 turbines (100 MW in size, depending on turbine type), in which more turbines would be placed along the Melvin Mountain ridge in Grafton, and additional landowners in both Grafton and Alexandria would have been part of the project. The Project had discussions with other landowners to explore this alternative, and performed an evaluation of wind resources. This alternative ultimately was ruled out due to a lack of interested landowners. A number of landowners were interested and lease discussions ensued, but this alternative would have required all of the potential host landowners to have wanted to participate.

Alternative 2 – 40 turbine project

Another alternative evaluated in depth was a 40 turbine (Gamesa 2.0 MW turbine) project. This alternative would have extended potential turbine locations to southern portions of Melvin Mountain and on Shepard Hill in Grafton. Meteorological towers were installed and the wind resource was determined to be suitable for a Project of this size. However, lease negotiations with 3 landowners ultimately achieved agreement with only two of the landowners, and this Alternative was removed from further consideration.

Alternative 3 – 37 turbine project

A 37- turbine (Gamesa 2.0 MW turbines) project was extensively evaluated, including a full engineering layout and design, multiple public meetings and

Open Houses. The number of turbines in the proposal was a concern expressed by some members of the public and some groups. This alternative would have placed turbines on three ridgelines: Forbes Mountain in the east; Tinkham/Braley in the central region; and Melvin Mountain in the west.

In evaluating the ability to markedly reduce the number of turbines in the layout, the key factors that led to dropping the western (Melvin) portion of the project were:

- Lesser wind resources in the Melvin area
- The more difficult civil engineering design, due to steep slopes, that was observed in the various Melvin access options
- The original primary Melvin access route (southern) was determined to result in a much greater amount of stream, wetland, vernal pool, and secondary impacts. The southern access route would have upgraded existing logging and skidder roads. Those roads had been rutted over many years of logging use, and the rutting had created drainage that converted skidder ruts into vernal pools. Elimination of the western (Melvin) portion of the project ultimately resulted in a reduction of over 5 miles of access road and over 10,000 square feet of direct wetland impact (Figure 7). In addition, the elimination of this portion of the project resulted in the avoidance of 3 crossings of Wild Meadows Brook, one additional perennial stream crossing, and six intermittent stream crossings.
- Dropping the western portion of the project and changing the turbine type also allowed for a greater distance from the Cardigan Mountain summit (approximately 4.5 miles) and allowed for a more compact project layout that reduced the amount of roads and electrical collector lines by over 30%.

Alternative 4 – 33 turbine project with Pemi S/S interconnect

A 33 turbine (Gamesa 2.0 MW turbines) project was evaluated, including an initial engineering layout and design. This configuration was evaluated during analysis of an interconnect point with the Northeast Utilities Pemigewassett Substation in Bristol. The interconnection was proposed to be at either 34.5 kV or 115 kV. After study of these options, Northeast Utilities determined that the substation could not accommodate more than 10 MWs, and this Alternative was eliminated from further consideration.

Alternative 5 – Danbury only project

Another alternative briefly considered was a further reduction in project size, and limiting the project turbine locations to the Town of Danbury only. This alternative would have been able to include a maximum of only about 45 MWs, which would not be able to support the capital expenses of the interconnection, and therefore was not pursued further. Any wind project has certain fixed costs regardless of the number of turbines. For this project, the largest fixed costs are the substation/interconnection and the permitting studies and proceedings.

Alternative 6 – Ragged Mountain

The Project had discussions with the ownership of Ragged Mountain Resort, and performed a first order evaluation of wind power potential at that location, as a component of a larger Wild Meadows Project. Ragged Mountain Resort owns approximately 2,100 acres, including ridgeline areas in the Town of Danbury. The initial analysis indicated potential for commercial wind turbines. The key issue that removed this alternative was the distance away from the main project site, and the requirement to run electrical collector lines a long distance to connect prospective turbines in the Ragged Mountain area to the rest of the project. Secondarily, the Ragged Mountain expansion plans would limit the number of potential turbines that could be sited. A significant expansion at Ragged Mountain Resort, including up to 890 residential units, has already been approved.

Alternative 7 – Different turbine types

A number of modern wind turbine models and manufacturers were evaluated before selecting the Vestas V112 3.3 MW model proposed for this Project. Alternative turbine models were evaluated for efficiency, reliability, cost, ease and cost of transport, and construction requirements.

The Project considered Gamesa, Vestas, Siemen, General Electric, and Mitsubishi wind turbines. The primary criterion for the evaluation was unit efficiency. Different wind turbines perform differently depending on the wind regime (speed, variability, wind shear, temperature and humidity).

The Vestas V112 - 3.3 MW turbine was determined to be the best overall fit for the Wild Meadows site as determined by the wind resource, overall project generation capacity, and best fit turbine manufacturer requirements. Within the Vestas family of turbines, the V117 - 3.3 MW turbine is ideally the most efficient for this site. However due to the complexity of the project site and limitations of constructible locations, the turbines would need to be located less than the ideal turbine spacing requirements of three rotor diameters leading to additional wake and sector curtailment losses. In addition, the V117 would have a taller tip height than the V112, with minor improvements in unit efficiency. This results in a net capacity factor (NCF) that is roughly equivalent to the NCF of the Vestas V112 primary scenario.

The Gamesa G97 turbine scenario, due to its maximum rated capacity of 2 MW, results in a much larger number of turbines required to approach the required nameplate capacity, which in turn results in a larger Project footprint and overall area of disturbance. While the NCF per turbine is higher than the V112, the net generation is generally 30-40% per turbine for the V112. Gamesa requires a complete turbine shutdown when the upstream wind is blocked by higher terrain. This results in a 3-4% additional sector curtailment loss than is estimated for the V112.

The Siemens SWT-108 was evaluated for the Wild Meadows project. While the power curve of the SWT-108 turbine is an excellent fit for the onsite wind regime, ambient and turbine added turbulence is estimated to be far higher than the site suitability specifications of the manufacturer.

The General Electric GE-2.85-103 turbine was evaluated for the Wild Meadows project. The estimated NCF for the project with these turbines was the second lowest of those turbines studied. Additionally, ambient and turbine added turbulence is estimated to be far higher than the site suitability specifications of the manufacturer.

The Mitsubishi MWT-102 2.4 MW turbine was evaluated for the Wild Meadows project. The estimated NCF for the project with these turbines was the lowest of those turbines studied, as the maximum hub height is limited to 80m by the manufacturer.

Alternatives 8a/b/c/d/e/f – Alternative road configurations

A number of possible road configurations were evaluated for constructability, with the goals of minimizing wetland impacts, reducing cut/fill, meeting maximum allowable grades, minimizing total road linear feet, and making optimum use of the many logging roads, skidder trails, and landings that have already been constructed on the site. As part of the preliminary engineering effort, design changes were identified that resulted in a reduction of impacts to wetlands, vernal pools, and buffers. Two specific locations where minimization measures were incorporated into the engineering design effort included in the vicinity of turbines C-7, C-8, C-9, and C-10.

In order to understand the possible alternative configurations of the roadways, it is important to consider the engineering criteria required for the Project to be constructed and operated. The following lists the basic engineering design criteria applied to the development of the site plan:

ENGINEERING CRITERIA SUMMARY

Access Roads (Non-Crane Roads): “Access Roads” are used to bring construction equipment to the ridgelines. Because of the size of the trailers needed to transport wind turbine components these roads must adhere to specific requirements regarding their horizontal and vertical geometry:

- Finished permanent gravel roads must be 16- feet wide.
- Roads only have a maximum grade of 15 percent.
- Centerline turning radius of horizontal curves shall be 170 feet or more. Radii less than 170 feet may be allowed, but only in special cases. In these special

cases, the road grade must typically be reduced below 5 percent and the road may need to be widened beyond 16 feet.

- The distance between horizontal curves must not be less than 150 feet, unless additional widening is provided.
- Vertical curves must be limited to a K value greater than 16.5 (i.e., be relatively smooth transition over the rate of change of grade).

Crane Roads: These roads are constructed to allow equipment to travel between turbine sites, including the fully assembled crane. Because of the size of the assembled crane, the crane roads must adhere to all of the criteria listed above, but must be wider than the access roads.

- Gravel roads must be 40 feet wide and compacted, as well as allowing for installation of the underground electrical collection system within the road and overhead electrical collection system alongside the road.
- Width of clearing shall vary, but typically will be 4-10 feet beyond the limits of disturbance as described above. Area for drainage and stormwater shall be in addition to the dimensions identified above.
- Crane Pads: At each turbine location, a proper surface for the construction of the turbine towers must be created. These crane pads are intended to provide a stable base from which the construction crane can operate. In order to serve this purpose, the crane pads must adhere to the following criteria:
- Crane pads must be approximately 60 feet by 90 feet.
- The turbine foundation should be level with the crane pad, but can be no lower than 2feet below the crane pad.
- Crane pad length must be parallel to access road direction of travel..
- For crane pads at the end of a road, the pad length shall be parallel to access road or spur road direction of travel. Crane pad centerline and road centerline must match.

Alternative access road layouts

The criteria above were used by Project engineers to develop the design plans for the Project. Several different alternatives were considered in arriving at the proposed Project design as described below.

a. Access via Forbes Mountain Road

The Project evaluated an access approach whereby the primary access point would be via the existing Forbes Mountain Road (Figure 7). This alternative would have allowed for fewer linear feet of new road, and a more central access point to the project turbines. This alternative was ruled out due to the long, narrow, and winding nature of Forbes Mountain Road, which would have resulted in proportionally high stream and wetland impacts. Other limitations included existing and new residential development (which has increased markedly in the past year), and very steep grades from the end of Forbes Mountain Road to the project crane roads.

Elimination of using this route resulted in the following:

- Avoidance of using approximately 2 miles of Forbes Mountain Road
- Avoidance of substantial road upgrades and associated impacts to perennial streams, smaller streams, and adjacent wetlands
- Avoidance of potential disturbances to sensitive wildlife habitat
- Avoidance of several vernal pools and associated buffers

b. Access via Washburn Road

The Project evaluated an access approach using Washburn Road as a primary or secondary access point. This alternative was only briefly evaluated and clearly found to be an undesirable option. Washburn Road is generally in poor condition and is narrow. Access from Washburn Road would require bridging Patten Brook and crossing a number of wetlands areas.

Elimination of this route resulted in the following:

- Avoidance of using 4 miles of Washburn Road
- Avoidance of using 2 miles of Cass Mill Road
- Avoidance of Intersection improvements at
  - Washburn and Cass Mill
  - Washburn and Wild meadows Road
  - Cass Mill and State Route 104

c. Access via Wild Meadow Road/Golden Valley Road

The Project area is accessed currently via Wild Meadows Road in Grafton, connecting to Golden Valley Road (private road). Upgrading this existing route was evaluated in some detail, including review of the bridge crossing on Golden Valley Road over Wild Meadow Brook. This route would also require extensive upgrades and replacements of existing culverts and drainage structures located on private land, past the former Airport Road. The approach using Wild Meadows Road in Grafton offered other challenges, principally at least two bridges that may be nearing failure and that do not meet current NH DOT standards. This route would also require a lengthier route to access the project site. Elimination of this route resulted in following:

- Reduction of access road length by 3,200 feet

- Avoided substantial earthwork cuts of approximately
- Avoidance of two town bridges along Wild Meadows Road and one on Golden Valley Road
- Reduction of impacts to one perennial and two intermittent streams
- Reduction of Direct impacts to wetlands and streams by over 4,000 sq. ft.
- Reduction of secondary impacts to streams, wetlands and vernal pools by over 2,000 sq. ft.

d. Access via Wild Meadow Road via Central Access Road North

As part of Alternative 3 (37 turbine layout), the Project evaluated an additional access point off of Wild meadows road. This access was planned in order to provide a second access option to Braley Hill (Figure 7). The access point was located at an existing log landing, and the access road would have to impact several wetlands and vernal pools. After further evaluation and considerations this access option was dropped. This resulted in overall reduced wetland impacts, reduced road lengths and avoided few major cuts along the roadway. Elimination of this route resulted in following:

- Reduction of road length by 6,500 feet
- Avoidance of three town bridges along Wild Meadows Road
- Avoided Overhead electric line crossing Wild Meadows Brook
- Avoided major earthwork cuts and fills
- Reduction of Impacts to one ephemeral stream
- Reduction of Direct impacts to wetlands and streams by over 3,500 sq. ft.
- Reduction of secondary impacts to wetlands and vernal pools by nearly 1,500 sq. ft.

e. Access to Melvin Mountain area via North/South Access Roads

As part of Alternative 3 (37 turbine layout), the Project evaluated multiple access points and routes for the Melvin Mountain area of the project (Figure 7). The primary south access route was designed and preferred initially because it made use of an existing network of logging roads and skidder trails. However, as described above, those log/skidder roads had in some areas become drainage courses and had become vernal pools in some areas. The Melvin south access alternative would have necessitated greater wetlands impacts, and greater vernal pool impacts in particular. The Melvin north routes were drier, but would have required one or two stream crossings, and the access road location would have required another, separate access off of Wild Meadows

Road/Grafton Road – essentially another project access point. Elimination of this route resulted in following:

- Reduction of road length by 15,000 feet
- Avoidance of two-three town bridges along Wild Meadows Road
- Avoided overhead electric line crossing Wild Meadows Brook
- Avoided major earthwork cuts and fill of approximately 185,000 and 151,000 CY
- Reduction of Impacts to three perennial, two intermittent and six ephemeral stream
- Reduction of direct impacts to wetlands and streams by 4,788 sq. ft.
- Reduction of secondary impacts to wetlands and Vernal pools by 459 sq. ft.

Multiple corridors were studied prior to selecting the preferred Project Access off of Wild Meadows Road. The selected route resulted in a further reduction in project impacts to wetlands, streams, and vernal pools.

f. Further Wetland Impact Minimization Efforts

After selection of the preferred Project Access off of Wild Meadows Road, the final route was refined to further minimize impacts to wetland resources. Figure 8 includes an example of micro-siting modifications to avoid and minimize wetland and stream impacts that were made during the 50% design planning stage of the Project. Other examples of minimization measures include:

- Micro-siting the access roads and turbine pads to avoid/minimize impacts to wetlands, streams and vernal pools
- Reducing road side slopes for cuts in wetlands to 1.5:1
- Adjusting drainage swales and culverts to match existing drainages
- Maintaining local drainage patterns to wetlands and streams to minimize changes in runoff patterns
- Designing road, turbine pad and shoulder grades and surfaces to minimize impedance to wildlife crossings.

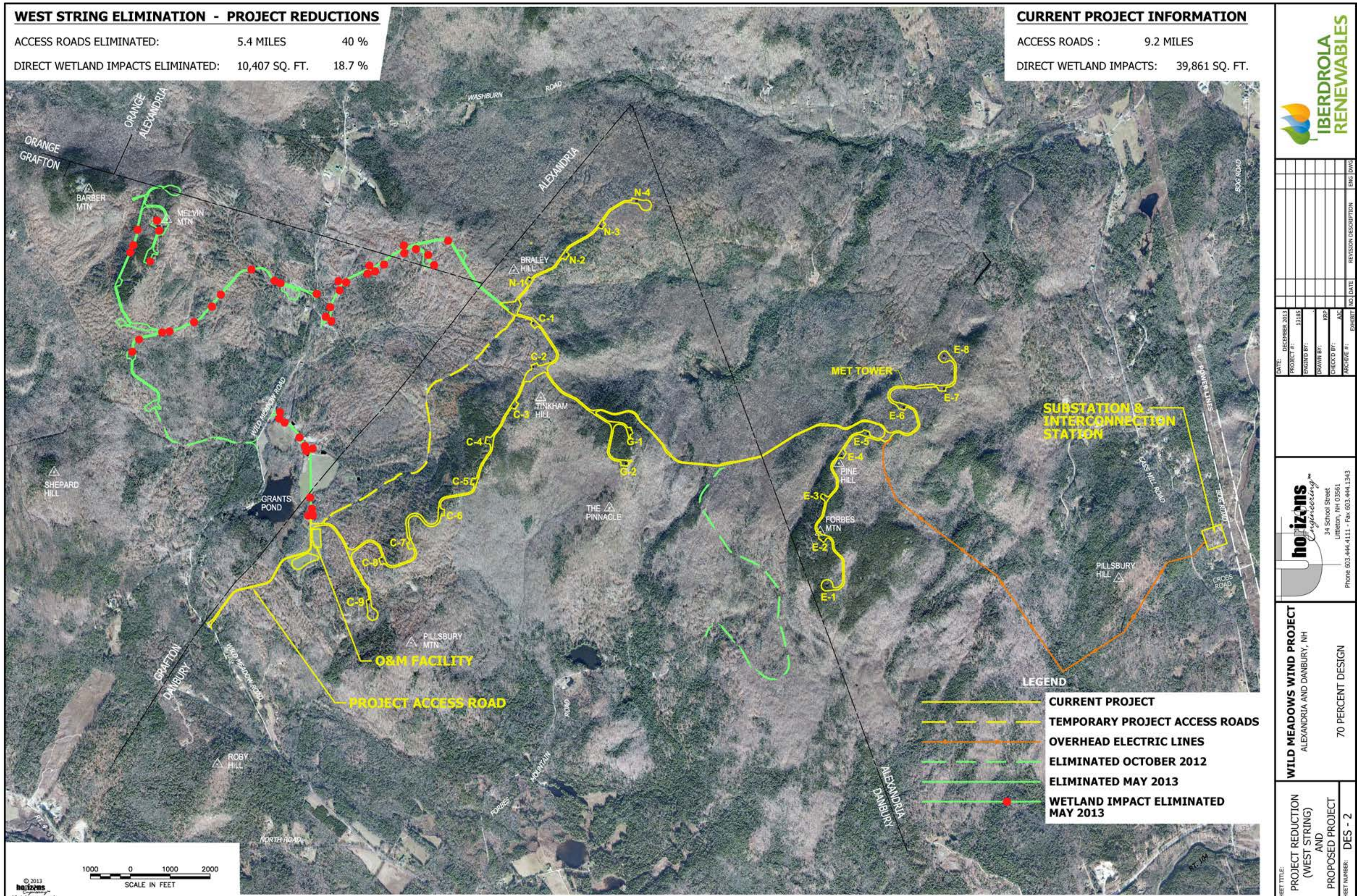

Figure 7: Project Alternatives Map

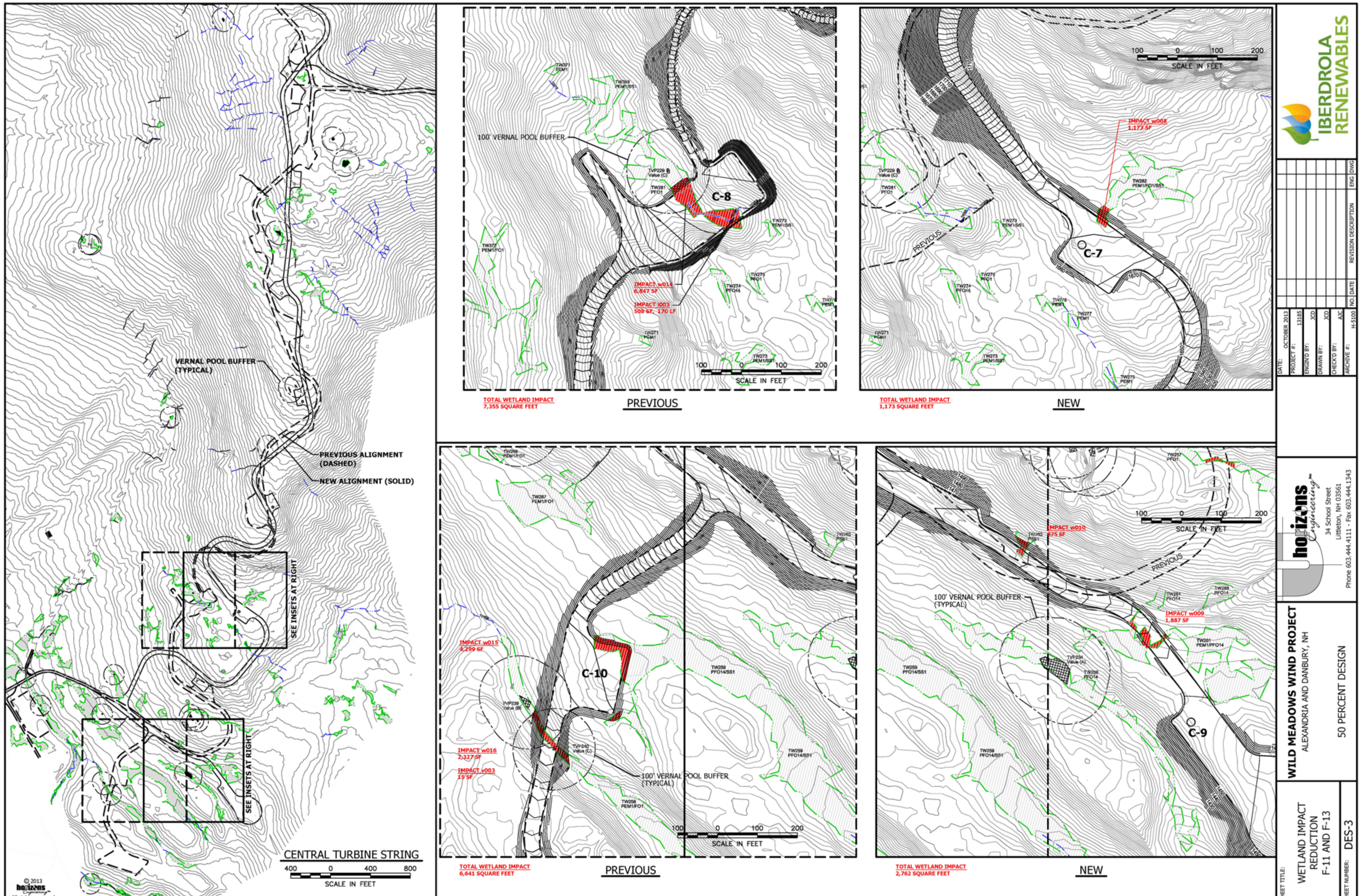

Figure 8: Wetland Impact Minimization Map

H.3. A description in detail of the impact of each major part of the proposed facility on the environment for each site proposed

Atlantic Wind has designed the Project to avoid environmental impacts where possible. Extensive environmental surveys were conducted by an experienced team of consultants and in consultation with the regulatory authorities. A full description of studies conducted to assess impacts and minimize potential negative impacts is provided in Sections H.4 and I.1-5. The results of these studies were incorporated into the siting, design and engineering aspects of the project, resulting in a final design that avoids and minimizes environmental impacts to the greatest extent possible, while still achieving the goals of the Project. These alternatives are discussed in detail in Section H.2, above.

Studies designed to assess and minimize the potential impacts of the project on birds and bats, and the resulting Bird and Bat Risk Assessment, concluded that the Project would have a low magnitude of potential impact to resident and migratory species. A Wildlife Habitat Assessment, and consultation with state and federal agencies, determined that there are no known state or federally-listed species within the Project limits, nor are there any exemplary natural communities occurring within or in close proximity to the Project area.

Water resources are also not expected to be adversely impacted by the Project. Direct impacts to 90% of wetlands, 90% of streams, and 96% of vernal pools have been avoided, and those impacts that are unavoidable have been minimized. Proposed crossings of small streams and wetlands were configured to be as perpendicular to the flow direction as possible, and to minimize the length of culverts and extent of clearing associated with each crossing site. Proposed crossings adhere to the New Hampshire Stream Crossing Guidelines (2009). The crossings have been designed to withstand and to prevent the restriction of high flows, to maintain existing low flows, and to not obstruct the movement of aquatic life indigenous to the stream beyond the actual duration of construction.

A robust mitigation plan has been developed in coordination with several local, state and federal agencies to offset the unavoidable impacts associated with the project (see Section I.4.(d), below).

Potential aesthetic impacts, impacts related to sounds associated with the project, and impacts to historical resources were also evaluated. The VIA concludes that although the Project will present appreciable contrast from certain viewpoints, including some public resources of potential statewide significance, their overall visual impact is not unreasonably adverse.

Further information and specific details are contained in the NHDES Standard Dredge and Fill Permit Application (which also serves as the USACE Programmatic General Permit Application) and NHDES Alteration of Terrain Permit Application found in Appendices 1 and 2, respectively.

H.4. A description in detail of the Applicant's proposals for studying and solving environmental problems

Iberdrola Renewables has implemented a corporate Avian and Bat Protection Plan (ABPP). This was the wind industry's first company-wide Avian and Bat Protection Plan and was released in conjunction with the USFWS in October 2008. Iberdrola Renewables' ABPP plan is modeled in part after the 2005 Avian Protection Plan template developed by approximately 30 electric utility companies, numerous electric cooperatives and rural utilities, and the USFWS to address impacts of transmission and distribution lines on birds. The Iberdrola Renewables ABPP applies those principles to its wind fleet and also addresses bats as well as birds. It contains a corporate policy concerning wildlife protection and establishes a process for early consultation with agencies for project evaluation (See Appendix 22). It also establishes internal policies for pre- and post-construction monitoring and proper site design, impact assessment, permit compliance, nest management, training, mortality reduction measures and mitigation. The ABPP press release includes then USFWS Director H. Dale Hall's statement that,

"*The U.S. Fish and Wildlife Service commends Iberdrola Renewables for seeking ways to minimize bird and bat deaths at their wind turbine facilities while pursuing renewable energy development in an environmentally responsible way. Through their avian and bat protection plan, drafted in consultation with the Service, Iberdrola Renewables is the first wind energy company to incorporate a voluntary set of principles in a formal plan to reduce wildlife impacts. The plan's principles, similar to ones originally developed by the electric utility industry to minimize bird electrocutions and power line collisions, will reduce risk to birds and liability under the Migratory Bird Treaty Act.*"

As mentioned in Corporate Policy section of the ABPP, Iberdrola Renewables is continuously enhancing its efforts by applying lessons learned, implementing research and applying results, investigating new technologies and working with others in the industry to improve regulations and guidelines.

With this USFWS-approved framework in mind, Atlantic Wind created a Proposed Work Plan for Avian, Bat and Habitat Studies, Appendix 23. In an effort to assess potential impacts to birds and bats at the proposed Project, Atlantic Wind consulted with the NH F&G and the USFWS at a meeting in Concord, New Hampshire on April 1, 2010. At this meeting, a proposed work plan documenting methods for standard pre-construction surveys were discussed (i.e., radar, raptor, acoustic bat, and breeding bird surveys), and NH F&G recommended adding additional surveys (bat habitat assessment, literature review, and mist netting, and surveys for American marten). The work plan was subsequently revised to incorporate these additional surveys. A second meeting with NH F&G, Atlantic Wind, and Stantec occurred on March 31, 2011, to discuss the level of effort, protocol, and survey locations for mist netting surveys.

Multiple pre-application meetings and site walks regarding the wetland, stream and vernal pool resources have been held with the US Army Corps of Engineers (USACE), US Environmental Protection Agency (USEPA), and NH Department of Environmental Services (DES). Dates of pre-application meetings include May 15, 2012, September 19, 2012, and August 29, 2013.

Agency site walks were conducted October 9 and 10, 2012, and December 4, 2012. Dave Keddell (USACE) was present both October dates, Mark Kern (USEPA) and Craig Rennie (NHDES Alteration of Terrain and NHDES Wetlands Bureau) were present on October 10. The Golden Valley Road access area was observed during both dates. On October 9, the group toured the southern end of Tinkham, and two proposed access roads and ridges at the northern ends of Melvin and Braley Hills. On October 10, the group drove up the proposed temporary construction road and walked to the central Tinkham met tower. On December 4, 2012, Dave Keddell (USACE), Lori Sommer (NHDES Wetlands) and John Kanter (NH F&G) walked the site with the Iberdrola team. Golden Valley Road, the southern end of Tinkham, the Melvin access road and the proposed substation were all visited.

NHNHB database search requests were submitted in 2010, 2012 and 2013. The NHNHB reviews indicated that there is a record of one sensitive state-threatened plant species and one sensitive wildlife habitat area within the Project leased lands. There are no other known state or federally listed species within the Project limits, nor are there any exemplary natural communities occurring within the Project area. However, the NHNHB data did indicate there are records of peregrine falcon (state-threatened), bald eagle (state-threatened), osprey (state special concern), and northern harrier (state-endangered) within 10 miles of the site. In addition to these species, coordination with the NH F&G identified the potential for American marten on the Project site as potential concerns.

In response to these concerns, Atlantic Wind conducted a Wildlife Habitat Assessment on the Project site that consisted of multiple site visits between 2010 and 2013 by a Certified Wildlife Biologist. This assessment is provided as Appendix 24, and is discussed in Section 1.5.b.iii below.

Atlantic Wind met with staff of the NHDHR and USACE in mid-October 2012 to introduce the Project and discuss federal agency involvement. At this meeting, NHDHR assigned review number R&C #4186 to the Project which initiated review.

Additionally, Atlantic Wind has hired accomplished firms to conduct visual and sound monitoring. Visual simulations, viewshed maps, and sound modeling maps were all briefed and discussed in public Open Houses and meetings. Dates and specifics of these meetings can be found in Section C.6 and Appendix 5. Atlantic Wind also met with the Towns in various formats throughout 2012 and 2013 to provide continued updates on the Project.

Section I. contains additional information regarding the Applicant's proposals for studying and solving environmental problems.

H.5. A description in detail of the Applicant's financial, technical and managerial capability to construct and operate the proposed facility

Atlantic Wind, LLC is a limited liability company organized for the development and ownership of this Project. It is 100% owned by Iberdrola Renewables, LLC (IR). IR's parent company is Iberdrola SA, a publicly traded company on the Madrid stock exchange and the largest owner and operator of renewable energy projects in the world.

H.5.(a) Applicant's financial capability

As the owner of Atlantic Wind, LLC, Iberdrola Renewables, LLC is focused on developing, financing, constructing, owning and operating its wind farms. Iberdrola Renewables finances the construction costs of its wind farms through equity investments provided by Iberdrola S.A., one of the world's largest energy and utility companies. Iberdrola Renewables has the capability to provide adequate assurances, guarantees, financing and insurance for the Project's development, construction and operation. It currently funds all development activities for the Project, and through Iberdrola S.A., will arrange for the capital needed for construction finance, equipment orders, and long-term investment in the Project.

Iberdrola Renewables' parent company, Iberdrola S.A., remains well capitalized with total assets of $125 billion through September 2013. A detailed summary of Iberdrola S.A. balance sheet as of June 30, 2013 has been submitted as part of the Application as Figure 1. Iberdrola S.A.'s credit rating is investment grade, with a rating of Baa1 from Moody's and BBB from Standard & Poors.

H.5.(b) Applicant's technical and managerial capability

Iberdrola, S.A., an energy pioneer with the largest renewable asset base of any company in the world - more than 14,000 megawatts (MW) of renewable energy spread across a dozen countries. Iberdrola Renewables is the second-largest provider of clean renewable electricity in the United States with more than 5,800 MW of wind and solar power in operation or under contract. Iberdrola Renewables, LLC has successfully financed, constructed and operates 53 wind energy facilities in the United States including the Lempster and Groton Wind Project in New Hampshire. Appendix 25 is a map of Iberdrola Renewables, LLC owned and operated projects in the United States. Iberdrola Renewables maintains world-leading expertise in managerial and technical capabilities related to wind power projects. Iberdrola Renewables has a full in-house construction management staff, including Project Managers, Site Managers, Superintendents, and Quality Assurance inspectors. This level of experience and technical depth is supported by a number of standardized construction sequence plans to ensure efficiency, shorter timelines, and minimized disruption to area communities during construction.

Atlantic Wind will construct and operate the Project consistent with Iberdrola Renewables' corporate commitment to meeting all applicable state and Federal OSHA safety regulations. Each turbine and all electrical equipment will be inspected under rigorous commissioning procedures. In addition, the interconnecting utility will also perform and require inspections, testing, and commissioning documentation for grid and system safety, prior to line activation. Once turbines are commissioned, qualified personnel will routinely inspect and repair them as necessary pursuant to preventive maintenance schedules.

The Project will be operated and maintained by a team of up to 6 full-time, locally-based O&M personnel. The O&M team will staff the Project during normal working hours, with weekend shifts and extended hours as required to maintain operations. Iberdrola Renewables, LLC operates its wind farms with its own employees, and trains all employees in safety regulations and procedures, operational standards, and applicable staff certifications.

The Project's central supervisory, control and data acquisition (SCADA) system provides remote operation of the wind turbines and collects operating and performance data 24 hours per day. In the event of turbine or plant facility outage, the SCADA system sends alarm messages to on-call technicians via pager or cell phone to notify them of the outage. The Project will have an on-call local technician who can respond quickly in the event of emergency notification or critical outage. Wind farm turbines are managed via computer controllers installed in each unit. In the event of a unit trip (caused by electrical error, high winds, icing, etc.), the turbines automatically are tripped via computer. Re-starts require personnel to go the specific turbine site.

In addition to local staff, Iberdrola Renewables, LLC has a control center located in Portland, Oregon (the National Control Center) that is staffed 24 hours a day, 7 days a week. Along with Iberdrola Renewables' other projects located throughout the country, the National Control Center will continuously monitor and control the Wild Meadows Wind Project.

H.6. A statement of assets and liabilities of the applicant

Please refer to Figure 1 which contains Iberdrola Renewables financial statement and Appendix 4, which includes further details.

H.7. Documentation that written notification of the proposed project, including appropriate copies of the application, has been given to the governing body of each community in which the facility is proposed to be located

The Town of Danbury Board of Selectmen and the Town of Alexandria Board of Selectmen will both be provided a copy of this Application at the time it is filed with the Site Evaluation Committee. The Applicant will file a copy of the return receipt or other documentation of receipt with the Site Evaluation Committee and has reserved Appendix 26 for this documentation.

H.8. Consistency with state energy policies

The Project is consistent with and advances a number important local and regional public policy goals. New Hampshire is part of ISO New England's (ISO-NE) Balancing Authority Area, within which ISO-NE is responsible for the reliable operation of New England's power generation, demand response, and transmission system; the administration of the region's wholesale electricity markets; and the management of the comprehensive planning of the regional power system[9]. ISO-NE has ultimately has the responsibility to protect the short-term reliability and plan for the long-term reliability of the electrical system in New England, including New Hampshire, Massachusetts, Vermont, Maine, Connecticut and Rhode Island. In 2010, the New England Wind Integration Study (NEWIS) was finalized and presented to ISO-NE (Appendices 18 and 19). The goal of NEWIS was to evaluate the operational impacts of a range of hypothetical large-scale wind-integration scenarios[10]. To achieve this goal, the study identified a New England-specific wind climate regime and modeled the effects of this wind regime on the different scenarios. The need to forecast wind energy and the need for flexible resources to balance the variability that increased wind generation adds to the system were also analyzed. The study resulted in several major findings and recommendations, including that New England could integrate even the highest amount of wind studied (approximately 24% of the region's energy being provided by wind power by 2020) assuming a number of transmission upgrades and no significant retirement of supply-side and demand-side resources able to provide flexibility to the system; and that with 20% of New England's energy provided by wind power (by 2020), NOX emissions would be reduced by approximately 26%, SOX emissions reduced by 6%, and CO2 emissions reduced by 25%.[11]

This NEWIS supports the capacity for wind power within New England and highlights the benefits, including those associated with the reductions in harmful emissions and CO2. This reduction of CO2 is instrumental in minimizing the effect of global climate change, locally, regionally and worldwide. To this day, New Hampshire has been assertive in studying and attempting to mitigate these concerns, including the development of a Climate Change Action Plan which was the result of an Executive Order in 2007 (Appendices 27 and 29); and the passage of RSA 362-F, New Hampshire's renewable portfolio standard (RPS) law, which requires that 25% of the

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[9] General Electric International, Inc. 2010. *Final Report: New England Wind Integration Study; Prepared for ISO New England.* (Appendix 19)

[10] ISO-NE. 2010. New England Wind Integration Study: Summary. November 2010. Accessed online at: http://www.iso-ne.com/committees/comm_wkgrps/prtcpnts_comm/pac/mtrls/2010/nov162010/newis_iso_summary.pdf. Date accessed: 11/27/13. (Appendix 18)

[11] U.S. Department of Energy. 2011. *ISO New England Releases the New England Wind Integration Study*. Accessed online at: http://www.windpoweringamerica.gov/filter_detail.asp?itemid=3177. Date accessed: 11/27/13.

electricity sold by retail suppliers in New Hampshire come from renewable sources by 2025 (Appendix 30). Other states in New England have been active as well by establishing their own RPS laws and targets, with the goal of collectively addressing the threats caused by global climate change.

The Wild Meadows Project is consistent with the purpose of New Hampshire's RPS statute articulated in RSA 362-F:1: it provides fuel diversity to the state and the region's generation supply through the use of a local renewable resource that is completely emission-free (i.e. the wind) which can displace and lower regional dependence on fossil fuels, and projected power plant retirements, thereby stabilizing volatile energy costs; the Project will aid the local and state economy; and because it will emit no air pollutants, it will help to reduce the amount of greenhouse gases, nitrogen oxides and particulate matter emissions generated in the state, thereby improving air quality, public health, and mitigating against the risks of climate change. This statement is consistent with that of other regional RPS laws throughout New England.

The Project is supportive of and complimentary to the recent statement of policy issued jointly by the six New England Governors (Appendix 28). The joint statement on energy describes a new initiative:

> *"This initiative will accelerate regional cooperation on expanding renewable energy and energy infrastructure in New England.*
>
> *In the joint statement, the Governors are committing to more thoughtful and strategic investments focused on expanding the region's energy portfolio. Regional expansion will bring New England lower electricity and heating costs, increased economic development, competitiveness and job growth, and improved air quality through a reduction in harmful air emissions from the burning of fossil fuels.*
>
> *The Governors said the agreement will "ensure that we are on a course toward a transformed energy, environment, and economic future for our region that offers a model for the nation.[12]"*

The initiative continues with a summary joint statement:

> *The states believe that investments in local renewable generation, combined heat and power, and renewable heating for buildings "support local markets and result in additional cost savings, new jobs and economic opportunities, and environmental gains.[12]"*

[12] Gov. Dannel P. Malloy's Office. 2013. Press Release: *New England Governors Sign Energy Statement Committing Region to Cooperation on Infrastructure*. Targeted News Service, 12/7/13. Accessed online at: http://www.elp.com/news/2013/12/07/new-england-governors-sign-energy-statement-committing-region-to-cooperation-on-infrastructure.html. Date accessed: 12/10/13. (Appendix 28).

In addition to promoting the public policy goals embodied in the RPS statute noted above, the Project will assist in addressing the issue of climate change which the New Hampshire Legislature has determined is a significant environmental problem that can be addressed through reducing greenhouse gases such as carbon dioxide, which is produced by electricity generators. See RSA 125-O:19 et seq. Because the Project will produce electricity without producing greenhouse gases, it is therefore consistent with and complimentary to the Regional Greenhouse Gas Initiative (RGGI) which is aimed at reducing greenhouse gas emissions resulting from energy use in New Hampshire and other northeastern states. By generating electricity without using fossil fuels, the Project will assist in addressing the important issue of climate change.

Winter tourism is a perfect example of a component of New Hampshire's economy that will likely be negatively impacted by climate change if its effects cannot be mitigated through the switch to cleaner sources of energy and other measures (see Appendix 31 for a study on the impacts of wind farms on tourism in New Hampshire). Additional evidence from the New Hampshire, across the U.S., and internationally suggests that in some cases, wind farms are serving as a tourism draw to a given area. Appendix 32 summarizes instances in which this is the case. The approximately $12.2 billion dollar U.S. winter tourism industry, as reviewed in a report titled *Climate Impacts on the Winter Tourism Economy in the United States* by two New Hampshire-based authors on behalf of the Natural Resources Defense Council (NRDC) and Protect Our Winters (POW), has already felt the direct impact of decreased winter snowpack and rising average winter temperatures[13] (Appendix 33). This report included a case-study on New Hampshire, with the findings excerpted below:

- The state provided winter recreation opportunities to 2.2 million skier visits and 500,000 snowmobile visits in 2010. The winter tourism industry supplied jobs for almost 8,000 employees, who earned $259 million in wages;
- Lower-snowfall winters (e.g., 2001/2002 and 2006/2007) cost New Hampshire ski resorts an estimated $54.3 million in lost revenue and a 17 percent fewer skier visits compared to higher-snowfall winters (e.g., 2007/2008 and 2008/2009); and
- Winter temperatures are expected to increase an additional 6°F to 10°F by the end of the century under a higher-emissions scenario. Warmer winter temperatures will mean less snowfall, more winter rain, and earlier melting of snowpack. The length of the snow season could be reduced by 25 percent to 50 percent, with larger reductions under higher-emissions scenarios.

The National Ski Areas Association (NSAA) has also adopted a Ski Industry Climate Change Policy as a part of their Environmental Charter known as "Sustainable Slopes"

[13] Burakowski E and M Magnusson. 2012. *Climate Impacts on the Winter Tourism Economy in the United States*. Accessed online at: http://www.nrdc.org/globalwarming/files/climate-impacts-winter-tourism-report.pdf. Date accessed: 11/27/13.

that will include actions such as guest education, raising policy maker awareness, advocating for greenhouse gas reductions, supporting the use of renewable energy, and partnering with other groups and organizations that share the same goals (Appendix 34).

Another icon in New Hampshire that is threatened by climate change is the moose. These large, symbolic mammals have traditionally thrived in New Hampshire's cool and mountainous terrain; so much so that they are featured prominently on the State's only conservation license plate. According to recent studies, the New Hampshire moose herd has plummeted by more than 40% in the last decade from over 7,500 moose to just over 4,500, with some of this decline attributed to shorter winters.[14] The warming climate in NH affects moose directly, including lower weights and the reduction of reproductive success, alteration of behavior to stay cool, and increased vulnerability to predators[14]. The warmer winters have also led to spikes in tick populations which leave moose weakened and in some cases can lead to death from anemia; for example, ticks have accounted for 41% of all moose deaths in NH over a recent 5 year period[14]. This decline has led to the Executive Council to approve a four-year, $695,000 study of the state's declining moose population[15]. Declining moose populations are also affecting wildlife watching and recreational hunting expenditures in the state, which totaled more than $556 million in 2011[14]. Wildlife watching, which includes moose watching, leads to $115 million in trip related expenses per year in New Hampshire, with tour operators in places like Gorham and Lincoln seeing fewer moose per tour than they did in years past[15]. With the numbers of moose hunting permits dropping (by more than 60% from 2007 to 2012) the associated revenues attributed to the species are predicted to drop as well[14].

The Wild Meadows Project will provide a critical source of clean, reliable, zero-carbon energy to the New England grid and will help counter the negative effects of global climate change on New Hampshire's economy, including skiing, snowmobiling, wildlife watching and hunting; as well as impacts to the iconic species and their habitat.

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[14] National Wildlife Federation. ND. *Save a Species – New Hampshire: Help Save the Moose from a Changing Climate*. Accessed online: http://www.nwf.org/pdf/2013-State-Facts-Postcards/NH%20Fact%20Sheet.pdf. Date accessed: 12/2/13.

[15] Timmins, A. 2013. *Concord Monitor: Climate change, ticks claiming moose in New Hampshire*. Accessed online: http://www.concordmonitor.com/news/7828891-95/climate-change-ticks-claiming-moose-in-new-hampshire. Date accessed: 12/2/13.

I. Potential Effects and Mitigation Plans

I.1. Aesthetics

I.1.(a) Visual impact

A Visual Impact Assessment (VIA) was prepared by Environmental Design and Research (EDR) for the proposed Project and can be found in Appendix 36 of this application.

The visual study area for the Wild Meadows Wind Project was defined as the area within a 10-mile radius of each of the proposed turbines. This study area totals approximately 391.3 square miles in Grafton, Merrimack, Sullivan and Belknap Counties, and includes all or portions of the Towns of Meredith, New Hampton, Sanbornton, Dorchester, Groton, Plymouth, Canaan, Hebron, Bridgewater, Orange, Alexandria, Bristol, Enfield, Grafton, Danbury, Hill, Wilmot, Franklin, Andover, New London, and Springfield. This area includes 10 sites or districts listed on the National Register of Historic Places, two state parks, nine state forests, 13 wildlife management areas, two designated scenic sites, and several designated trails.

Land use within the 10-mile radius visual study area is dominated by forest land, much of which is subject to regular logging/timber harvest. In many areas the forest is interspersed with rural residences along the frontage of public roads. Farms and agricultural land occur primarily in valley areas along Routes 4 and 104, and are concentrated in the eastern portion of Alexandria, the central portion of Danbury, the southern portion of Bristol and outside the hamlet areas of Hebron and Canaan. However, small farms and open fields are scattered throughout the visual study area. Higher density residential and commercial development is concentrated in the village/downtown area of Bristol, around Newfound Lake, and in smaller settlements, such as the hamlet areas of Alexandria, Hebron, Danbury, Canaan, and New Hampton. The village area of Bristol is characterized by a main street business district, surrounded by traditional residential neighborhoods, with some commercial frontage development along the outskirts. The hamlet areas are generally characterized by clusters of residential buildings, principally single-family dwellings (often with an associated church and municipal buildings) within a primarily rural landscape. Fourteen distinct Landscape Similarity Zones (LSZ's) within the visual study area were established as well as viewer/user groups.

Viewshed analyses were conducted to identify those areas within the study area where an unobstructed line of sight is potentially available between a viewer and any portion of one or more of the proposed turbines. Topographic viewshed analysis indicates that approximately 53.4% of the 10-mile radius study area surrounding the proposed turbine sites will be screened from view of the Project by topography alone. However, since the visual study area is 85% forested, areas with potential visibility of the proposed Project will be much more limited. When also considering the screening provided by mapped forest vegetation, this analysis indicates that no turbines should be visible in 96.2% of the study area. In addition, views of the Project are likely to be fully screened from approximately half of the identified historic sites, state parks, state forest, designated scenic areas, and other public resources of potential state or local significance within the 10-mile radius study area. Because forest land is the dominant land use within the study area, the Project's viewshed is largely restricted to areas within or directly adjacent to water bodies, agricultural fields and other clearings (e.g., utility corridors) that provide the opportunity for unscreened views. Newfound Lake (lake edge would be approximately 3.8 miles to the northeast of the closest turbine) and its eastern shoreline, as well as some scattered higher elevation openings and larger open fields in valleys to the south and east of the proposed Project area, are the areas most likely to have views that include the majority of the proposed turbines.

Field reviews conducted during September 2012 and September 2013 revealed that Project visibility is likely to be much more limited than suggested by topographic viewshed mapping. This is due to the fact that screening provided by buildings is significant in more developed areas, and trees within rural portions of the study area typically limit long distance views. The field review confirmed that the vegetation viewshed analysis accurately predicts locations where Project visibility is most likely to occur. Consistent with the results of that analysis, large portions of the visual study area were found to be screened from view of the Project by forest vegetation. Open views toward the Project were concentrated to the south and east of the site, and were largely restricted to open fields, water bodies, road corridors, and cleared residential yards where lack of foreground trees allowed for unscreened views. Of the 126 most significant public resources within the study area, viewshed analysis and field review suggest that 86 (68%) will be completely screened from view of the Project, and an additional 27 (21%) will have partially screened views. However, open views will be available from several public resources of potential statewide significance, including the Mount Cardigan summit, Newfound Lake, the Murray Hill Historic District, Canaan Street Historic District and Paradise Point Nature Center.

To evaluate the visual impact of the proposed Project, computer-assisted visual simulations were prepared from 21 selected viewpoints within the 10-mile radius study area. These viewpoints were selected because they provide open views toward the Project site that will be available to representative viewer/user groups from selected public resources and representative landscape settings within the study area. Daytime simulations of the proposed Project are based on turbine specifications, dimensions, and coordinates provided by the Project sponsor. They illustrate views of different numbers of turbines, from a variety of viewer distances, and under different lighting conditions, to illustrate the range of visual change that could occur with the Project in place. In most cases where open views are available, the Project will be viewed on a forested background ridge. In many of the open views featured in the simulations, the Project resulted in the addition of man-made features to a primarily undeveloped view. This change resulted in perceived contrast with land use and viewer activity in forested and residential settings, but appeared compatible with working agricultural landscapes.

Evaluation of the simulations by a panel of registered landscape architects indicates that the Project's overall contrast with the visual/aesthetic character of the area will be highly variable. Composite contrast ratings for individual daytime viewpoints ranged from 0.3 to 3.3 on the scale of 0 (insignificant) to 4 (strong), and averaged 2.3 (moderate). This likely reflects the variety of circumstances under which the Project will be viewed, and the differing perspectives of the individual rating panel members. However, appreciable contrast (scores of 2.5 to 3.5) was noted for nine of the 20 daytime viewpoints. In general, the highest contrast scores were received by views where the turbines were relatively close to the viewer, were completely or substantially unscreened, occupied a significant portion of the view, and/or presented substantial contrast with the landscape features or viewer activities occurring at the site. For those viewpoints with the highest contrast rating, rating panel comments indicated that the Project presented appreciable to strong contrast with multiple features of the existing landscape, in particular land use and viewer activity.

To evaluate potential nighttime impacts, nighttime simulations were prepared for three of the selected viewpoints. These specific viewpoints were selected to show variety in sky conditions, number of lighted turbines, and other lights in the landscape. The simulations are based on proposed lighting specifications and Federal Aviation Administration (FAA) guidance which suggest that approximately 13 of the proposed turbines will be equipped with FAA obstruction warning lights. Based upon rating panel review of nighttime simulations, the turbines and FAA warning lights could result in a nighttime visual impact on certain viewers. Composite contrast rating scores for nighttime simulations ranged from 1.4 to 3.0. This range of contrast was related to how many lighted turbines were visible, what other sources of lighting were present in the view, the extent of screening provided by structures and trees, and nighttime viewer activity/sensitivity. While night lighting will likely be perceived negatively by rural residents and vacationers in locations where they currently experience dark nighttime skies, nighttime visibility/visual impact will be limited due to the abundance of mature trees that screen the Project from many homes, and the concentration of residences in village and hamlet areas, and along highways, where existing lights already compromise dark skies and compete for viewer attention.

Based on rating panel comments, recreational user surveys from other sites, and experience with currently operating wind power projects elsewhere, public reaction to the Project is also likely to be variable depending on proximity to the turbines, the affected landscape, the activity in which the viewer is engaged, and the viewer's personal attitude regarding wind power. Recreational surveys conducted for wind power projects in Maine consistently indicate that the projects may result in a perceived decrease in scenic quality, but are unlikely to diminish the recreational experience for most users, or reduce the likelihood of their returning to the area in the future. This may reflect the fact that wind turbines are not, in and of themselves, unattractive and have a positive connotation for many viewers. Consequently, although the Project will present appreciable contrast from certain viewpoints, including some public resources of potential statewide significance, their overall visual impact is not unreasonably adverse.

Mitigation

Given the nature of wind power projects and their siting criteria (tall structures located on elevated sites) some level of visual impact is unavoidable. However, several measures that help mitigate visual impact have been incorporated into the design of the Wild Meadows Wind Project. These include the following:

- The initial Project design, including 37 turbines, was reduced to 23 turbines (a 38% reduction).
- Among the turbines eliminated from the original Project design were those proposed to be closest to Mount Cardigan.
- The Project will be located in a forested area that essentially eliminates the opportunity for foreground views from public vantage points, and limits potential Project visibility to a small portion of the surrounding area.
- New access road construction will be minimized by utilizing existing logging roads whenever possible, and forest clearing along the proposed access roads and at turbine sites will be minimized to the extent practicable.
- The placement of manufacturer's logos or other markings on the turbines will be prohibited.
- The proposed substations will be located at least 350 feet off of the nearest public road and will be partially screened by surrounding forest vegetation. The stations will also be located adjacent to an existing high voltage transmission corridor. These project components are well removed from any significant public resources and should present little if any adverse visual impact

- The proposed Operations and Maintenance facility will be located approximately 1,800 feet from the nearest public road and will be well screened by forest vegetation. It therefore will present little if any adverse visual impact.
- The Project will use a radar activated lighting system associated with the minimum number of aviation warning lights (currently assumed to be 13 of the 23 turbines), and longest permissible off cycle allowed by FAA guidance (see Section I.1.(c), below, for more details).
- The Project will be decommissioned and removed at the end of its operation life.

I.1.(b) Shadow flicker

Shadow flicker refers to the moving shadows that an operating wind turbine casts over a receptor when the turbine is operating between the sun and the receptor. While health effects from shadow flicker have been alleged, no studies have confirmed these assertions. Therefore, the primary concern associated with this phenomenon is the annoyance it may cause for adjacent homeowners.

The analysis conducted by EDR used WindPRO 2.8.579 software, and the associated Shadow module, to model shadow flicker impacts within a 10-rotor diameter (1,200 meter) radius of the proposed turbines. A copy of the analysis can be found in Appendix 35. Input data for this analysis included the proposed turbine locations, turbine dimensions, topography, local wind direction frequency data, and historical sunshine data. The model assumes that the turbines are always operating (i.e., blades are moving) and does not take into consideration the presence or orientation of windows at receptor structures, or the screening provided by adjacent trees or structures. Modeling results thus represent an extremely conservative prediction of potential shadow flicker impacts. A total of 27 potential receptors within the 1,200 meter radius study area were identified and shadow flicker occurrence and duration was calculated at each location.

In general, quantified limits on shadow flicker duration are uncommon in the United States. However, 30 hours per year is a commonly applied threshold for significant impacts and was used in this analysis. Shadow flicker modeling for the Wild Meadows Wind Project indicates that only one receptor is expected to receive greater than 30 hours per year of shadow flicker. This structure is a seasonally occupied residence that is owned by a Project participant. Three other receptors are predicted to receive over 10 hours of shadow flicker per year. Of these, only one receptor is not a participating landowner. Viewshed analysis conducted by EDR that factors the screening of forest vegetation into the assessment of potential Project visibility indicates that this sole non-participating receptor would not have views of the Project and therefore is not expected to receive shadow flicker. Field review of this structure confirmed the presence of abundant forest screening on all sides, which should block any shadow flicker created by the Project. Viewshed analysis indicates that, of the structures predicted to receive 10 or more hours of shadow flicker, only one receptor could have an open view of the proposed turbines and this is a nonresidential structure owned by a Project participant. The remaining 23 structures within the study area (86%) are predicted to receive no more than 10 hours of shadow flicker annually. Consequently, no significant adverse impacts from shadow flicker are expected as a result of the Project.

I.1.(c) Wind turbine safety lighting

The VIA analysis discussed in section I.1.a and found in Appendix 36 also evaluated the visual effect of lighting. The white color of the turbines generally blends well with the sky at the horizon, and eliminates the need for daytime FAA warning lights. The FAA's guidance (DOT/FAA/AR-TN05/50 dated 11/05) on standards for obstruction lighting for wind turbine farms requires lighting the Project as one large obstruction with lights spaced approximately 3,000 feet apart, rather than lighting every structure over 200 feet in height. As a result, wind farms are typically lit with synchronized red pulsing lights at night and only a subset of the turbines are lit. It is anticipated that FAA lights will be placed on 13 of the 23 turbines.

Based upon nighttime observations of existing wind power projects, the red pulsing lights on the turbines may result in a nighttime visual impact on certain viewers. The actual significance of this impact from a given viewpoint will depend on the exact number of lights visible, what other sources of lighting are present in the view, the extent of screening provided by structures and trees, and nighttime viewer activity/sensitivity. It is possible that the synchronized pulsing of the red FAA warning lights on the turbines (where visible) could have an adverse effect on rural residents and vacationers that currently experience very dark nighttime skies in the immediate Project area. It should be noted, however, that nighttime visibility/visual impact will be limited by the abundance of mature trees that screen the Project from many homes, and the concentration of residences in town centers and along highways where existing lights already compromise dark skies and compete for viewer attention. In addition there are existing, lighted communications towers in the area.

Mitigation

To mitigate for any potential visual affect, Atlantic Wind proposes the installation and implementation of a radar activated lighting system at the Wild Meadows Project. During the various meetings that Atlantic Wind has held with Towns, stakeholders, and non-government organizations, the concept of radar activated lighting to offset or eliminate nighttime visual lighting aids has been raised. The implementation of this system would be conditioned upon receiving site-specific approval by the FAA of the use of such technology for the Wild

Meadows Project, and upon determination of its efficacy with the successful implementation of such a system at a wind facility operating in the U.S. for a time period of no less than one year. Atlantic Wind proposes to implement radar activated lighting technologies at Wild Meadows within one year of the completion of those milestones.

Implementation of this technology will substantially reduce the amount of time that the lights are activated, when compared with traditional warning light systems.

I.2. Historic sites

As noted, the Project will require review by the USACE for wetland impacts. For the purposes of compliance with Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended (16 U.S.C. § 470), the USACE is acting as the lead federal agency for the Project and will take into account any possible impacts of the Project on historic properties and will consult with the NHDHR regarding effects on properties that are listed, or eligible for listing, in the National Register of Historic Places (NRHP).

Atlantic Wind met with NHDHR in October of 2009 to initiate Project review. At this meeting, NHDHR assigned project number R&C#4186 to the Project. A Phase IA archaeological survey which has been produced by The Louis Berger Group (LBG) of Albany, NY provides an initial review of the Project to assess areas of potential archaeological sensitivity and potential resource management issues. In addition, a NHDHR Project Area Form (PAF) for the Project was completed by VHB to identify historic structures in and around the Project area. These reports can be found in Appendices 37 and 38.

The Phase IA archaeological survey consisted of background research and a pedestrian (field) survey to gain an understanding of previous disturbances, identify and assess areas of potential archaeological sensitivity, and identify any extant archaeological sites in the defined Areas of Potential Effect (APE). Project designs were revised several times throughout the duration of the survey, resulting in the identification of historical archaeological sites outside the final APE. Background research was conducted in October 2012, January 2013, and October 2013; pedestrian surveys were conducted October 14-16, 2012, May 2-3, 2013, and October 9-10, 2013. Background research did not identify any previously recorded precontact or historical archaeological sites in the APE, but one historical archaeological site was identified within a 3-mile (4.8-kilometer) radius of the APE. During the pedestrian surveys several stone foundations and associated features and mining pits were observed in and adjacent to portions of the APE. In total, eight areas with historical archaeological resources were assigned temporary site numbers, TS-4980-01 through TS-4980-08. Of these, four sites, TS-4980-01, TS-4980-02, TS-4980-05, and TS-4980-06, were identified in the vicinity of project components that have since been eliminated from the Project. A total of four areas are considered to possess a moderate to high archaeological sensitivity for resources associated with the observed historical features. During the pedestrian survey four areas were identified as having low to moderate sensitivity for precontact archaeological resources in the APE. Overall, the majority of the APE is considered to possess little potential to contain precontact archaeological resources; however, some areas are worth investigating for precontact resources, particularly those on relatively level terrain and near potable water.

For the historic resources and architectural survey, the USACE is consulting with the NHDHR on an appropriate area of potential effects (APE) and scope of work for any architectural field survey within the APE. The historic architectural survey has identified those historic properties listed on the NRHP and the New Hampshire State Register of Historic Places within a 3-mile APE for visual effects or viewshed. For this Project and in consideration of the proposed turbine height, an APE of three (3) miles has been proposed for the study area in which the proposed Project has the potential to insert visual effects that could diminish the setting of an historic property where the property's setting is a central feature of NRHP eligibility. As part of the work, a site file check was conducted at the NHDHR to research previously identified historic properties listed and/or eligible for listing on the National Register and New Hampshire State Register within the APE.

The historic architectural survey suggests that one property listed in the NRHP and a number of potentially National Register-eligible properties are located within the Project's APE (defined by the three-mile viewshed). Thus, the nature and extent of potential visual impacts of the proposed Project on historic buildings, structures and/or districts is still under review. The review of any potential visual impacts will continue by the USACE, in consultation with the NHDHR. It is important to note that no buildings or structures will be acquired or physically altered or removed by the Project, and thus impacts, if any, would be limited to those resulting from the visibility of the Project from the historic property.

Based on the preliminary survey findings, this Project is not expected to have an unreasonable adverse effect on historic properties. No historic structures will be physically impacted, and at present it appears unlikely that the visibility of the Project would demonstrably diminish any aspects of setting that might contribute to the significance of such historic properties. In addition, the proposed Project is unlikely to have an unreasonable adverse effect on any significant archaeological resources as any resource will be identified and avoided.

I.3. Air quality

The Wild Meadows Wind Project will not combust any fuels to produce electricity and therefore will not create any air emissions or have an adverse impact on air quality. Moreover, as a source of clean, renewable energy, the Project will add a new power supply to the region without adding any new air pollutant or greenhouse gas emissions.

In addition to providing a new, clean source of electricity, the Project has the potential – depending on what resources are contributing to the regional power grid at the time the Project is operating - to displace the production of electricity from existing fossil fuel plants, thereby reducing air emissions. Thus, overall, the Project will have a positive effect on air quality.

The fact that wind power is an emission-free energy source is often overlooked in the broader siting debate. However, the benefit of a generation source that adds new power supply without adding any new air pollutants or greenhouse gas emissions should not be understated or taken for granted. The statistics on the positive impact that wind power has on clean air are compelling. Wind farms emit no carbon dioxide. Using the U.S. Environmental Protection Agency (EPA) "Green Power Equivalency Calculator"[16] and the expected annual average MWh that will be generated by Wild Meadows, yields the following results:

- 130,983 tons of CO2 avoided, which is the equivalent of:
- The greenhouse gas emissions from 24,755 passenger vehicles each year; OR the CO2 emissions from:
- 13,321,261 gallons of gasoline consumed; OR
- 276,339 barrels of oil consumed; OR
- Burning 511 railcars of coal; OR
- 4,951,069 propane cylinders used for barbecues

These are only average single year avoided emissions. Over 20 years the environmental benefits are even more substantial.

A document produced by the American Wind Energy Association entitled Wind Energy & Reducing Greenhouse Gas Emissions is submitted with this Application as Appendix 39 contains more details and statistics about the clean air effects of wind as compared with other energy sources.

Unlike all forms of fossil fuel generated electricity, wind power has no air emissions associated with it. The Project's positive effects with respect to air quality should therefore be given significant consideration when balancing the issues of new facility siting, environmental protection and public health.

16 http://www.epa.gov/greenpower/pubs/calculator.htm

I.4. Water quality

I.4.(a) *Surface water quality*

Background & potential effects

Impacts on surface water quality from the Project include potential stormwater runoff and erosion from Project roads and facilities as discussed above. Total suspended soils are the potential pollutant of concern that must be addressed in both cases. To a lesser extent, gear and transformer oil are other potential pollutants as they are contained within the turbines and substations. Containment mechanisms, however, are incorporated into the design of each and these oils are therefore of much lower risk in terms of release to the environment. Surface waters potentially impacted by the Project include wetlands, intermittent streams and ephemeral streams (Figure 1 and Figure 9).

Study & mitigation

Normandeau scientists investigated an approximately 2,000 acre wetland study area from the spring of 2010 to the fall of 2013 for surface waters, including streams. This area includes all of the proposed Project infrastructure and associated disturbances including those associated with multiple turbine and access road alternatives (see Appendix 1 for methodology).

There are no named lakes or ponds within the 2,000 acre wetland study area. The study area contained 21 perennial stream segments, of which only two, Wild Meadow Brook and Pine Hill Brook, have official names. Two perennial streams originated on Braley Hill as well as three perennial streams from Tinkham Hill and flowed into Wild Meadow Brook. One perennial stream, located on the southeast lower slope of Tinkham ended at a wetland which is associated with Grants Pond (which is located outside of the study area). A total of six perennial streams within the study area were found on Forbes Mountain during field surveys. Perennial streams from Forbes Mountain flowed into Patten Brook or Taylor Brook and one stream to the far north flowed into an unnamed pond north of the Pinnacle and eventually into Patten Brook. Most of the streams associated with the collector line are tributaries of Pine Hill Brook, which is crossed by the corridor and drains into the Smith River. The substation site is located near Bog Brook, which flows north, eventually to Newfound Lake. Small streams associated with the proposed access route off of Wild Meadow Road drain into Wild Meadow Brook.

In general, the perennial streams exhibited signs of rapidly fluctuating or "flashy" flow; responding rapidly to precipitation or melt events. Portions of Wild Meadow Brook showed signs of heavy sediment loads from carrying the flood waters of Tropical Storm Irene in the late summer of 2011. A portion of Airport Road was severely eroded by a perennial stream during the same storm. Boulder and bedrock substrates were found in perennial streams located on upper slopes of this project. Cobble and sandy substrates were found in perennial streams with a gentler gradient and were generally within the valleys.

The remainders of the stream segments had intermittent (116) or ephemeral (296) flow regimes. Most intermittent streams began as seeps or ephemeral flow in the upper reaches, with increasingly frequent flow down the slopes. Most of the streams were narrow and incised in the upper elevations. Very few fine sediments remained in these stream sections. Boulders, stones and gravel were the typical substrates in the till areas of the site. Sand and gravel predominated in the more gently sloping lower elevations. The stream channels were well defined, and typically lacked vegetation. In the steeper reaches, upland vegetation frequently bordered the channels, except in seep areas. Where slopes allow, some wetland development occurred, but the hydrology of these sites was more dependent on groundwater than on surface flows.

Approximately seventy percent of streams segments were ephemeral. Ephemeral streams often transitioned into an intermittent stream, diffused into wetlands, or ended where the surface water infiltrated into better drained soils or rocky areas often on terraces and at the toe of slope. The substrates consisted of organics and channels were shallow (general less than 1 foot deep) and most often defined by pushed leaves and exposed mineral soil. The ephemeral streams only flowed during times of heavy precipitation or during spring melt.

No streams in the study area are located within 0.25 miles of any National Wild and Scenic Rivers, are Essential Fish Habitat (EFH) for Atlantic salmon or are subject to the New Hampshire SWQPA.

Despite the size and the linear nature of the Project, 90% of the delineated stream segments have been avoided with only 0.19 acres of permanent stream impacts and 0.29 acres temporary stream impacts proposed. This does not include proposed impacts to wetlands or vernal pools (see below). The details of these impacts are reported in the wetlands permit application, which is included in Appendix 1 to this application. There should be no long term impacts to water quality and/or temperature in any of the streams located near the Project. Short term effects due to alteration of terrain have been minimized throughout the design of the project and are detailed in the Project design plans and the Alteration of Terrain Application (Appendix 2).

Many of the small headwater streams that will be crossed by the Project are intermittent and/or ephemeral in nature and have minimal water levels and the values of these water bodies are generally associated with support of aquatic life, wildlife, and limited recreational uses. Aquatic life and wildlife uses could be impacted in the immediate area of the culvert placement at each stream due to the altered nature of the new environment (i.e. within the culvert).

A culvert is a modified environment that may limit stream usage by some aquatic and wildlife species; however a culvert may create habitat for other species. Recreational uses will not be affected because the property is privately owned and because the small headwater streams do not offer much recreational opportunity. The Project should have no long term adverse effect on the water quality of these streams and may result in some improvements where a more stable road base and well-designed culvert replace existing skidder trails that are more prone to erode.

In 2012, the NHDES categorized all surface waters as Category 5 as a result of a statewide fish consumption advisory for mercury in freshwater fish (Edwardson, 2012). Fourteen impaired waters are located within one mile of the project site. All impairments are generated from regional pollutants as opposed to local pollutants. Wild Meadows Brook is considered impaired due to mercury in fish and caustic waters, defined by NHDES as a pH value lower than 6.5.

The design plan set for the Project incorporates best management practices (BMP's) which will be employed prior to and during construction to limit the mobilization of total suspended solid from disturbed terrain. BMP's are

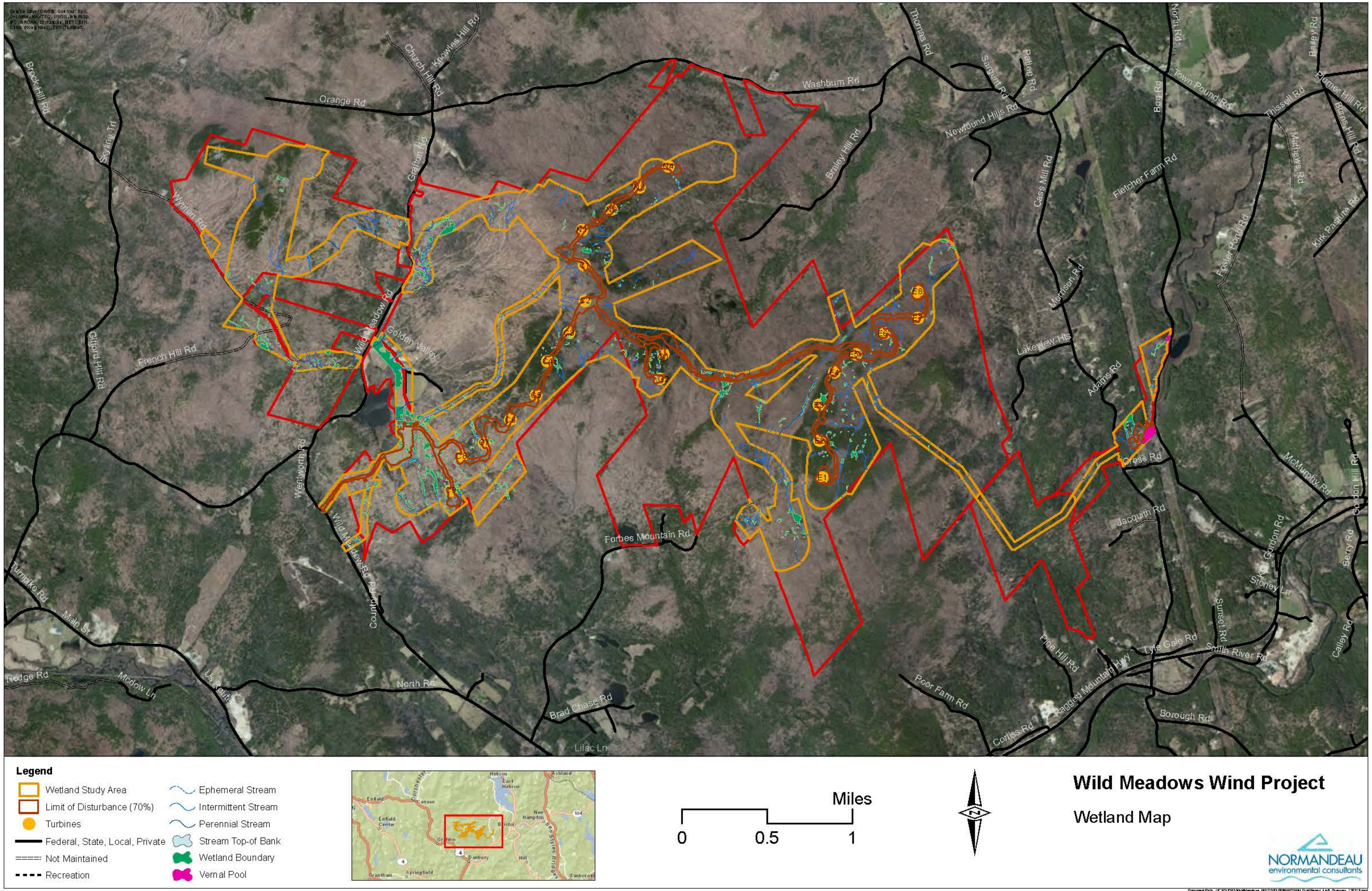

Figure 9: Wild Meadows Wind Study Area Wetlands Map

discussed in the above section on sediment and erosion control as well as in the Alteration of Terrain Permit Application (Appendix 2). All proposed measures were selected for their ability to be successful in projects characterized by steep terrain, shallow depth to bedrock and short growing seasons. Frequent monitoring of the performance of such devices will occur and corrective actions will be employed if necessary.

I.4.(b) Stormwater, soil erosion and sediment control

Background & Potential Effects

The Project will involve construction of approximately 9 miles of new gravel road, as well as the construction of the infrastructure for the support of the Project (turbine foundations, crane pads, material storage areas and operation & maintenance facilities) on an area that will occupy and disturb approximately 150 acres. During construction, the potential for erosion and sedimentation of waterbodies is increased as a result of alteration of the terrain. As described below the Project has been designed to minimize changes to natural flow paths so as to minimize impacts on the existing hydrology patterns, minimize erosive forces and retain favorable conditions for localized treatment of any stormwater that is generated on the site. Post-construction impacts are generally related to the intensity of use and thus the very low intensity of use of the proposed features (travel by maintenance personnel), combined with low generation of surface water runoff, is anticipated to have minimal adverse effect on receiving waters.

Study & mitigation

Stormwater runoff and erosion and sediment control have been addressed in NHDES Alteration of Terrain Application (Appendix 2) and summarized in the NHDES/USACE Wetland Permit Application (Appendix 1). The Alteration of Terrain Application contains a detailed set of Project plans for civil engineering measures to minimize and mitigate for any soil erosion due to stormwater generated by the Project. The Project will not significantly change the peak stormwater runoff discharge rates between the pre and post development conditions for the 2, 10, and 50 year storm events. The Project has been designed to minimize surface water and stormwater runoff impacts by maintaining natural drainage patters where possible through the use of culverts and subsurface stone drainage ways (stone mattresses). Design measures to protect surface water quality during construction of the Project have focused on control of erosion during construction through use of sediment barriers (such as siltsock and other permeable barriers consisting of bark mulch and stump grinding) and the use of soil stabilization measures including erosion control blankets, spray-on polymer emulsions, and prompt stabilization of exposed surfaces. Riprap aprons will be installed at the outlet end of proposed circular culverts to minimize the potential for erosion.

I.4.(c) Wetlands

Background and potential effects

Wetlands within an approximately 2,000 acre study area were delineated by NH Certified Wetland Scientists (NHCWS). A total of 455 wetlands (totaling approximately 70 acres) were delineated with the majority characterized as forested (47%), followed by emergent (21%) and various combinations of either emergent, forested or scrub-shrub (24%). Historically, a large percentage of the delineated wetlands have been impacted by logging, including the construction of haul roads and log yards, and log skidder operations. A qualitative assessment of 13 wetland functions and values on wetlands on the Project site found that many of the wetlands on site have limited functions due to their small size and disturbed nature. However, even the small wetlands provide for some functions such as groundwater discharge (seeps), wildlife habitat (including vernal pools), and sediment retention associated with historic and ongoing logging activities.

Study and mitigation

Despite the size and the linear nature of the Project, approximately 90% of the wetlands have been avoided with only 0.9 acres of direct permanent impacts to wetlands, and 0.5 acres of direct temporary impacts. These figures do not include impacts to streams (see above) or vernal pools (see below). The details of these impacts are reported in the wetlands permit application, which is included in Appendix 1 to this application. The majority of the direct permanent wetland impacts are small (average approximately 890 SF or 0.020 acres), as are the proposed direct temporary impacts (average approximately 400 SF or 0.009 acres). The average total size of the wetlands delineated within the wetland study area is nearly 6,700 SF for comparison. Nearly 70 acres of wetlands were delineated within the wetland study area and direct permanent impacts total only 1.3% of the total delineated wetland area. One of the most common impacts involves crossings of the numerous narrow forested drainages on the side slopes of the ridges associated with the Project. In these cases, the engineers have incorporated either small culverts or “stone sandwich” structures into the roadway which will allow water to continue to flow down the drainage as it currently does. This will help to minimize the potential effect on downslope wetlands.

The first step in mitigating impacts is to avoid and minimize impacts and this has been a key component of the design for this Project. The Project has worked with its engineers to make design changes to avoid proposed wetland impacts where possible. In addition, the Project has developed a mitigation plan for addressing unavoidable wetland impacts. For this Project, collaboration between the wetland scientists, the design engineers and other civil engineers was an ongoing and integral part of the design and helped to achieve dual Project goals, that of optimizing the roadway alignments and cross-sections to limit wetland impacts to the absolute minimum while maximizing adherence to the Applicant's design constraints and criteria.

The initial turbine and access road concepts were laid out conceptually by using National Wetland Inventory (NWI) wetland data, U.S. Geological Survey (USGS) topography, aerial orthophotos and other Geographic Information System (GIS) based data. The proposed location of the turbines on ridge lines avoids impacts to some of the larger forested wetland complexes and perennial streams located in the valleys, which are some of the most ecologically important wetlands on the Project site. Wetland scientists were dispatched to perform reconnaissance-level surveys of potential routes, and this information was utilized to further refine the layout and avoid impacts. New access roads have been located to avoid wetlands entirely or to cross wetlands at or near their narrowest points if they cannot be avoided. The width of access roads has been limited to the minimum required for construction access and safety. The roadway design uses sideslopes of 1:2 in rock cuts and 1.5:1 constructed stone slopes to further minimize slope impacts (1.5:1 slopes are the steepest non-mechanically stabilized earth slopes practical).

Given that the Project will occupy approximately 150 acres within the 4,930-acre Project leased area, and taking into consideration the type and scope of the Project, the permanent direct wetland impact of 0.9 acres is relatively minor and represents only 1.3% of the delineated wetlands in the Project area and only 0.1% of the total Project area.

Because the Project involves greater than 10,000 square feet of permanent impacts to wetlands, NHDES rules state that compensatory mitigation is required to offset these impacts. A mitigation assessment plan was prepared in consultation and conceptual discussions with representatives of NHDES, NH F&G, USEPA, USFWS, and USACE (see below).

I.4.(d) Mitigation plans

In designing the Project, the Applicant has worked to avoid and minimize water quality and wetlands impacts associated with the Project. The layout of the access roads and turbines has been continuously refined in an effort to avoid wetlands or cross them at or near their narrowest points if they could not be avoided. Roadways were designed such that an existing road will be used for access to the Project and existing undersized culverts will be upgraded. New roadways will be constructed at the minimum widths required to provide safe and adequate access during the construction phase and will be allowed to re-vegetate post-construction to reduce those widths. Appropriate stormwater pollution prevention and erosion control measures will be employed.

The important components of a compensatory mitigation parcel for this project were identified through agency discussions to aid Atlantic Wind in selecting a suitable site. To summarize, the parcel size should be large enough to adequately compensate for project impacts; include high value wildlife habitat; be in close proximity to existing conservation land; have a potential threat from development; have a willing landowner; have a willing easement holder; and be in close proximity to, or include portions of, the impacted lands. Atlantic Wind looked at several parcels within the unfragmented habitat block that surrounds the proposed project in an attempt to identify the best site. Three sites were identified that offered a range of beneficial components. The 223-acre Patten Brook parcel met agency approval and was taken forward for compensatory mitigation. Highlights of the site are that it:

- Includes sections of a large perennial stream Patten Brook which drains to Newfound Lake;
- Includes additional small perennial, intermittent and ephemeral streams, wetlands and at least one vernal pool;
- Contains several significant wildlife features, including a NHF&G-mapped deer wintering area and a bat hibernaculum listed by NHNHB;
- Approximately 25% of the site is modelled by WAP as Highest Priority Habitat in the State;
- Is connected at northwest corner to SPNHF's Forest's Butman parcel (486 acres). A 787-acre Forest Legacy Tract managed by NHDRED lies north of the Butman tract and approximately one-half mile north of the proposed Patten Brook parcel. When combined, the three parcels would create a 1496-acre bloc of conservation lands; and
- Is potentially subject to development threats along Washburn Road.

Atlantic Wind is proposing to protect the Patten Brook parcel through a conservation easement. The landowners, H & H Investments, Inc., have indicated their willingness to enter into negotiations to sell a conservation easement on the parcel. NHDRED's Forest and Lands Division has indicated a willingness to hold the easement. The details of the easement have yet to be negotiated but will be based on the components included in the easement template provided by NHDES. Atlantic Wind has agreed to provide the deed research and a full ground survey of the parcel boundary. Atlantic Wind's goal is to have the easement in place by May 2014, as stated in the Preliminary Mitigation Agreement between Atlantic Wind and NHDES signed by both parties.

The mitigation plan meets or exceeds applicable federal and state standards.

I.5. Natural environment

As noted in section H.4 of this application, the Applicant has met with both USFWS and NH F&G on multiple occasions to discuss pre-construction studies applicable to the Project site. Feedback was received from NH F&G and USFWS in 2012 following submittal of draft study plans and meetings, and ultimately incorporated into final study design. Atlantic Wind consulted with Normandeau Associates, Stantec Consulting, and New Hampshire Audubon to complete requested surveys. All reports, with the exception of any documenting ongoing efforts, were delivered to USFWS, NH F&G and USACE in October of 2013. Drafts of most of the reports were delivered to the agencies in September of 2012. Reports of ongoing studies will be delivered to the agencies upon study completion.

I.5.(a) Plants and trees

Based on aerial imagery it is evident that, even with extensive logging, the site remains primarily forested. However, due to the ongoing commercial logging, the pattern of forest canopy is continuously changing.

Plant community types were identified using data associated with the 2006 New Hampshire Wildlife Action Plan (NHWAP). Four mapped communities are located within the Project boundary: Northern Hardwood Conifer Forests; Lowland Spruce-Fir Forests; Hemlock-Hardwood-Pine Forests; and Grasslands. The percent of each of these cover types in the 1,610 acre limit of disturbance is summarized in Table 2.

Table 2: Plant Community Cover Types (from NHWAP)

Community Type	Site Acreage
Northern Hardwood–Conifer Forest	33.2
Lowland Spruce-Fir Forest	32.6
Hemlock-Hardwood-Pine Forest	28.8
Grassland	5.4

Source: NHWAP GIS database provided by NHFG.

Based on the NHWAP cover types, no wetlands are mapped in the roughly 1,610 acre envelope including and surrounding the Project Footprint. The field delineations results indicate that wetlands are present on-site, but as would be expected given the topography, they are generally small in size and comprise only a small portion of the cover. Palustrine forested wetlands, palustrine emergent wetlands, and intermittent/ephemeral streams account for the majority of the wetland cover in the surveyed area. Other wetland and water features observed include scrub-shrub wetland areas, vernal pools, and perennial streams. Wetland and stream abundance appears to be driven by recent forest management as well as topography.

1.5.(b) Wildlife

1.5.(b)i Birds and Bats

A variety of bird and bat field surveys were conducted within the Project Area in 2009, 2010, and 2011, with additional studies performed in 2013. These surveys were conducted by Stantec Consulting, with assistance from New Hampshire Audubon. Following the completion of the 2009-2011 field surveys, a bird and bat risk assessment was prepared using the results of on-site field surveys, information from literature review, agency consultation, regional surveys and databases. This risk assessment sought to characterize bird and bat use of the Project Area and assess potential risk presented by the Project to raptors, nocturnally migrating passerines, breeding birds, and bats. The risk assessment is attached as Appendix 40 to this application. The methods and results of the underlying field surveys are described in detail within five separate reports and are attached as appendices to this application. These reports include:

Appendix 41: Fall 2009 Radar and Acoustic Surveys;

Appendix 42: Spring 2010 Avian and Bat Survey Report;

Appendix 43: Northern Long-eared Bat Habitat Requirements, Literature Review and Annotated Bibliography

Appendix 44: 2010 Spring and Fall Raptor Migration Surveys

Appendix 45: 2011 Mist Net Survey Report

Rare, threatened, or endangered bird species that were documented in the Project area during these surveys include northern harrier (state- listed endangered) and bald eagle (state- listed threatened). No federally-listed threatened or endangered birds were observed during any of the field surveys; however one state special concern species was observed (American kestrel). No rare, threatened, or endangered bat species were confirmed present in the Project Area.

Nocturnal migration

During fall 2009 and spring 2010, Stantec conducted nocturnal radar surveys at the Wild Meadows Wind Project during the peak migration period. A full description of methods and results, including comparison with results from other projects, is available in Appendix 41 and 42, respectively. Overall, compared to other publically available radar surveys conducted on forested ridgelines in the northeast, fall radar surveys at the Project documented higher numbers of nocturnal migrants in the air space above the ridgelines whereas the spring radar surveys documented typical numbers of nocturnal migrants when compared to similar surveys. Although the seasonal mean passage rate during the fall survey was higher than similar surveys, the average nightly passage rates at the Project were within the range of those recorded for other publicly available studies. Project flight heights were similar to the results of nocturnal radar surveys conducted at other sites in New Hampshire. This pattern is similar across radar surveys in New Hampshire and the northeast, and suggests that birds may be moving across the state and region at similar heights and do not appear to be influenced by topography. Overall, this pattern suggests that factors influencing rates of nocturnal migration are occurring on a more regional scale than a project-specific scale.

Literature review suggests that, while impacts to nocturnally migrating birds occur at most wind energy facilities, very small numbers of birds have collided with turbines relative to the large numbers of nocturnally migrating songbirds. The results of the Bird and Bat Risk Assessment, which followed a standardized weight of evidence approach and included a detailed information review as well as incorporated the results of on-site field surveys, predicted a low magnitude of potential impact to nocturnal migrants.

Breeding birds

In general, species documented in the Project area were typical of the moderate elevation northern hardwood forests that dominate the Project area. Among the most common species were dark-eyed junco (*Junco hyemalis*), ovenbird (*Seiurus aurocapillus*), and chestnut-sided warbler (*Dendroica pensylvanica*). No state or federally- listed species were observed during the breeding bird surveys.

Generally, direct and indirect impacts to breeding birds at the Project are expected to be limited to a small amount of collision mortality and slight shifts in the distribution of breeding bird species within the Project area. Because many of the common species in the Project area are edge-associated species that typically inhabit areas with human activity, many breeding bird species are expected to become habituated to the presence of the turbines, thereby minimizing displacement and other indirect impacts.

The results of the Bird and Bat Risk Assessment, which followed a standardized weight of evidence approach and included a detailed information review as well as incorporated the results of on-site field surveys, predicted a low magnitude of potential impact to breeding birds.

Raptor migration

Species observed most frequently during the spring and fall migration surveys were turkey vulture (*Cathartes aura*), red-tailed hawk (*Buteo jamaicensis*), and broad-winged hawk (*Buteo platypterus*). Of the 266 total raptor observations made during the spring survey, 174 (65%) observations occurred within the Project area. One bald eagle (*Haliaeetus leucocephalus*;

state threatened) was observed during the spring surveys but did not fly within the Project Area. Two state species of special concern (American kestrel (*Falco sparvarius*), osprey (*Pandion halietus*)), were observed during the surveys. None of the American kestrels observed were within the Project area. Ten of the 14 ospreys observed were in the Project area.

Of the 346 raptor observations made in the Study Area during the fall surveys, 71% (n=244) occurred within the Project area. Four species of conservation concern were observed during the fall 2010 surveys: state endangered northern harrier (n=2), state threatened bald eagle (n=7), state species of special concern osprey (n=12), and state species of special concern American kestrel (n=7). Six of the bald eagle observations occurred within the Project Area, one of the northern harrier observations occurred in the Project Area, 11 of the osprey observations occurred in the Project Area, and three of the American kestrel observations occurred in the Project Area.

The results of the Bird and Bat Risk Assessment, which followed a standardized weight of evidence approach and included a detailed information review as well as incorporated the results of the Wild Meadows on-site field surveys, predicted a low magnitude of potential impact to raptors.

Resident Bats

On-site field surveys designed to assess bat presence and activity in the Project Area consisted of acoustic bat surveys in the fall of 2009 and the spring/summer of 2010, and 10 days of mist nest survey on some of the Project Area ridge lines conducted in 2011. Methods and results are discussed in detail in Appendices 41, 42, 43 and 45, respectively. The acoustic bat survey results documented variable bat activity patterns in the Project Area, including differing species composition and activity levels between ground-level and met tower detectors, variability in activity levels between detectors and nights, and seasonal patterns in activity levels. These results were similar to those documented in other acoustic bat surveys conducted in the northeast. A single bat was captured during the mist net survey.

The Bird and Bat Risk Assessment concludes that potential impacts to bats at the Project likely will follow patterns similar to those documented at other facilities, particularly those in New England. In general, rates of collision are low at existing, operational facilities in New England, and consist principally of collision mortality during the spring and particularly the fall migration seasons. Long-distance migratory species appear to be more vulnerable to collision mortality than other species, based on available post-construction survey results, and were well represented in the results of acoustic surveys conducted for the Project. The risk assessment ultimately concludes that the Project will not have an unreasonable adverse impact to bats.

The only state-listed bat species that may occur within the vicinity of the Project is the small-footed bat, but the northern long-eared bat, which was recently proposed for listing by the USFWS, may also occur in proximity to the Project. Species within the genus *Myotis*, including both the eastern small-footed bat (*M. leibii*) and the northern long-eared bat (*M. septentrionalis*), are not distinguishable from each other based on acoustic surveys, and mist net surveys did not capture either of these species within the Project area. Based upon these surveys, it cannot be conclusively determined if either of these species are present in the Project area. However, both species are thought to primarily feed and fly below the tree canopy and collision mortality is not expected to constitute as great a risk to these species in comparison to migratory species.

Indirect impacts to bats are expected to be minor at the Project, given the relatively small amount of anticipated clearing and the currently disturbed nature of many habitats within the Project area.

1.5.(b)ii Post-Construction Monitoring

After the Project commences operations, Atlantic Wind will commit to one year of formal post-construction monitoring similar to efforts completed at both the Lempster and Groton including searcher efficiency, scavenging removal rates, and habitat analysis. Appendix 46 contains the Study Plan for Post-Construction Monitoring Surveys that was prepared for the Project and submitted to applicable agencies for review and approval. The study will be performed by a qualified third party consultant with experience conducting transect based post-construction studies at wind facilities. The study will cover both spring and fall migration seasons for both birds and bats. The results will be made available to USFWS and NHFG. If, after one year of study, the Project's mortality rates are lower or within the range of other Northern Forested wind project locations, Atlantic Wind will immediately implement yearly monitoring for the life of the Project as described in the Iberdrola Renewables Avian and Bat Protection Plan discussed in Section H.4. This includes training operations staff on a Wildlife Reporting and Handling System for avian and bat casualties or injured wildlife found by Project personnel throughout the life of the Project. If, after the first year of study, Wild Meadow Wind's mortality rates exceed the most current established threshold ranges for mortality at wind projects on northern forested ridges, Atlantic Wind will conduct a second year of post-construction monitoring similar to the first but with an emphasis on determining why mortality rates have exceeded estimated thresholds. These results will also be reviewed by USFWS and NHFG.

I.5.(b).iii Other wildlife

A Wildlife Habitat Assessment was conducted on the Project site to address the overall value of habitat in the project Area to wildlife in general (Appendix 24). A remote camera survey was also conducted to determine specifically if American marten are present in the Project Area (Appendix 47).

The habitat present in and around the proposed Wild Meadows Wind Project is typical of New Hampshire's Central Highlands region, and consists of cover types that are common throughout this region of the state. The bird, mammal, amphibian, and reptile species observed on-site were also commonly occurring species, typical of forested habitats in central NH. Because of the ridgeline topography and steep slopes, streams in the project site are predominantly ephemeral and intermittent and wetlands tend to be small, encompassing a relatively small portion of the overall acreage of the project site. Although vernal pools are present throughout the site, they are not abundant and also tend to be small. Rocky outcrops are present in numerous locations along the ridgelines within the Project Footprint, and provide a small amount of a relatively unique habitat type.

Based on field observations and the NH Wildlife Action Plan habitat rankings, the habitat quality of the unfragmented forested block in which the Project is proposed is relatively high for wildlife species commonly associated with northern hardwood-conifer forest types, especially those that benefit from a mosaic of hardwood forest age classes. Due to the logging activities, forest stands in and around the site exhibit a wide range of age classes from recently cut to young and mature second growth. Most stands include some large diameter trees, creating a diversity of habitat conditions which can in turn support a diversity of wildlife species.

The predominant forest habitat types in and around the project are a mosaic of age classes and disturbance regimes, and the species that use this habitat are largely adapted to these conditions. Therefore, neither the construction-related nor operations-related impacts associated with the project are expected to significantly reduce the habitat value of the project area for the wildlife species known or likely to be present. In general, while the proposed project may cause the temporary or permanent displacement or mortality of some individual animals, it is not expected to have a population level effect on species known to be present in the region.

Per written correspondence received from the NH Natural Heritage Bureau and field surveys, there are no known state or federally-listed species within the Project limits, nor are there any exemplary natural communities occurring within or in close proximity to the Project area. However, the Natural Heritage Bureau data does indicate there are populations of a sensitive state-threatened plant species and an area of sensitive wildlife habitat in the vicinity of the site. Both habitats are over 1,000 feet from the nearest project-related disturbance and neither will be affected by the proposed project.

Vernal pools

For four consecutive field seasons, beginning in May of 2010 and concluding in May of 2013, the study area was surveyed for vernal pools in a systematic manner by a team of field biologists during the spring, typically between mid-April and May 30. Each potential vernal pool encountered was visually inspected for egg masses and/or larvae of amphibian vernal pool indicator species. A dip net was also used to survey for amphibian larvae and invertebrates. Vernal pools were identified in accordance with the NHDES Wetland Rules (Env-Wt) 101.99 and Env-Wt 301.01, and procedures described in *Identification and Documentation of Vernal Pools in New Hampshire*, 2nd Ed. 2004, published by the New Hampshire Fish and Game Department.

Primary and secondary vernal pool indicator species were identified as described in Env-Wt 101.71 and Env-Wt 101.82, respectively. Under these rules, primary vernal pool indicators refer to: "*the presence or physical evidence of breeding by marbled salamander (Ambystoma opacum), wood frog (Rana sylvatica), spotted salamander (Ambystoma maculatum), Jefferson-blue spotted salamander complex (Ambystoma jeffersonianum/A. laterale complex), or fairy shrimp (Eubranchipus sp.)*". [Env-Wt 101.71]

Secondary vernal pool indicators are: "*physical evidence used by wildlife biologists or certified wetlands scientists who are familiar with vernal pool habitats as evidence of the presence of a vernal pool, if primary vernal pool indicators are absent and other vernal pool characteristics suggest vernal pool habitat. Secondary vernal pool indicators include, but are not limited to, caddisfly larvae and cases (Limnephilidae, Phyrganeidae, or Polycentropodidae), clam shrimp and their shells (Laevicaudata, Spinicaudata), fingernail clams and their shells (Sphaeriidae), aquatic beetle larvae (Dytiscidae, Gyrinidae, Haliplidae, and Hydrophilidae), dragonfly larvae and exuviae (Aeshnidae, Libellulidae), spire-shaped snails and their shells (Physidae, Lymnaeidae), flat-spire snails exuviae (Coenagrionidae, Lestidae), and true fly larvae and pupae (Culicidae, Chaoboridae, and Chironomidae).*" [Env-Wt 101.82]

After field data collection was completed, all of the vernal pool resources were ranked according to habitat value. This ranking system was developed by Normandeau staff based on published resources and assesses the presence of biological indicators, estimated hydroperiod, and landscape position.

A total of 97 vernal pools were identified within the approximately 2,000 acre wetland study area from May 2010 to May 2013 (see Appendix 1 for more details). The majority of the vernal pools are man-made (48 pools, or 49%) or influenced by anthropogenic activities (22 pools, or 23%) with 27 pools (28%) considered natural. This is consistent with the level of disturbance observed within the study area associated with current and historical logging activity. Twelve (12%) of these pools are ranked as highest value (A) pools, 43 (44%) are ranked as intermediate value (B) pools, and 42 (43%) are ranked as least value (C) pools. Wood frogs, spotted salamanders and Jefferson/blue-spotted salamander hybrids were the only primary vernal pool indicators identified. Several secondary indicators were also observed within many pools, including caddisfly, true fly and aquatic beetle larvae. American toads, red efts and green frogs were other amphibians encountered in the vernal pools that are not regarded as vernal pool obligate species. The highest value pools were primarily natural depressions, or in one case, a man-made excavation. Many of the least value pools occurred in manmade depressions (skidder ruts, drainage features).

Direct impacts to 96% of the delineated vernal pools were avoided, and unavoidable impacts were minimized as described above for surface waters and wetlands. Direct and secondary impacts to all of the highest value (A) pools were successfully avoided, while some direct or secondary impacts to three intermediate value (B) and three least value (C) pools were unavoidable; proposed direct permanent impacts to vernal pools total only 1,251 SF, or 0.029 acres. The effects of the project on vernal pool amphibians are expected to be relatively low, given the project design and operation. Once construction is complete, the access roads will be between 16 and 22 feet wide, gravel, and with no barriers to passage except in areas of steep cuts and fill, where stone riprap may inhibit some species. Vernal pool amphibians are expected to readily cross these roads during migrations to and from breeding pools. Additionally, traffic will be very light, limited to 1 or 2 vehicles on most days and virtually none at night, which will minimize mortality of amphibians crossing the roads. Water quality deterioration is another development threat to vernal pools which is unlikely at Wild Meadows due to the multiple design features to stabilize slopes during construction, and to minimize concentrated flows and treat runoff from the roads and turbine pads.

I.6. Public health and safety

Iberdrola Renewables is a responsible renewable energy developer and owner and works very hard to prevent any negative environmental, health or safety impacts to the communities and residents where it constructs and operates its wind plants. Iberdrola Renewables strives to proactively deal with all concerns during the development, siting, permitting and construction process. The company also operates its wind facilities under prudent wind practices. Iberdrola Renewables has received many accolades from communities around the country recognizing Iberdrola Renewables' good working relationships with these communities and residents to develop, construct, and operate wind plants, and its responsiveness to concerns.

Iberdrola Renewables holds itself and its employees to a very high standard of safety and all construction general contractors are required to meet strict safety qualifications. The company has a very good environmental, health and safety (EHS) record. With its underlying supporting EHS and training programs, Iberdrola Renewables approach and culture is captured by the title of its EHS Policy: "People & the Environment First"(Appendix 48). Iberdrola Renewables' safety record is among the industry's best and incident rates are trending lower due to planning, training, and supervision. As an example of the Iberdrola Renewables' safety record, the injury rates for both construction and operation of our plants are significantly below industry averages and are trending downward. This is due to a fully supported training and integrated safety program. All Iberdrola Renewables' wind technicians receive training on technical qualifications for their jobs and are well prepared for emergencies. All technicians are trained in tower rescue, First Aid and CPR. Crews are equipped with tower rescue equipment, first aid kits, automatic external defibrillators, and company vehicles are equipped with fire extinguishers. Iberdrola Renewables has enjoyed excellent relationships with local emergency services personnel, and periodically meets and drills with them to be proactive on safety issues and to inform them about the wind business and safety hazards associated with electricity. Iberdrola employees at the Lempster Wind Farm also serve in the Town's volunteer fire department. Iberdrola Renewables also ensures that its landowners are educated on safety issues related to the wind plant and construction, and all plants are constructed in accordance with applicable standards. The Company Safety Director, Gary LeMoine, has served as the Vice Chairman of the American Wind Energy Association (AWEA) Safety Committee for 3 years, and has presented numerous times at conferences on safety in the wind industry, including emergency preparedness and public safety. He recently received the AWEA Operations Award at the National Wind Power Conference for his leadership for safety in the Wind Industry.

Atlantic Wind will construct and operate the Project consistent with Iberdrola's corporate commitment to meeting all applicable state and federal requirements, including OSHA safety regulations. During construction and before the Project is fully operational, each turbine and all electrical equipment will be inspected under rigorous testing and commissioning procedures. In addition, prior to activating the electrical lines, the interconnecting utility will also perform and require inspections, testing, and commissioning documentation for grid and system safety. This process is also coordinated through regular conference calls with the ISO-NE and local utilities.

Atlantic Wind will work with local fire departments to notify them of construction plans, provide site visits to review the location of and access to Project facilities and emergency response procedures, and mutual assistance in the case of fire or other emergency in or around the Project area. Typically, projects establish a 911 address for each building and turbine during construction, and work with local responders to identify access points, and Atlantic Wind intends to do this. In addition, Atlantic Wind will enter into an agreement with the Towns of Danbury and Alexandria that addresses issues related to public health and safety (Appendices 7 and 8).

Communications Safety

Atlantic Wind has studied the potential impacts of the project on local microwave bands and communications towers. Microwave bands are the telecommunication backbone of the country, providing long-distance and local telephone service, backhaul for cellular and personal communication service, data interconnects for mainframe computers and the Internet, network controls for utilities and railroads, and various video services. A site-specific obstruction analysis was performed using Comsearch's proprietary microwave database, which contains all non-government licensed, proposed and applied paths from 0.9 - 23 GHz (Appendix 49). The Comsearch study identified six microwave paths intersecting the Project area of interest. The Fresnel Zones for these microwave paths were calculated and mapped in order to assess the potential impact from the turbines. A total of 23 turbines were considered in the analysis, each with a blade diameter of 112 meters and turbine hub height of 94 meters. Of those turbines, none were found to have potential obstruction with the microwave systems in the area. Additionally, an enhanced tower structures review was performed using a variety of sources including the FCC's Antenna Structure Registration (ASR) database, Universal Licensing System (ULS), national and regional tower owner databases, and the local planning and zoning boards (Appendix 49). The review revealed that no tower structures or communication antennas are located within the wind energy area of interest. An extended search on the broadcast antennas revealed no AM, FM and TV stations within four kilometers of the project area. The nearest tower structure identified was located approximately five kilometers from the AOI border. It is owned by American Tower Corporation and serves wireless communication operators in the area. The study concluded that no communications towers or antennas will be impacted by the Project.

I.6.(a) Ice shed

Icing conditions have been known to occur during certain winter conditions of temperature and precipitation. On all Iberdrola Renewables turbines sited in cold weather climates, nacelle-mounted anemometers are heated and provide accurate wind speed information during all weather conditions. Ice build-up on the blades degrades the airfoil profile and causes a reduction in aerodynamic lift, and thus, a reduction in power. Continued ice build-up further disrupts airfoil performance and eventually leads to minimal or no power production, even in adequate wind conditions. The turbine power curve program identifies an inconsistency between the wind speed, expected power production and RPMs, and automatically switches the turbine into standby mode when the generator falls below 850 rpm.

Project access roads will have visible signs warning of the danger of potential falling ice.

I.6.(b) Lightning strikes

Due to the height of the turbines and their metal/carbon components, lightning strikes can occur. The Vestas V112 turbines proposed for the Wild Meadows Wind Project include lightning protection systems which protect against blade damage. These systems rely on lightning receptors and diverter strips in the blade to provide a path for the lightning strike to follow to the grounded tower. The turbine monitoring system provides documentation of all critical lightning events and if a problem is detected, the turbine will shut down automatically or, at a minimum, be inspected to assure that damage has not occurred.

Iberdrola Renewables has an extensive grounding system that includes an engineered and tested grounding grid at each turbine foundation. Upon completion, there will be an underground collector system that also serves to dissipate the effects of lightning.

I.6.(c) Tower collapse/blade throw

Failures causing the collapse of blades or towers are rare for modern wind turbines. Technological improvements and mandatory standards during turbine design, manufacturing, and installation have largely reduced such occurrences.

Atlantic Wind will construct and operate the Project consistent with its corporate commitment to meeting all applicable state and Federal OSHA safety regulations. In addition to compliance with the design specifications and construction standards noted in section F.5.a, each turbine is certified according to international engineering standards. All electrical equipment will be inspected by Iberdrola Renewables under rigorous commissioning procedures, as well as by the local utilities (for grid and system safety), prior to being brought on line. Once turbines are commissioned, qualified personnel routinely inspect and repair them as necessary pursuant to preventive maintenance schedules. The V112 turbines proposed for the Wild Meadows Wind Project have state of the art braking systems, pitch controls, sensors and speed controls that operate to reduce the risk of overspin which can lead to blade and or tower failure. Additionally, the turbines cease operation if significant vibrations or rotor blade stress is sensed by the blade monitoring system. In the unlikely event that tower collapse or blade failure occur, site personnel would immediately call appropriate local emergency response personnel.

In normal operating conditions, the wind turbine uses the blades as an aerodynamic brake when it is necessary to stop rotation. The pitch control system makes the blade turn around its longitudinal axis in order to adjust the blade's angle of attack to the wind. The system operates as the primary brake system by turning the blades to a 90° position. The control system only applies the mechanical brake when the rotor has stopped.

The mechanical brake consists of a disc brake, which is mounted on the high-speed shaft of the gearbox and brakes using three hydraulic calipers, powered by the main hydraulic unit. The fundamental function of the brake is to serve as a parking brake, being applied once the machine has been brought to a halt by the aerodynamic brake.

I.6.(d) Stray voltage

While concerns of stray voltage are legitimate, it is important to note that it stray voltage is largely preventable with proper electrical and grounding practices. A grounding study as well as step and touch calculations will be conducted. The Wild Meadows Wind Project's collection system will be engineered, tested, and properly grounded and will not be connected directly to the local electrical distribution lines that provide electrical service to local residences. In addition, because interconnection lines and substations are designed in accordance with local utility regulations, it is unlikely that the Project poses any risk to the public's health or safety as the result of stray voltage.

I.6.(e) Fire

Prior to operation, each turbine and all electrical equipment will be inspected under rigorous commissioning procedures, as well as by the utilities (for grid connection and protection system safety). During operations, qualified personnel will routinely inspect equipment in accordance with preventive maintenance schedules.

The Vestas V112-3.3 MW turbines have been carefully designed with multiple engineering and technological features specifically designed to minimize the risk of fire, and furthermore, have advanced systems built-in to detect and extinguish any that do occur. Appendix 16 provides a detailed description of the measures that have been incorporated into the design of the Vestas V112-3.3 MW machine to minimize the risk of fire.

The on-site Operations and Maintenance Building staff is described in section H.5.b. In addition to the on-site staff, the Project is continually monitored 24 hours a day 7 days a week by the Iberdrola Renewables National Control Center located in Portland, Oregon. There is a secondary backup location for monitoring in Scottsdale, AZ and a final backup in Madrid, Spain.

Although an extremely unlikely event, if a fire were to occur inside the nacelle it would be detected by the SCADA system which would 1) automatically shutdown the turbine including all high-voltage within the turbine, and 2) report the problem to both the O&M Building and the Operations Center in Portland Oregon. Project maintenance personnel would immediately notify local officials and respond as appropriate, pursuant to Atlantic Wind's detailed emergency procedures that address response to fire or other emergency situations. Power to the section of the Project with the turbine fire would be disconnected.

Other applicable fire laws and regulations will be followed in accordance with state and local requirements.

I.6.(f) Aviation safety

Atlantic Wind will comply with all applicable FAA requirements. Preliminary turbine layouts were submitted to the FAA in August 2012 for a determination if the proposed turbines will cause a hazard to aviation or infringe on federally-protected airspace. In October of 2012, Atlantic Wind received FAA study notification on all preliminary turbine locations. The Project has since been revised, and the overall number of turbine locations was reduced. The Project re-filed the new locations in September 2013. The studies can be found in Appendices 13 and 14.

As mitigation for any risk the Project poses to aviation, and in accordance with federal regulations, Atlantic Wind will illuminate some of the turbines as directed by FAA requirements for obstruction lighting or marking of structures over 200 feet above ground surface (US DOT FAA Advisory Circular 70/7460-I K dated 2/1/2007). The FAA's guidance (DOT/FAA/AR-TN05/50 dated 11/05) on standards for obstruction lighting for wind turbine farms requires lighting the Project as one large obstruction with lights spaced approximately 3,000 feet apart, rather than lighting every structure over 200 feet in height. The FAA has determined that the standard turbine color is sufficient daylight marking and white strobe lights will not be utilized. As a result, wind farms are typically lit with synchronized red flashing lights at night and only a subset of the turbines are lit.

During the various meetings that Atlantic Wind has held with Towns, stakeholders, and non-government organizations, the concept of radar activated lighting to minimize the activation of nighttime visual lighting aids has been raised. In response to these concerns, Atlantic Wind proposes the installation and implementation of a radar activated lighting system at the Wild Meadows Project. Installation would be conditioned upon site-specific approval by the FAA of the use of such technology for the Wild Meadows Project, and upon determination of its efficacy with the successful implementation of such a system at a wind facility operating in the U.S. for a time period of no less than one year. Atlantic Wind proposes to implement radar activated lighting technologies at Wild Meadows within one year of the completion of these milestones.

As preliminarily designed, approximately 13 of the turbines will be lit utilizing the proposed radar activated system. The permanent meteorological tower will also be lit in accordance with FAA guidance, if required.

I.6.(g) Sound

Atlantic Wind conducted a sound level assessment which included a sound-monitoring program to determine existing sound levels in the vicinity of the Project, computer modeling to predict future sound levels when the wind turbines are operational, and a comparison of the maximum operational sound levels associated with the wind turbines to relevant criteria. A copy of this analysis is included as Appendix 50.

A comprehensive two-season sound level measurement program was conducted to characterize the existing acoustical environment under varying wind conditions in the vicinity of the Project. Current sound sources include: traffic on local roads and pathways, birds and other wildlife, aircraft flyovers, logging activities, residential maintenance activities, running water, rustling vegetation, wind, and insect noise (summertime only). The ambient sound level survey was conducted at nine (9) representative locations to characterize the current acoustical environment under varying wind conditions at the properties. During the summertime monitoring program, approximately 20 days (480 hours) of ambient sound level measurements were collected between Tuesday, July 3, 2012 and Sunday, July 22, 2012. Continuous broadband (A-weighted) sound level measurements were made at all eight locations (L1, L2, L3, L4, L5, L6, L8, L9), with 1/3 octave-band sound level statistics collected at two locations (L3 and L5). Ground-level wind speeds were continuously measured and logged at three locations (H1, H3, and H6), with temperature, relative humidity, and precipitation collected at one location (H3). During the wintertime monitoring program, approximately 23 days (550 hours) of ambient sound level measurements were collected between Monday, December 3, 2012 and Wednesday, December 26, 2012. Continuous broadband (A-weighted) sound level measurements were made at six locations (L1, L3, L4, L5, L6, L9), with 1/3 octave-band sound level statistics collected at three locations (L3, L5, and L9). Ground-level wind speeds were continuously measured and logged at two locations (H1 and H3).

Sound effects associated with all 23 proposed wind turbine generators were modeled at 741 of the closest structures using Cadna/A noise calculation software. Maximum operational sound levels at all of the closest year-round occupied residential receptors are predicted to be equal to or less than 40 dBA. There are no federal or existing local noise regulations that apply to this project. However, the results of this sound level impact assessment show that the Project will easily comply with recent NH SEC approvals for comparable wind turbine projects in New Hampshire, (including the Lempster and Groton Wind Farms), community noise guidelines published by the World Health Organization, and noise guidelines put out by the US Environmental Protection Agency.

An evaluation was also performed to assess tonality and low frequency sound with respect to Project operation. No prominent discrete tones were identified in the sound power level spectra for the Vestas V112-3.3 MW unit, or in the calculated received sound pressure levels at the closest year-round occupied residential receptor to the Project. Low frequency sound levels at all receptors are also well below the recommended criteria to avoid disturbance indoors as well as any potential vibration and rattle.

The SEC has previously evaluated claims of health effects as a result of operational wind turbines, and found those claims to be baseless.

In the Groton SEC decision[17], the Committee concluded:

"The existence of Wind Turbine Syndrome has not been scientifically established and the Intervenors [sic] have not pointed us to any specific characteristics of this Project that are likely to cause the constellation of symptoms which the Intervenors allege establish this "syndrome".

In the Granite Reliable SEC decision, the Committee did not even reference "wind turbine syndrome" claims.

In the Lempster SEC decision[18], some interveners made claims of wind turbine "harmonic beating" and effects on human health. The Committee concluded:

"The Committee finds, based on the record, that the project is unlikely to create the harmonic beating effect suggested by the consolidated interveners."

In the Antrim SEC decision[19], the SEC concluded:

"The Subcommittee also agreed that there was insufficient data to determine that the turbines will emit low frequency inaudible or infrasound that would cause harm to human health."

Several reports and studies have been conducted over the past several years specific to health effects as a result of noise as well. Studies reviewed included: a Wind Turbine Health Impact Study commissioned by the Massachusetts Department of Environmental Protection and the Massachusetts Department of Public Health (Appendix 51); a summary of the main conclusions reached in

[17] *Decision Granting Certificate of Site and Facility with Conditions*, New Hampshire Site Evaluation Committee, May 6, 2011, Docket No. 2010-01. At p. 82

[18] *Decision Issuing Certificate of Site and Facility with Conditions*, New Hampshire Site Evaluation Committee, June 28, 2007, Docket No. 2006-01. At p. 45

[19] *Decision and Order Denying Application for Certificate of Site and Facility*, April 25, 2013, New Hampshire Site Evaluation Committee, May 6, 2011, Docket No. 2012-01. At p. 68

nineteen review of the research literature on wind farms and health (Appendix 52); a review of turbine noise and possible health effects conducted by the Dr. Dore Anne Mills, head of the Maine Center for Disease Control within the Department of Health and Human Services; a report prepared by the Chief Medical Officer of Health (CMOH) of Ontario, Canada; and a study commissioned by the American Wind Energy Association and Canadian Wind Energy Association entitled Wind Turbine Sound and Health Effects – An Expert Panel Review (Appendix 53). These reports are consistent with the evaluation and findings of the SEC stated above.

I.6.(h) Mitigation

Setbacks/gates/signage

The Wild Meadows Wind Project has been designed such that its setbacks from residences, roads, and utilities will protect the public's health and safety by allowing ample space for the safe construction and operation of the facility. The equipment proposed is proven reliable and held to the highest international standards of quality, and will be operated and maintained by a highly trained locally based operations team. As discussed above, the design and installation of the equipment, as well as the overall configuration of the Project facilities, guards against danger to the public from ice shedding, lighting, tower collapse, blade throw, stray voltage, fire, aviation and noise. Construction and operation of the Project will have minimal impacts on the public health and safety of the local populace.

As previously noted, the entire Project is located on private land. There will be no public access to the construction site. Access roads going into the Project site off of Wild Meadow Road will be gated and locked. Additionally, gates will be installed to control access at other points where necessary.

Agreements with Towns of Danbury and Alexandria

Appendices 7 and 8 to the Application contain the Applicant's draft proposed agreements with the Towns of Danbury and Alexandria. As the agreements indicate, among the steps that the Project will take to address the Town's health and safety concerns are site security and access limitations, communications and reports to the Town, emergency response and coordination, use of public roads, construction period protocols, sound restrictions, setbacks, and decommissioning.

J. Effects of the Facility on the Orderly Development of the Region; Estimate of Impacts of Construction and Operation of the Facility Local Land Use

J.1. Local land use

The Project's impacts on local land use during construction and operation of the Project are expected to be minimal. The Project Site is used primarily for timber harvesting. Other uses in the nearby area include sand and gravel excavation, seasonal camping, tourism, wood products (chips, pellets, logs); commercial enterprises along NH Routes 4 and 104, some scattered agricultural activity, residential areas, and undeveloped forest.

J.1.(a) Commercial timber

The site is privately owned by forest product companies and is primarily undeveloped. It is home to an on-going commercial timber harvesting operation. The area has been actively harvested for timber since the 1800's, and commercial timber operations have owned the parcel continuously since the 1940s.

J.1.(b) Outdoor recreation

The site is privately owned and public access for portions is by written permission of the landowners. Gates restrict public access to the site at Wild Meadow Road. Some recreational activity occurs on the property at the discretion of the landowners. This includes hunting, off-road vehicle riding, and snowmobiling. The proposed Project will not have any effect on the manner in which the landowners allows public access to the site, except for safety limitations on public access to wind turbine facilities.

J.1.(c) Motorized trail

There is an extensive network of logging roads and skidder trails throughout the site; however motorized vehicle uses are restricted by the landowners and access is controlled with gates, barriers, and other measures where possible. Some of these trails are utilized for motorized recreational vehicles at the invitation of the landowner. The NH Trails Bureau has identified one snowmobile trail on the property, which would cross the project in the vicinity of turbine N-1. Unofficial local trail use is also possible, but is not of mapped or signed trails that have approval. The Project will work with the Trails Bureau and local clubs to minimize temporary impacts on use of snowmobile trails.

There are also a number of informal non-motorized trails within the Project area which are used for hiking and occasionally horseback riding. Such use is at the discretion and permission of the landowners. No portion of the site is mapped for recreational hiking trails by outdoor recreational organizations.

J.2. Local economy

J.2.(a) Economic effects

Atlantic Wind commissioned a study on the economic impact of the Project. This study was conducted by Professor Neil B. Niman of the UNH Peter T. Paul College of Business and Economics and can be found in Appendix 11. To evaluate the economic impact of the project, IMPLAN –based multipliers were constructed for the local economy.1 In conjunction with the widely used JEDI spreadsheet tool, customized project data based on proprietary information was used to estimate economic impacts.

These impacts were divided between the construction and operational phases of the project. During the construction phase of the project, it is estimated that $42.35 million dollars of local in-state economic activity will be created. Constructing the project will require the use of 404 full time equivalent employees who will earn $21.77 million dollars in income.

During the operational phase of the project, the total number of full time equivalent jobs created after accounting for both direct and indirect impacts is 13 leading to an increase in annual local incomes by $770,000. This will contribute to an annual level of economic activity estimated at $2.31 million dollars.

In addition to the benefits identified by regional economic modeling is the contribution of the project toward meeting the State of NH's targeted goal of achieving 25% of its electricity from renewable sources by 2025. It will either increase the availability of renewable energy which will lower the price of Renewable Energy Certificates (RECs) or will enable those New England States that have Renewable Portfolio Standards (RPSs) to more quickly meet their targeted goals at the same price. The project also affords the potential for significant local property tax reduction or a substantial upgrade in local services; either should have a positive impact on local property taxes.

The construction and operation of the Groton and Lempster Wind Projects have demonstrated the economic benefits of wind farms can bring to New Hampshire. Many local businesses in the Groton, Plymouth, Rumney, Lempster, Goshen, and Newport area reported that during construction of these projects, they enjoyed substantial increases in sales as a result of wind farm construction labor and materials. From local restaurants and hotels, to labor and materials, these projects injected substantial amounts of money into the local economy. The projects are also a significant source of local revenue to landowners and to the Towns, providing a substantial amount of the Town's total revenues.

The benefits from the Project to the state are clear. The positive economic impacts will be large and continue throughout the life of the project. The benefits to the host communities are equally impressive. With a small commercial tax base, both Alexandria and Danbury will receive substantial payments in lieu of taxes that can be used to reduce already high property taxes or improve/expand municipal services. While alternative investments may exist for some areas, , for these two municipalities, it is the best opportunity for reducing the tax burden on already stressed homeowners.

J.2.(b) Property values

Atlantic Wind commissioned a study to determine the potential effect of the Wild Meadows Wind Farm on local real estate values, and has also studied the effects of the operational Lempster Wind Farm on local residential property values in its surrounding towns (Appendices 54 and 55). As the number of wind farms increase in New Hampshire, an area of concern has been whether there are any potential effects on the values of residential properties that are located in close proximity to or that have significant views of wind turbines.

This study conducted the following research.: 1) reviewed relevant research on the relationships between wind farms and residential property values, 2) analyzed post-construction property transactions in the communities around the Lempster Wind Farm from November 2008 through July 2013, 3) analyzing post-construction property transactions in the communities around the newly-constructed Groton Wind from December 2012 through July 2013, and 4) analyzed town and county property assessment data.

Since the completion of these two wind farms in New Hampshire, there have been 132 arms-length single family home property transactions at a value of $22.5 million in the immediate communities surrounding the wind farms. Over a four year period following the construction of the Lempster Wind Farm there have been 102 arms-length single family home property transactions in the towns of Goshen, Lempster and Washington totaling $16 million. During the eight-month period following the construction of the Groton Wind Farm , 30 arms-length single family home property transactions have occurred in the towns of Groton, Hebron, Plymouth, and Rumney totaling $6.5 million.

There was no statistically-significant difference between the sales price and pre-sale assessed value for NH homes within 0-1 mile of a turbine, 1-3 miles of a turbine, and 3-10 miles to a turbine. However, a limitation of this study is that the number of property transactions that have occurred since construction of the wind turbines is relatively small—from a statistical perspective—and this can limit the power of statistical tests. This is not unique to this study as other studies of wind farms and property values have had this same limitation. A study released in 2013 by the Lawrence Berkley National Laboratory (LBNL) sought to address this common issue of statistical power in wind farm property value studies by nationally assembling a data set of over 50,000 property transactions with 1,200 sales having occurred within 1-mile of a turbine. The 2013 LBNL study reported no statistically significant difference in sales price for transactions at any distance, including within bands of 0.5-miles and 1-mile of a wind turbine.

An area of interest in NH has been whether or not waterfront properties may experience a unique impact from views of wind turbine. Accordingly, a separate analysis of waterfront NH property transactions within close proximity to the two wind farms was conducted. Since completion of the two wind farms, there have been 14 arms-length single family home transactions totaling $6.1 million for waterfront residential properties located on bodies of water that are within 10 miles of a turbine and that feature visibility of a turbine from areas on the body of water and areas of the shoreline.

There is no evidence to suggest that the experience at the Lempster Wind Farm or the Groton Wind Farm should be any different than the experience at the proposed Wild Meadows Wind (see Appendix 55). Therefore, there is not expected to be any consistent, statistically significant difference in the sales price relative to assessed value for post-construction property transactions about the Wild Meadows Wind Farm including for properties in close proximity to turbines or properties with significant views of the turbines.

These conclusions are supported by recent studies at the national level as well. A statistically robust 2013 study published by the Ernest Orlando Lawrence Berkeley National Laboratory titled *A Spatial Hedonic Analysis of the Effects of Wind Energy Facilities on Surrounding Property Values in the United States* collected data from more than 50,000 home sales among 27 counties in nine states (Appendix 56). The results of the study indicated that no statistical evidence that home values near turbines were affected in the post-construction or post-announcement/pre-construction periods[20].

J.2.(c) Tourism

Atlantic Wind commissioned a study on the Lempster, New Hampshire Wind Project's impact on local and regional tourism (Appendix 31). This study integrates local results with those of tourism studies that were conducted elsewhere dealing with wind farms and draws on this information to assess the potential tourism impacts of the proposed Wild Meadows project. Most studies of wind farm impacts on tourism use visitor surveys to assess actual or potential impacts. This study draws on that data but also draws on actual New Hampshire-based data derived from economic trends in the Lempster region before and after the introduction of the wind farm. The study uses publicly available, objective data on spending for accommodations, food services and recreational

[20] Hoen, B et. al. 2013. *A Spatial Hedonic Analysis of the Effects of Wind Energy Facilities on Surrounding Property Values in the United States*. Published by the Ernest Orlando Lawrence Berkeley National Laboratory. Accessed online at: http://emp.lbl.gov/sites/all/files/lbnl-6362e.pdf. Date accessed: 12/5/13. (Appendix 56)

activities, traffic volumes, and changes in employment to assess the impact that the Lempster wind farm had on the tourism economy in the region.

The results and findings of this report provide quantitative, objective support to the many studies that used survey-based techniques and demonstrates that were will be no negative impacts to tourism from the presence of a wind farm.

Key findings of the report include:

- The introduction of the Lempster Wind project appears to have had little or no impact on meals and rooms sales in the region where the project is located.
- Since Lempster Wind began operating, growth in tourism-related employment in the project region has been as large, or larger, than it has been in a majority of regions in the state.
- State park revenues for have grown more at the state parks closest to the Lempster Wind region than have aggregate state park revenues, with the largest increase at the park closest to Lempster Wind.
- Weekend traffic volume (an indication of visitor activity) in the Lempster Wind region suggests that the presence of the wind farm has not discouraged visits to the region.
- Based on our review of relevant national and international studies, as well as our analysis of the impacts of the Lempster Wind project, we estimate that the proposed Wild Meadows wind farm project will have a +/- 1.28% impact on tourism activity in the Wild Meadows region, and a +/- 0.24% impact on tourism activity in the larger Grafton County region (including the towns of Danbury, Wilmont and Hill in Merrimack County). By way of comparison, a $0.33 increase in gasoline prices could be expected to have an impact on tourism that is three to five time larger.

The findings of this report, along with evidence from visitor surveys in Europe and the U.S., suggest that perceptions regarding the impact of wind farms on tourism are more a function of individual attitudes toward the aesthetics of wind farms, or attitudes toward renewable energy in general, than they are of an empirical analysis of how the behaviors and expenditures of visitors to a region are actually influenced by wind farms. It is important to distinguish between arguments rooted in aesthetic values and those based on empirical evidence, as well as the validity of each. Included in the report (see Appendix 31) are numerous examples to demonstrate instances where the presence of a wind farm has generated a positive tourism related impact.

J.3. Local employment

The Economic Impact study noted above in section J.2.a estimates a total of 404 full-time equivalent jobs will be created during the construction phase of the project, and an additional 13 full-time equivalent jobs will be created to support the operational phase. The construction phase employees alone will earn $21.77 million dollars in income and the operational phase workers will add another $770,000 to local incomes. Other local economic benefits include direct expenditures on labor, materials, and services during construction and operations, payments to landowners, and payments to the Towns of Danbury and Alexandria and State of New Hampshire.

Thus, the above information establishes that the Project will not have an unreasonable adverse impact on the orderly development of the region insofar as local land use, the local economy and local employment are concerned. Moreover, information presented in Professor Niman's report demonstrates that the Project will have substantial positive effects upon the region's development and economy.

K. Prefiled testimony and exhibits supporting application

Prefiled Testimony of the following persons in support of this application is submitted by the following persons:

1. Edward Cherian, addressing: Orderly Regional Development, Background info on Applicant and Project Development, Project Alternatives, other areas not specifically addressed or support by other witnesses
2. Kevin Devlin, addressing: Technical and Managerial capabilities of Atlantic Wind
3. Clay Coleman, addressing: Financial Capability of Atlantic Wind to construct and operate the Project
4. Karl DeLooff, addressing: Construction and Public Health and Safety
5. John D. Hecklau, addressing: The Project's visual impacts (i.e. aesthetics and shadow flicker)
6. Adam J. Gravel, addressing: The Project's impacts on avian, bat and other wildlife species
7. Sarah Allen, addressing: The Project's impacts on the natural environment (wetlands and wildlife habitat)
8. Dr. Rita Walsh, addressing: Historic Resources
9. Dr. Hope Luhman, addressing: Archaeological Resources
10. Robert D. O'Neal addressing: Sound
11. Prof. Neil Niman, addressing: Economic Impacts
12. Matt Magnusson, addressing: Regional Property Values
13. Chuck Braxton, addressing: Local Property Values
14. Brian Gottlob, addressing: Tourism
15. Tyler Phillips, addressing: Stormwater Design and Water Quality
16. Art Colvin, addressing: Civil Engineering/Design

THE STATE OF NEW HAMPSHIRE
BEFORE THE
SITE EVALUATION COMMITTEE

DOCKET NO. 2013-

APPLICATION OF ATLANTIC WIND, LLC
FOR A CERTIFICATE OF SITE AND FACILITY

PREFILED DIRECT TESTIMONY OF EDWARD CHERIAN
ON BEHALF OF
ATLANTIC WIND, LLC

December, 2013

Qualifications

Q. Please state your name and business address.

A. My name is Edward Cherian. My business address is P.O. Box 326, Concord, New Hampshire, 03302.

Q. Who is your current employer and what position do you hold?

A. I am employed by Iberdrola Renewables, LLC ("IR") as New England Development Director.

Q. Please summarize your educational and professional background and experience.

A. I hold a B.A. from Syracuse University and a Master of Public Administration from Virginia Tech University. I have worked on renewable energy projects since 2000, including numerous wind and hydropower projects. Since March of 2007, I have been employed at Iberdrola Renewables, and have responsibility for New

England wind development activities. For the Lempster Wind Farm, I led the final permitting activities, and served as the Project Manager during construction with responsibility for all phases of the project's construction. For the Groton Wind Farm I was the Project Manager with responsibilities for project development, design, and permitting. Prior to working for Iberdrola, I was employed at environmental and engineering companies, working on renewable energy projects in New England and elsewhere in the United States.

Q. Please describe your current employment responsibilities.

A. My current responsibilities include project management, wind project development, the coordination of permitting and engineering activities, and coordination with local officials, boards, and citizens for the Wild Meadows Wind Farm proposal. I also have responsibility for other early stage potential projects in New England.

Q. Please identify any regulatory proceedings in which you have testified.

I testified before the New Hampshire Site Evaluation Committee ("SEC" or "Committee") on the Groton Wind Farm. I have also testified before the Vermont Public Service Board.

Q. How do your past and current responsibilities for Lempster Wind and Groton Wind and/or any other wind energy projects bear upon the Wild Meadows Wind Project?

A. My responsibilities and experience with the Lempster Wind Farm and the Groton Wind Farm, in addition to my involvement with other wind projects in New England and elsewhere, inform and support my work on Wild Meadows Wind, and provide the experience base necessary for a disciplined and comprehensive approach to development. Iberdrola is the only company that has twice obtained a Certificate of Site and Facility from the SEC, and is the only company that has directed wind projects in New Hampshire from early stage development through construction and operations. My managerial role and experience with the Lempster Wind Farm and Groton Wind Farm provide valuable lessons and experience which greatly assist the Wild Meadows Wind Project.

<u>Purpose of Testimony</u>

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to provide the Committee with background information about the Applicant and the Project, and with information on the following topics that are contained in Atlantic Wind, LLC's Application for Wild Meadows: detail on alternatives to the Project that were considered; the Project's consistency with the orderly development of the region; consideration of the views of municipal and regional planning commissions and local governments; the Project's anticipated impacts on local land use; the Project's consistency with the objectives of RSA 162-H and with other public policies; and the Project's impacts on air quality. In addition, my testimony is intended to support and sponsor information contained in the Application that is not specifically addressed or supported by other witnesses.

<u>Applicant Information</u>

Q. Please provide information about the Applicant and the companies with which it is affiliated.

A. The entity that has submitted an application to the Committee for a Certificate of Site and Facility for the Wild Meadows Wind Project is Atlantic Wind, LLC ("the Applicant"). Atlantic Wind, LLC is an Oregon limited liability company. Atlantic Wind, LLC is 100% owned by Iberdrola Renewables, LLC which is headquartered in Portland, Oregon, and has offices in several United States locations. IR has successfully financed, constructed and now operates 53 wind farms in the United States, including the Lempster Wind and Groton Wind projects in New Hampshire. IR's parent company is Iberdrola SA. Worldwide Iberdrola has over 14,000 MWs of installed wind capacity worldwide, including within the United States. IR has over 5,800 MWs of installed wind capacity in the United States at 53 wind farms located in 18 different states. Iberdrola's strategy includes a commitment to the long term ownership and operation of wind power facilities worldwide.

More information about the Applicant and its affiliated companies is contained in Sections B and H.5 of the Application. In addition, Mr. Clay Coleman's prefiled testimony provides further details on Atlantic Wind's and IR's financial capabilities to construct and own the Wild Meadows Wind Farm in continuing compliance with the terms and conditions of any certificate that the Committee may issue as the result of this proceeding. Also, Mr. Kevin Devlin's prefiled testimony addresses Atlantic Wind's and IR's technical and managerial capabilities to operate the project.

<u>Site Information</u>

Q. Please describe the location and basic characteristics of the proposed Project site.

A. The Project site includes approximately 4,800 acres of privately-owned land, all of which is located in the Towns of Danbury, Merrimack County, and Alexandria, Grafton County, New Hampshire.

Atlantic Wind, LLC has entered into long term leases or easements with the owners of the property. The leased property is bounded by Washburn Road to the north, Wild Meadows Road to the south and west, and Cass Mill Road to the east. The southern end of Newfound Lake is approximately 4.0 miles north of the Project area. The summit of Cardigan Mountain is approximately 4.4 miles to the west-northwest. The Project site is situated along two ridge features known as Tinkham/Braley Hills in the western portion of the project and Forbes Mountain in the eastern portion of the project, with an area north of what is known at The Pinnacle in the central portion of the project. Ridges are generally oriented in a northeast/southwest direction and range in elevation from 1,590 to 2,270 feet. As indicated in Figure 3 of the Application, thirteen (13) of the Project's wind turbines are proposed to be located along the Tinkham/Braley ridge in a north-south direction. Two (2) turbines will be similarly oriented in the vicinity of The Pinnacle, and eight (8) turbines will be located on the Forbes Mountain ridgeline. The Project site will be accessible via a private access road off of the existing Wild Meadow Road.

The Project area is forested and primarily consists of a mix of northern hardwood and conifers. The primary activity within the Project area is timber harvesting which has occurred for many decades. In addition, there is agricultural use (principally hay fields), as well as some recreational activity occurs there, including hunting and snowmobiling.

More detailed information about the location and characteristics of the Project site and surrounding area is found in Sections C (1) through C (5) of the Application. In addition, Section I of the Application provides information about the natural and other resources at the Project Site.

Facility Information

Q. Please provide information about the basic design of the proposed wind energy facility.

A. The Wild Meadows Wind Project is a 75.9 megawatt ("MW") facility that will consist of 23 wind turbine generators manufactured by Vestas, each with a capacity rating of 3.3 megawatts ("MW"). In addition to the turbines, the Project will consist of access roads, crane pads at each turbine location, staging areas, an electrical collection system composed of underground and overhead power lines, an electrical substation, an operations and maintenance building, a permanent meteorological tower and associated support facilities. More detailed information about the type and size of each major part of the Project is contained in Sections E.3 and H.1 of the Application. In addition, a map showing the locations of the major components of the Project is contained in Figure 3 of the Application.

Q. Please explain how the power produced by the Project will be delivered to the electricity grid.

A. The Project is expected to deliver electricity via standard distribution system level, three-phase power (34.5 kV). The power is expected to be conveyed via project overhead lines, on standard utility poles ranging from 35' to 65' to a substation location off of Bog Road in Alexandria, in immediate proximity to the National Grid 230 kV lines. The line from the project site to the substation will be approximately 1.5 miles long, and will interconnect the Project's output to the National Grid 230 kV system. A voltage step-up substation near the existing transmission lines will raise the voltage from 34.5 kV to 230 kV, for interconnection and delivery to the existing electrical grid. One of the important aspects of Wild Meadows, and the planning for the Project, is its proximity to the existing New Hampshire electrical transmission infrastructure, rather than proposing new transmission lines. The Project seeks to use available transmission capacity that already exists in the region.

The Project, assuming the use of Gamesa wind turbines, originally filed a generation interconnection request with ISO New England (ISO-NE) in September 2011 requesting interconnection to the National Grid 230 kV line. A combined Feasibility/System Impact Study was performed by ISO-NE and National Grid and was completed in September 2013. The results of that study indicated the Project does not show any significant adverse impact to the New England Transmission System. The Project design has been changed from Gamesa to Vestas wind turbines, however, requiring a new generation interconnection request with ISO-NE and a new combined Feasibility/System Impact Study to be performed. This study is currently in progress and is expected to be completed by April 2014. The initial Feasibility Study indicated adequate capacity; the change in turbine type is not expected to change these results.

Q. Please describe the Project's anticipated capability to produce electricity.

A. Based on on-site wind data collected since 2009, it is anticipated that the Project's net capacity factor will be approximately 34.0%. Based on this projected capacity factor, the Project is expected to produce approximately 226,332 Megawatt hours (MWh) of electricity per year. Translated to homes, the Project is expected to produce electricity equal to the average annual consumption of approximately 30,000 to 32,000 average NH homes, and during periods of peak production would produce electricity equal to approximately 95,000 NH homes.

<u>Consideration of Available Alternatives</u>

Q. Did Atlantic Wind consider any other available alternatives to the proposed site for this Project? If so, please describe those alternatives and explain why they were not selected.

A. The criteria used by Iberdrola to select the site for this Project are described in Section H.2 of the Application, and the alternatives considered are described in Section H.2.a. Among the alternatives to the instant Project which were considered were 50, 40, and 37 turbine configurations, inclusion of other areas, alternative interconnections, and a wide range of alternative road and access plans. The primary change was the reduction from the publicly vetted 37 turbine Gamesa 2.0 MW project to the proposed 23 turbine Vestas 3.3 MW project. In evaluating the ability to markedly reduce the number of turbines in the layout, a number of key factors led to dropping the western (Melvin) portion of the project. First, among the three ridge areas, the Melvin Mountain area has lesser and more unpredictable wind resources. Secondly, the civil engineering design options for the Melvin area were more difficult, due to steep slopes and fewer options, and limited access road choices. The original primary Melvin access route (southern) was noted for a much greater amount of wetlands. The southern access route would have upgraded existing logging and skidder roads. Those roads had been rutted over many years of logging use, and the rutting had created drainage that converted skidder ruts into vernal pools. The wetland impacts accordingly would have been larger, especially of vernal pools.

Dropping the western portion of the project and changing the turbine type also allowed for a greater distance from the Cardigan Mountain summit (approximately 4.4 miles) and allowed for a more compact project layout that reduced the number of turbines by 38%, the total project footprint by 31%, the amount of roads by 36%, and the length of electrical collector system lines by 44%.

The Project evaluated a number of wind turbine make and models. Within the goal of reducing the overall Project footprint and number of turbines, The Vestas V112 - 3.3 MW turbine was determined to be the best overall fit for the Wild Meadows site as determined by the wind resource, overall project generation capacity, and best fit turbine manufacturer requirements.

Within the land parcels which have been leased for the proposed Project, a number of alternative layouts or designs were considered, and are discussed in Section H of the Application. The Project's current design is preferred to all of the other alternatives that were considered because it provides for the most efficient and economic use of resources with fewer environmental impacts.

<u>Orderly Development of the Region</u>

Q. Please state whether you believe the Project will unduly interfere with the orderly development of the region and explain your position.

A. The Project is consistent with the orderly development of the region and therefore will not unduly interfere with it. The land within the Project area is primarily used for commercial timber harvesting and agricultural uses and has been logged for many years. Other activities and land uses in the immediate area include hunting and snowmobiling. Within the surrounding region, activities include: logging and forestry products, sand and gravel excavation, biomass energy, two 230 kv National Grid lines and a Hydro Quebec DC line, concrete production, skiing (at the Ragged Mountain Resort), seasonal camping, hiking tourism, scattered commercial enterprises along Routes 4 and 104, low-density residential development, undeveloped forestlands, and conservation lands.

The land uses and activities listed above easily co-exist with the Project. In particular, based on my experience with the Lempster Wind Farm and the Groton Wind Farm, wind power is a complementary land use that supports local landowners while continuing to allow and support other land use activities.

The Project is consistent with a number of the goals articulated in the Town of Danbury Master Plan and the Town of Alexandria Master Plan. The Danbury Master Plan includes goals to encourage commercial and industrial growth and includes survey results showing a desire for wind power development. The Alexandria Master Plan expresses goals of managed economic growth that does not exceed the Town's ability to provide services, and the growth of local businesses and job opportunities.

The Project is also consistent with and complementary to Lakes Region Planning Commission planning documents, principally the Comprehensive Economic Development Strategy (CEDS). The CEDS identifies goals that include attracting new investment, and building on the sustainability of regional economic development.

The CEDS also includes a detailed SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis of the region. The analysis identifies an over-reliance on tourism as the #1 weakness in the region, and questions the sustainability of tourism growth in the region, and the need for economic diversification.

A second key goal is the promotion of alternative energy and "green" industry. CEDS states that "Renewable energy development also needs to be balanced by responsible stewardship of the region's natural resources."

The project is consistent with the goals of the CEDS, by providing a substantial local investment, using renewable and sustainable fuel to generate electricity, expanding the tax base, and providing new employment opportunities.

In addition, the Project is consistent with and complementary to the goals of the Grafton County Economic Development Council, which seeks to encourage and support new business growth in Grafton County, and the Capital Regional Development Council (Merrimack County). The UNH economic impact analysis for Wild Meadows clearly indicates substantial local, regional, and state economic benefits that accrue from the Project.

Atlantic Wind has coordinated with local and regional planning organizations (in addition to others), by providing information and updates on the proposed Project, responding to questions, and reviewing planning documents.

Outreach Activities/Consideration of the Views of Municipal and Regional Planning Commissions and Municipal Governing Bodies

Q. Please summarize how the Applicant has considered the views of municipal and regional planning commissions and municipal governing bodies with respect to the Project.

A. In addition to considering the goals of the Lakes Region Planning Commission and county economic development councils, the Project has carefully and comprehensively taken the views of the Towns of Alexandria and Danbury into consideration during the development phase of this Project. The Project has attended and presented (and responded to questions) at least thirteen (13) different public, noticed meetings in Alexandria and Danbury. The project has also provided tours to both the Lempster Wind Farm and the Groton Wind Farm. Both sets of tours were publicly noticed via direct mailings, posted notices, announcements at public meetings, and website notices. The noticed public meetings attended by representatives of Atlantic Wind have included detailed discussion of the proposed Project, numerous lengthy question and answer sessions, project open houses, and many responses to emailed or telephone requests for information.

The Project reviewed the Newfound Lake Region Association (NLRA) watershed plans and documents, to ensure consistency, and the Project is consistent with the goals of those documents (greater detail is available in the Pre-Filed Testimony of Tyler Phillips). The Project design concept is to maintain existing drainage patterns as much as possible. This means frequent smaller culverts and treatment features to avoid concentrated run-off and phosphorus transport – two of the key goals of the NLRA plans. In addition, intensity of use after construction is very low compared to typical residential development around Newfound Lake. In fact, many of the progressive design standards used for the Project have not yet been widely adopted within the larger watersheds, such as no use of fertilizers, lack of impervious cover, treatment features such as swales, and runoff dispersal.

At a number of the public meetings and consultations for the 37 turbine layout, the number of turbines and the scale of the project across three towns was a concern expressed by many. The project then evaluated a number of factors to see whether the proposal could be significantly scaled back and yet still remain economically feasible. Those details are found in Section H of the Application. The result was the reduced project that is the subject of this Application: one that reduced the number of turbines from 37 to 23, removed the western portion of the project, and shrunk the footprint to enable greater setbacks from area resources.

The Project has also met with numerous abutters to the Project site, and other community leaders. A wide variety of Project information has been provided on the project website, hard copies offered to be provided at the Town Halls, electronic copies of all materials provided, and direct mailings of information, updates, and schedule. Outside of Alexandria and Danbury, the Project has met with the Town of Grafton Board of Selectmen, held an Open House in Grafton, had informal discussions at various times with a Town of Hill selectman, Town of Bristol administrator, Town of Bridgewater property owners, a number of residents near the project site, elected representatives at the local and state level, non-profit interest groups, area businesses, a wide range of print, radio, and TV media, and consultations with many state agencies, including DES, DRED, DHR, OEP, F&G. A more complete listing of meetings can be found at Appendix 5 of the application.

<u>Project's Consistency with the Objectives of Public Policies</u>

Q. Is the Project consistent with public policies relating to renewable energy and climate change?

A. Yes. The Project is consistent with and promotes several public policy goals such as those reflected in RSA 362-F, New Hampshire's renewable portfolio standard ("RPS") law, which requires that 25% of the electricity sold by retail suppliers in New Hampshire come from renewable sources by 2025. The Project is consistent with the purpose of the RPS statute articulated in RSA 362-F:1: it provides fuel diversity to the state and the region's generation supply through the use of a local renewable resource that is completely emission-free (i.e. the wind) which can displace and lower regional dependence on fossil fuels, thereby stabilizing volatile energy costs; the Project will aid the local and state economy as indicated above; and because it will emit no air pollutants, it will help to reduce the amount of greenhouse gases, nitrogen oxides and particulate matter emissions generated in the state, thereby improving air quality, public health, and mitigating against the risks of climate change.

The Project is also consistent with and will further the objectives of RSA 162-H by enabling a new, clean, renewable energy resource with low environmental, health and safety impacts, and significant economic development benefits, to meet the growing demand for electricity in the region, particularly in light of a number of major plant retirements that have been announced. The Project will maintain an appropriate balance between the environment and the need for new renewable energy facilities. It can also be constructed relatively quickly, without undue delay, and will help to ensure that the region's energy supply is adequate, reliable and conforms to sound environmental principles.

Because the Project will produce electricity without producing greenhouse gases, it is consistent with the state's Regional Greenhouse Gas Initiative ("RGGI") set forth in RSA 125-O:19 *et seq.* which is aimed at reducing greenhouse gas emissions resulting from energy use in New Hampshire. The Legislature has determined that global climate change is a significant environmental problem that can be addressed through reducing greenhouse gases such as carbon dioxide which is produced by electricity generators that combust fossil fuels. By generating electricity without using fossil fuels, the Project will assist in addressing the issue of climate change.

<u>Project's Impact on Air Quality</u>

Q. Will the Project have an unreasonable adverse impact on air quality?

A. No. Unlike other electricity generators that use gas, oil or coal to produce electricity, the Project will not combust fuel and therefore will produce no air emissions. The turbine blades will be powered entirely by the wind, which is a clean, renewable and free source of energy. This means that the Project will add a new power supply to the region without adding any new air pollutant or greenhouse gas emissions. Not only does the Project not have an unreasonable adverse effect on air quality, it offers significant and long-term benefits. In addition to providing a new, clean source of electricity, the Project has the potential – depending on what resources are contributing to the regional power grid at the time the Project is operating - to displace the production of electricity from existing fossil fuel plants, thereby reducing air emissions. Thus, overall, the Project will have a positive effect on air quality.

The fact that wind power is an emission-free energy source is often overlooked in the broader siting debate. However, the benefit of a generation source that adds new power supply without adding any new air pollutants or greenhouse gas emissions should not be understated or taken for granted. The statistics on the positive impact that wind power has on clean air are compelling. Wind farms emit no carbon dioxide. Using the U.S. Environmental Protection Agency (EPA) "Green Power Equivalency Calculator"[1] and the expected annual average MWhrs that will be generated by Wild Meadows, yields the following results:

- 130,983 tons of CO2 avoided, which is the equivalent of:

[1] http://www.epa.gov/greenpower/pubs/calculator.htm

- The greenhouse gas emissions from 24,755 passenger vehicles each year; OR the CO_2 emissions from:
- 13,321,261 gallons of gasoline consumed; OR
- 276,339 barrels of oil consumed; OR
- Burning 511 railcars of coal; OR
- 4,951,069 propane cylinders used for barbecues

These are only average single year avoided emissions. Over 20 years the environmental benefits are even more substantial.

In addition, a study published by the National Academy of Science in 2010 entitled "Electricity from Renewable Resources: Status, Prospects, and Impediments" indicates that renewable electricity technologies have inherently low life-cycle CO_2 emissions as compared to fossil-fuel-based electricity production, with most emissions occurring during manufacturing and deployment.[2]

The bottom line is that the long-term environmental and public health problems associated with fossil-fueled power plants (i.e. air emissions) are severe, the statistics are compelling, and it is clear that wind energy does not add to those problems and can be a significant part of the solution. We believe that the Project's positive effects on clean air and climate change are factors that should be given significant consideration in examining the balance between energy production, environmental protection and public health.

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[2] http://www.nap.edu/catalog.php?record_id=12619

Q. Does this conclude your testimony?

A. Yes.

THE STATE OF NEW HAMPSHIRE
BEFORE THE
SITE EVALUATION COMMITTEE

DOCKET NO. 2013-

APPLICATION OF ATLANTIC WIND, LLC
FOR A CERTIFICATE OF SITE AND FACILITY

PREFILED DIRECT TESTIMONY OF KEVIN E. DEVLIN
ON BEHALF OF
ATLANTIC WIND, LLC

December, 2013

Qualifications

Q. Please state your name and business address.

A. My name is Kevin E. Devlin. My business address is 1125 NW Couch Street, Suite 700 Portland, OR 97209.

Q. Who is your current employer and what position do you hold?

A. I am employed by Iberdrola Renewables, LLC. ("IR") as Vice President Commercial Operations.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to address the technical and managerial capabilities of Atlantic Wind, LLC ("Atlantic Wind" or "the Applicant") to assure the operation of the proposed Wild Meadows Wind Project in continuing compliance with the terms and conditions of a certificate of site and facility issued by the New Hampshire Site Evaluation Committee. My testimony supports Sections H. 5(b) and I. 6 (a) through (g) of the Application.

Q. Please describe your background and qualifications?

A. I have over 25 years of experience in the energy industry and have been in my current position for approximately six years. I hold a degree in Mechanical Engineering from Queens University Belfast.

Q. Please describe your current employment responsibilities.

A. As Vice President Commercial Operations my responsibilities include the management of all operational wind generation facilities in the U.S. owned by Iberdrola Renewables, LLC or its subsidiaries.

Q. How do your current responsibilities for other wind energy projects bear upon the Wild Meadows Wind Project?

A. My current responsibilities are to ensure that existing IR projects are operated and maintained in a safe and reliable manner, and to ensure that they meet all the requirements of regulatory agencies with oversight responsibilities for the projects, while carrying out the operating instructions received from grid operators such as ISO-NE.

Q. Are you familiar with the Project that is the subject of this proceeding?

A. Yes, I am. I have worked with the Development and Permitting departments of Iberdrola Renewables discussing specific project considerations.

Q. What will your role be in relation to the Project?

A. I am responsible for operations for all of IR's wind projects; as such, Wild Meadows will fall under my purview after construction.

<u>Managerial and Technical Capability</u>

Q. Please describe Atlantic Wind's technical and managerial capability to operate a wind power project.

A. Atlantic Wind is 100% owned by Iberdrola Renewables, LLC, which has successfully financed, constructed and now operates more than 50 wind energy facilities in the United States, including the Lempster and Groton Wind Projects in New Hampshire. In addition, Iberdrola Renewables owns and operates other renewable energy facilities including solar and biomass facilities. As an Iberdrola Renewables company, Atlantic Wind will have full access to the managerial and technical capabilities of Iberdrola Renewables to operate the Project.

Q. Please describe IR's managerial and technical capabilities to operate and maintain the Project?

A. Iberdrola Renewables has a full in-house Operations staff, including Asset Managers, Plant Managers, and Plant Technicians, all of whom have extensive experience in the wind energy industry. In total, IR employs approximately 420 staff in its Operations group. Operating and maintaining a wind power project requires technical expertise in several areas, including wind turbine operations, troubleshooting of wind turbine faults or trips, wind turbine preventative maintenance, logistics for major component maintenance, high voltage circuit switching and preventative maintenance, turbine safe operating procedures, preventative maintenance on transformers, distribution lines, and switchyards or substations, wind turbine SCADA systems, and predictive maintenance tools. The diverse staff employed by IR is fully versed in this wide range of expertise.

Q. So IR does have the requisite technical expertise in the areas that you have outlined above?

A. Yes. Iberdrola Renewables is the second largest operator of wind facilities in the United States and the largest worldwide. We have extensive technical expertise and experience developed over decades within the wind industry.

Q. How will the Wild Meadows Wind Project be staffed?

A. The Project will be operated and maintained by a team of four Iberdrola Renewables staff including a plant manager. This team will be supplemented by full time staff provided by the turbine vendor during the initial warranty period. Post-warranty, the site will likely be staffed by Iberdrola Renewables staff and a contracted O&M service provider (to be determined). The O&M team will staff the Project during normal working hours, with weekend shifts and extended hours as required to maintain continuous operations. Iberdrola Renewables operates its wind projects with its employees who receive applicable certifications and who are trained in operational standards, and safety regulations and procedures.

Q. How will the Project be operated and maintained?

A. In addition to local staff, Iberdrola Renewables has a control center located in Portland, Oregon (the "National Control Center") that is staffed 24 hours a day, 7 days a week. The National Control Center will continuously monitor and control the Wild Meadows Wind facility. The Project's central supervisory, control and data acquisition ("SCADA") system located in Portland, Oregon, provides remote operation and control of the wind turbines and collects operating and performance data 24 hours a day. Wind turbines are managed via computer controllers installed in each turbine. Under certain circumstances such as an electrical error, high winds or icing, for example, the turbines are tripped (automatically shut down) via computer. The SCADA system will send an alarm message to local O&M personnel via pager or cell phone to notify them of the outage.

During the warranty period of the wind turbines, the turbine vendor will have primary responsibilities for operations and maintenance, but Iberdrola Renewables will maintain personnel at the site as well. Turbine warranties are standard within the industry and address the initial two to five years of wind farm operations, including turbine adjustments and maintenance. During the warranty period, Iberdrola Renewables operations staff will be responsible for:

- managing and coordinating all scheduled and un-scheduled maintenance performed by the turbine vendor , including periodic operational checks, regular preventative maintenance, or implementation of service bulletins issued by the turbine vendor or balance of plant contractors;
- operating any switch gear, relay or protection equipment or performing electrical maintenance as needed, including any remote or local resets of the turbines through the control system;

- working in coordination with the grid operator and utility to gather and analyze data from the turbines and ensure that all SCADA systems are fully operational;
- maintaining all procedures defined in the detailed operations and maintenance manuals;
- ensuring compliance with all safety plans, emergency response protocols and environmental permits;
- ensuring that spare and replacement parts inventories maintained by the turbine vendor and balance of plant contractors are adequate to ensure timely service in the event of a failure;
- exercising site security to prevent unauthorized access to project facilities per requirements; and
- maintaining relations with local landowners and community representatives.

After the initial warranty period has expired, Iberdrola Renewables staff and a service provider (which could be the turbine vendor) will continue to assume full responsibility for all day-to-day operations and maintenance procedures, as well as maintaining an oversight role for the Project.

Q. What is Iberdrola Renewables's record with regard to the reliability, operation and maintenance of its wind power projects?

A. Iberdrola Renewables has a proven track record as a successful participant in the wind energy market in New England and the United States. Our primary goal is to operate all of its wind projects to ensure the highest level of safety to the public and employees and environmental protection to the site and community. Iberdrola Renewables strives to maximize the economic performance of its wind projects. Operational efficiency of wind turbines is a critical issue, as power production affects profitability and return on the significant long-term capital investments being made by Iberdrola. Operations and maintenance excellence is what makes a wind project successful. Company-wide, Iberdrola's goal is to achieve 97% availability (defined as the number of hours that a turbine is available to produce or is producing, divided by the number of hours in the period).

Q. In your opinion, does Atlantic Wind possess the managerial and technical capabilities to operate the proposed Project consistent with a certificate of site and facility that may be issued by the Committee?

A. Yes. I base this opinion upon my familiarity and experience with Atlantic Wind and its parent company, Iberdrola Renewables, which, as described above, will be providing Atlantic Wind with the necessary managerial and technical resources to operate the Project.

Q. Does this conclude your testimony?

A. Yes.

THE STATE OF NEW HAMPSHIRE
BEFORE THE
SITE EVALUATION COMMITTEE

DOCKET NO. 2013-__

APPLICATION OF ATLANTIC WIND, LLC
FOR A CERTIFICATE OF SITE AND FACILITY

PREFILED DIRECT TESTIMONY OF CLAY COLEMAN
ON BEHALF OF
ATLANTIC WIND, LLC

December, 2013

Qualifications

Q. Please state your name and business address.

A. My name is Clay Coleman. My business address is 1125 NW Couch Street, Suite 700, Portland, Oregon 97209.

Q. Who is your current employer and what position do you hold?

A. I am the Director of Finance & Treasury & Treasury of Iberdrola Renewables, LLC.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to address the financial capability of Atlantic Wind, LLC, and that of its parent company, Iberdrola Renewables, LLC to construct and operate the proposed Wild Meadows Wind Project.

Q. What are your background and qualifications?

A. I have approximately 30 years of experience in the finance and energy sectors, including 8 years as Director of Finance & Treasury for Iberdrola Renewables, LLC. Prior to my position as Director of Finance & Treasury, I worked in a similar role for a leading independent power producer for nearly 12 years. I hold a Master of Business Administration degree from the University of Chicago and a Bachelor of Science in Finance degree from Wharton School of Business, University of Pennsylvania.

Financial Capability to Construct and Operate the Project

Q. Are you familiar with the Project that is the subject of this Application?

A. Yes, I am. In my role as Director of Finance & Treasury of Iberdrola Renewables, my responsibilities include being on the review committees charged with approving new projects, including the Wild Meadows Project, as well as new power purchase agreements obtaining any tax equity required from financial institutions for our projects, and forecasting and managing the cash balances for the Company. As the Project advances, I will be involved with the processing and arranging cash for the capital expenditures for the Project, as well as managing the relationship with our tax equity investors.

Q. Please describe the corporate relationship between Iberdrola Renewables, LLC and Atlantic Wind, LLC.

A. Atlantic Wind, LLC is a limited liability company organized for the development of Projects in the eastern United States. It is 100% owned by Iberdrola Renewables. Iberdrola Renewables is the U.S. renewables division of parent company Iberdrola, S.A., an energy pioneer with the largest renewable asset base of any company in the world - more than 14,000 megawatts (MW) of renewable energy spread across a dozen countries. Iberdrola Renewables is the second-largest provider of clean renewable electricity in the United States with more than 5,800 MW of wind and solar power in operation or under contract. It operates more than 50 wind energy facilities in 18 states, including the Lempster and Groton Wind Projects in New Hampshire. This extensive experience in wind energy ownership, construction, operation, and management will allow it to provide superior financial capabilities to assure construction and operation of the Wild Meadows Wind Project.

As the owner of Atlantic Wind, LLC, Iberdrola Renewables finances the construction costs of its wind farms through equity investments provided by Iberdrola S.A., one of the world's largest energy and utility companies. Iberdrola Renewables has the capability to provide adequate assurances, guarantees, financing and insurance for the Project's development, construction and operation. It currently funds all development activities for the Project, and through Iberdrola S.A., will arrange for the capital needed for construction finance, equipment orders, and long-term investment in the Project.

Q. Please describe the financial capability of Atlantic Wind, LLC to construct and operate the proposed Project in compliance with the terms and conditions of any certificate that may be issued as the result of this proceeding.

A. Atlantic Wind, LLC and its parent company Iberdrola Renewables, has the financial capability to build, own, and operate all of its wind farms, including the proposed Wild Meadows Wind Project. IR is focused on developing, financing, constructing, owning and operating its wind farms. Its parent, Iberdrola S.A., remains well capitalized with total assets of $125 billion through September 2013. A detailed summary of Iberdrola S.A. balance sheet as of September 30, 2013 has been submitted as part of the Application as Figure 1. Cash flow from operations totaled $5.9 billion in the nine months ending in September of 2013. Iberdrola S.A.'s credit rating is investment grade, with a rating of Baa1 from Moody's and BBB from Standard & Poors.

Wind power is the predominant component of Iberdrola's growth strategy, building on Iberdrola's success throughout Europe and the United States, and expanding to markets in Central and South America. Iberdrola Renewables is the second-largest provider of clean renewable electricity in the United States with more than 5,800 MW of wind and solar power in operation or under contract. This is primarily because of Iberdrola Renewables' strategic vision of the industry, complemented by the competencies necessary to execute that vision. Appendix 25 of the application contains a list of all wind energy assets in the United States as of December 2012.

Iberdrola's corporate strategy includes a commitment to the long-term ownership and operation of wind power facilities worldwide, and the company intends to be involved in the United States market for the long-term.

The Wild Meadows Wind Project is currently estimated to require approximately $150 million in capital, depending on final equipment and construction costs. The Project will be financed by Iberdrola Renewables, through a combination of cash on hand and funds provided by a selected tax-equity investor that will make an investment in the project principally in return for the tax benefits that will be generated by the project during the first ten years of operations. Investment in the Project by Iberdrola Renewables and our tax-equity investors will be supported by a long-term contract for the purchase of power and renewable energy credits from the Project. A power purchase agreement has been executed with multiple utility companies including National Grid, NStar, Northeastern Utilities (parent company of Public Service of New Hampshire), Unitil, and Massachusetts Electric Company for 100% of the power output from the project for 15 years.

Q. In your opinion does Atlantic Wind/Iberdrola have the requisite financial capability to own and operate this Project?

A. Yes. As indicated above, Iberdrola Renewables has successfully financed, constructed and operated over 50 wind energy facilities in the United States including the Lempster and Groton Wind Projects in New Hampshire. Iberdrola Renewables has a proven track record as a successful participant in the wind energy market in New England, the United States and abroad which clearly demonstrates that it has the financial capability to construct and operate this Project in conformance with the terms and conditions of any certificate that may be issued by the New Hampshire Site Evaluation Committee.

Q. Does this conclude your pre-filed testimony?

A. Yes.

THE STATE OF NEW HAMPSHIRE
BEFORE THE
SITE EVALUATION COMMITTEE

DOCKET NO. 2013-__

APPLICATION OF ATLANTIC WIND, LLC
FOR A CERTIFICATE OF SITE AND FACILITY

PREFILED DIRECT TESTIMONY OF KARL DELOOFF
ON BEHALF OF
ATLANTIC WIND, LLC

December, 2013

Qualifications

Q. Please state your name and business address.

A. My name is Karl DeLooff. My business address is 1125 NW Couch Street, Suite 700 Portland, OR 97209.

Q. Who is your current employer and what position do you hold?

A. I am employed by Iberdrola Renewables, LLC ("IR") as Director of Environment, Health, and Safety (EHS) of the Engineering and Construction Group.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to address the technical and managerial capabilities of Atlantic Wind LLC ("Atlantic Wind" or "the Applicant") to ensure the construction of the Wild Meadows Project ("the Project") in compliance with the terms and conditions of a certificate of site and facility issued by the New Hampshire Site Evaluation Committee ("the Committee"), and to ensure that the wind farm meets all IR and industry applicable safety regulations, policies, practices, and training requirements.

I am also providing testimony to demonstrate that the Project will not have an unreasonable adverse effect upon public health and safety. My testimony supports Sections H. 5(b) and I. 6 (a) through (g) of the Application.

Q. Have you testified before the New Hampshire Site Evaluation Committee previously?

A. Yes.

Q. Please describe your background and qualifications?

A. I have been a professional environmental and safety officer since getting my commission in the United States Coast Guard in 1992. My active duty time included substantial training and experience in environmental law and compliance, investigations and presenting cases before Administrative Law Judges, and supervising spill and release cleanups as a Federal On-Scene Coordinator Representative. Subsequently, I have trained and worked as a contractor and consultant for diverse cleanup and remediation projects – including several on the National Priorities List. My involvement in the energy industry began when I was part of the project team that constructed the Bluegrass Ridge Wind Farm in Missouri. Since 2007, I have been employed with Iberdrola Renewables first as the Director of Construction and then as the Director, Environment, Health and Safety.

Q. Please describe your current employment responsibilities.

A. As Director of Environment, Health, and Safety of the Engineering and Construction Group, my responsibilities include setting the policies and procedures, as part of the management team, for Iberdrola Renewables personnel and contractors, selecting contractors, conducting investigations of incidents, providing training and resources to our personnel, and supervising technical projects related to my EHS duties. In total, I have been involved in over 20 wind farm construction projects.

Q. How do your current responsibilities for other wind energy projects bear upon the Wild Meadows Wind Project?

A. My current responsibilities are to ensure that IR projects are constructed, commissioned, and started so they can then be operated, and maintained in a safe and reliable manner, and thus ensure that they meet all the requirements of regulatory agencies with oversight responsibilities for the projects.

Q. Are you familiar with the Project that is the subject of this proceeding?

A. Yes, I am. I have worked with the Development and Permitting departments of IR discussing specific project considerations.

Q. What will your role be in relation to the Project?

A. My role will be to ensure that the Project Team constructs the Wild Meadows Project in a safe and compliant manner.

<u>Managerial and Technical Capability</u>

Q. Based on your knowledge and experience with the Engineering and Construction Group within Iberdrola Renewables, please describe Atlantic Wind's technical and managerial capability to construct a wind power project.

A. Atlantic Wind is 100% owned by IR, which has successfully constructed and now operates over 50 wind energy facilities in the United States, including the Lempster and Groton Wind Projects in New Hampshire, in addition to other renewable energy facilities such as two solar facilities. As an Iberdrola company, Atlantic Wind will have full access to the managerial and technical capabilities of IR to construct the Project.

Q. Please describe IR's managerial and technical capabilities as they relate to Project construction?

A. IR has a full in-house construction management staff, including Project Managers, Site Managers, Project Engineers, Quality Assurance Director, and an Environment, Health, and Safety Director, all of whom have extensive experience in the wind energy industry. This experience and technical depth is supported by a number of standardized sequence plans to insure efficiency, shorter timelines and minimized disruption to the community during construction. As the largest wind power company in the world, we work with many different contractors and follow a rigorous process for qualifying contractors that wish to bid on project work. As part of that process, we review contractors' past performance, financial stability, safety record and program, and depth of technical experience.

Atlantic Wind will construct and operate the Project consistent with Iberdrola's corporate commitment to meeting all applicable state and federal requirements, including OSHA safety regulations. During construction and before the Project is fully operational, each turbine and all electrical equipment will be inspected under rigorous testing and commissioning procedures. In addition, prior to activating the electrical lines, the interconnecting utility will also perform and require inspections, testing, and commissioning documentation for grid and system safety. This process is also coordinated through regular conference calls with the ISO-NE and local utilities.

Q. Does IR have the requisite technical expertise in the areas that you have outlined above?

A. Yes. IR is the second largest operator of wind facilities in the United States and the largest worldwide. We have extensive technical expertise and experience developed over decades within the wind industry.

Q. In your opinion, does Atlantic Wind possess the managerial and technical capabilities to construct the proposed Project consistent with a certificate of site and facility that may be issued by the Committee?

A. Yes. I base this opinion upon my familiarity and experience with Atlantic Wind's parent company, IR, which, as described above, will be providing Atlantic Wind with the necessary managerial and technical resources to construct the Project.

Construction of Wild Meadows Wind

Q. Please describe how the construction phase of the Project will be handled.

A. The Applicant will retain experienced general contractors who will have overall responsibility for construction of the Project in accordance with the plans and technical specifications prepared by Horizons Engineering and in accordance with all applicable codes, standards and permit conditions. We will retain an engineering consultant to develop final construction plans and assist Atlantic Wind's Construction and Engineering Group as necessary throughout the construction process to ensure the work is completed in conformance with the approved plans, to interpret the design intent, to provide field review of the work and to ensure that permit conditions are followed carefully.

Q. Please describe how the turbine components are transported to the site?

A. Because of the size of the turbines, components are shipped separately and assembled on site. Turbine blades, nacelles, and tower sections will be transported by truck for delivery to the site. Specialized hauling vehicles will be used for over-the-road and on-site transportation. The haulers contracted for this work will obtain NH DOT permits and use approved routes and escort vehicles when required while operating on public roads.

Components will primarily be delivered directly to turbine locations, where possible. Assembly of the turbine components will occur at each turbine site at the time of installation. The Project is located on private property in a remote area with a single access point (i.e., off of Wild Meadows Road) where public access is. Further restrictions on access will be employed to ensure that the public is not exposed to health and safety hazards associated with construction, including construction vehicle traffic, earth moving operations, blasting, etc.

Public Health and Safety

Q. What steps are being taken to ensure that the Project will not have an unreasonable adverse impact on public health and safety?

A. At IR and throughout all levels within the Iberdrola companies, safety is the foremost concern during every aspect of a wind project's construction and operation. Safety and environmental management systems are part of training and ongoing practices. In addition, operations and maintenance plans that include rigorous preventative maintenance and inspection, as well as repair and improvement measures, are designed to ensure a high level of safety at Iberdrola Renewable's wind projects. IR holds itself and its employees to very high safety standards, and all of its general construction contractors are required to meet strict safety qualifications. IR's Safety Director, Gary LeMoine, has served as the Vice Chairman of the American Wind Energy Association ("AWEA") Safety Committee for 3 years, and has received the AWEA Operations Award at the National Wind Power Conference in 2009 for his leadership in the area of safety in the wind industry.

The selection of contractors, the design of the civil works, the contracted scope of work, and the follow up on the site for safe and compliant operations are a part of every project we construct. Each project we construct has been improved by the lessons learned from the previous projects and a team approach to the project. Our safety and compliance records are very good.

Our contractors are required to be are trained in tower rescue (if working in the turbines), first aid and CPR, site permit conditions, and the Emergency Action Plan. At each project we provide training and an Emergency Action Plan drill during the construction phase of the project. IR has enjoyed excellent relationships with local emergency service providers in the communities where IR wind projects are located, and in some cases like Lempster Wind, our wind technicians have become a member of the town volunteer fire department. IR periodically meets with these providers to be proactive on safety issues. Some of the specific public health and safety issues that are usually raised in response to a wind project application such as Atlantic Wind's include hazardous waste, ice shedding, lightning strikes, blade or tower failure, stray voltage, fire and aviation safety. I will discuss each of these subjects below. In addition, Appendix 15 provides further information on Vestas and the Vestas V112-3 MW platform machines.

Hazardous Waste

The Vestas V112 turbines that are proposed for the Project will utilize small amounts of lubricant oil and other chemical materials for the routine operation of the generators. To the extent that these materials are considered "hazardous," handling and spill prevention will be dealt with in accordance with state and federal laws. Each turbine contains approximately 150 gallons of oil for lubrication and cooling in the gearbox and operation of the hydraulic systems. The wind turbines are designed so that in the event of an oil leak, containment would first be within the nacelle, and should any leak spill over it would be contained within the inside of the tower. In the improbable event of an external leak, spill quantities would likely be minimal and relatively easy to remediate. In addition, turbine sensors are programmed to detect a drop in oil pressure or turbine performance in the event of an oil leak, which would alert operations staff to the problem.

Oil and other chemical materials are stored on site under standard operation and maintenance procedures, in an area that utilizes protective containers and a "catch basin" on the floor. The Project will develop a Spill Prevention Containment and Countermeasure Plan (“SPCC”), which is required under Federal EPA regulations, that is implemented when the site becomes active and is updated as the amount and nature of petroleum products on the site change. The Project also will develop a site-specific Environmental, Health and Safety Plan, that will serve as the internal regulation for EHSS compliance on the site. During both construction and operations, an Emergency Action Plan (EAP) will be developed and instituted with the contents shared and training provided to local emergency responders.

<u>Ice Shedding</u>

Information about wind turbine icing is provided in Section I. 6 (b) of the Application. Depending upon weather and wind conditions, ice can build up on turbine blades, similar to any other structure. The turbine’s safety system automatically senses any small changes in rotational speed and vibrations, such as when ice accretes on the blades, and automatically shuts down the turbine. As the ice begins to thaw, it will typically drop straight to the ground. Any ice that stays on the blades as they rotate could shed some distance from the tower. Such a throw will usually result in the ice breaking into pieces and falling near the base of the tower. The turbine’s software operating system is programmed to prevent projectile ice throw by sensing the imbalance in the blade weights caused by the ice and to adjust accordingly by automatically operating in a greatly slowed or stopped (“safe”) mode. In addition, operations personnel closely monitor turbines in severe weather conditions and are able to manually adjust operations if needed to insure safety. When icing conditions are identified by site personnel, a safety radius around each tower base is maintained and no service personnel are allowed within the safety radius if the turbine is on-line when “ice rules” are in effect. There will be no public access to the turbines and signs will be posted to inform the public that snowmobiles and ATVs are not allowed within the immediate area of the turbines without escort from project personnel. In addition, visible signs warning of the danger from falling ice will be posted on all Project access roads in the proximity of turbines. Trained maintenance personnel will enforce procedures aimed at minimizing risks to the general public from ice shedding by maintaining warning signs and closing and locking gates after passing through them, in order to keep the public at a distance from the wind turbines, particularly during the winter.

Lightning Strikes

Due to the height of the wind turbines and their metal/carbon components, lightning strikes can occur. IR’s experience with lightning strikes is that while they can occur with turbines that have modern lightning protection systems, these incidents are infrequent. The Vestas V112 turbines proposed for the Wild Meadows Wind Project include lightning protection systems which protect against blade damage. These systems rely on lightning receptors and diverter strips in the blade to provide a path for the lightning strike to follow to the grounded tower and dissipated into the foundation’s grounding grid. The turbine monitoring system provides documentation of all critical lightning events and if a problem is detected, the turbine will shut down automatically or, at a minimum, be inspected to assure that damage has not occurred. When a lightning incident occurs, experienced operations and maintenance personnel will ensure that the turbine is not operating in an unsafe condition that might put the public or personnel at risk, and that the turbine is repaired quickly in order to minimize outage time for the affected unit(s). The fact that the turbines will be sited a great distance away from privately occupied structures also mitigates risks to the public associated with lightning strikes.

Blade or Tower Failure

Failures causing the collapse of blades or towers are rare for modern wind turbines. Technological improvements and mandatory standards during turbine design, manufacturing, and installation have largely reduced such occurrences. State of the art braking systems, pitch controls, sensors, and speed controls on wind turbines have greatly reduced the risk of tower collapse and blade throw as the result of high wind speeds. The Vestas V112 wind turbines that are proposed for the Project automatically shut down at wind speeds over 56 miles per hour, and they also cease operation when significant vibrations or rotor blade stress is identified by the turbines' blade monitoring system. As indicated above, setbacks and cautionary signage will protect the public in the event of a blade failure or tower collapse.

Stray Voltage

Stray voltage is a low level of electrical current that can occur between two points on a grounded electrical system and is a concern sometimes raised by livestock farmers. Stray voltage is usually caused by a damaged or poorly connected wiring system, corrosion on either end of the wires, or weak/damaged wire insulation materials. Stray voltage is largely preventable with proper electrical and grounding practices. The Wild

Meadows Project's electrical collection system will be properly grounded and will not be connected to the local electrical distribution lines that provide electrical service to local homes or buildings. The collection lines will be buried in most areas and will use shielded cables with multiple ground points. This design eliminates the potential for stray voltage. In addition, the Project's set back from private residences, safeguards to prevent public access to the site (such as gating and signage to warn of electrical facilities), and the absence of livestock nearby, will provide adequate protection to the public from any risks associated with stray voltage.

Fire

Although wind turbines contain relatively few flammable components, the presence of electrical equipment and various oils (i.e. lubricating, cooling and hydraulic) creates at least some potential for fire within the tower or the nacelle of a turbine. Other potential fire risks, although minimal, are posed by lightning strikes, short circuits or mechanical failure/malfunction. Fires at wind projects are rare and because of setbacks, they do not pose an immediate danger to the public. However, if a fire were to occur at the Project, the fire and safety sensor systems in the turbines would detect it and signal operations personnel of the event and/or shut down the turbine automatically. In the event of a fire within a turbine, local firefighters are expected only to prevent the fire from spreading on the ground. The practical response to these types of fires is to let nacelle fires burn out. However, because there could be a risk that the fire would spread onto the ground or into forested areas, the Project will in all cases coordinate with the local fire departments so that the situation is closely monitored and any fires are quickly contained.

Atlantic Wind will work with local fire departments and safety officials to develop a fire protection and emergency response plan for the Project. Atlantic Wind will notify local fire departments and emergency responders of construction plans and will provide them with site visits to review the location of and points of access to the Project facilities. As is usually the practice with Iberdrola Renewable's projects, Atlantic Wind intends to establish a 911 address for the Project during construction. In addition, the Project will follow all applicable fire laws and regulations.

Aviation Safety

The installation of relatively high structures atop ridgelines has the potential to pose a risk to aviation. However, the Project's compliance with all applicable Federal Aviation Administration ("FAA") requirements will minimize that risk. Atlantic Wind will install the wind turbines in locations where they will present no hazard to aviation and will not infringe upon federally-protected air space. Preliminary turbine layouts were submitted to the FAA in July 2012 for a determination if the proposed turbines will cause a hazard to aviation or infringe on federally-protected airspace. In October of 2012, Atlantic Wind received FAA Determinations of No Effect on all preliminary turbine locations. The Project has since been revised, and the overall number of turbine locations was reduced. The Project re-filed the new locations in September 2013.

In accordance with FAA requirements for obstruction lighting or marking for structures over 200 feet above ground surface, Atlantic Wind will install aircraft warning lights on turbines designated by the FAA. The FAA's guidance on standards for obstruction lighting for wind turbines requires lighting the Project as one large obstruction, such that lights may be spaced approximately 3,000 feet apart rather than lighting every turbine. Atlantic Wind proposes the installation and implementation of a radar activated lighting system at the Wild Meadows Project. Conditioned upon site-specific approval by the FAA of the use of such technology for wind powered electric generating facilities for the Wild Meadows Project, and upon determination of its efficacy with the successful implementation of such a system at a wind facility operating in the U.S. for a time period of no less than one year, Atlantic Wind proposes to implement radar activated lighting technologies at Wild Meadows within one year.

Q. Please further describe the turbine that is being proposed for the Wild Meadows Wind Project.

A. The Wild Meadows Wind Project is proposing to use the Vestas V112-3.3 MW turbine, installed on a 94 meter tower. Through December 2012, Vestas had nearly 49,000 turbines and over 55 GW of wind power capacity installed globally. Through June 2013, Vestas has 12,396 turbines totaling nearly 11 GW of power delivered in the United States, including 654 V112-3.3 MW turbines. According to Vestas, the fleet of turbines worldwide has a 98% availability rating, which is the share of available wind harvested by the turbine. This rating reflects the excellent reliability and availability of these turbines to capture the wind and be productive. Vestas is a global leader in wind turbine manufacturing and consider safety as their number one priority. This priority is reflected in the design and construction of their wind turbines, including V112, 3 MW platform machines. Appendix 15 of the Application provides additional information on Vestas and the Vestas V112 3 MW platform machines.

Q. In your opinion, will the Project have an unreasonable impact upon public health and safety?

A. No. Based upon the information contained in Section I. 6 of the Application, as well as the information set forth in my testimony above, I believe that the Project will not have an unreasonable impact upon public health and safety.

Q. Does this conclude your testimony?

A. Yes.

THE STATE OF NEW HAMPSHIRE
BEFORE THE
SITE EVALUATION COMMITTEE

DOCKET NO. 2013-

APPLICATION OF ATLANTIC WIND, LLC
FOR A CERTIFICATE OF SITE AND FACILITY

PREFILED DIRECT TESTIMONY OF JOHN D. HECKLAU
ON BEHALF OF
ATLANTIC WIND, LLC

December 2013

Qualifications

Q. Please state your name and business address.

A. My name is John D. Hecklau. My business address is 217 Montgomery Street, Suite 1000, Syracuse, New York 13202.

Q. By whom are you employed and what position do you hold?

A. I am a Principal with Environmental Design & Research, Landscape Architecture and Engineering P.C. ("EDR").

Q. What is the purpose of your testimony in this proceeding?

A. My testimony addresses the aesthetic/visual impact of the proposed Wild Meadows Project and summarizes the Visual Impact Assessment ("VIA") which EDR prepared. The VIA was filed with the Application in this proceeding and is labeled Appendix 37. I will also address the Shadow Flicker Study prepared by EDR for this Project. The Shadow Flicker Study was filed with the Application in this proceeding and is labeled Appendix 35.

Q. Please describe EDR.

A. EDR is a design, planning and environmental consulting firm with offices in Syracuse, Rochester, and Buffalo, New York. Founded in 1979, EDR is committed to providing appropriate and innovative design, planning and environmental services to communities, institutions, corporations, developers and private individuals throughout the Northeast. Over the years, EDR has developed a wide range of experience and specialized expertise in land planning, community design, site design, environmental management, regulatory compliance and visual impact assessment. EDR's multidisciplinary staff of landscape architects, civil engineers, ecologists, environmental analysis, planners and computer specialists work with clients to craft creative approaches to project design, permitting and implementation.

Q. What are your responsibilities with EDR?

A. As a Principal within EDR's Environmental Division, I oversee all aspects of the firm's environmental inventory, permitting and management projects. I am responsible for visual impact analysis, resource management planning, environmental impact analysis, and regulatory compliance on behalf of EDR's clients. I have over 25 years of experience performing and/or supervising projects involving wetlands delineation, environmental impact assessments, vegetation and wildlife inventories, visual impact assessments, habitat and ecosystem analysis, natural resource management plans, recreation planning, wetland permitting and environmental compliance monitoring.

Q. Please describe your education, training and experience.

A. I hold a Master of Science degree in Environmental and Forest Biology, specializing in Wildlife Biology, from the State University of New York, College of Environmental Science & Forestry. I hold a Bachelor of Arts degree in Biology from Middlebury College. I have over 20 years of experience conducting visual impact assessments and have prepared several publications and presentations regarding the visual impact of wind power projects. Examples of projects on which I have conducted/coordinated such assessments include the Groton (NH) Wind Project, Block Island (RI) Wind Farm, Howard (NY) Wind Power Project, Buckeye (Ohio) Wind Project, Alabama Ledge (NY) Wind Power Project, Jordanville (NY) Wind Power Project, Cohocton (NY) Wind Power Project, Marble River (NY) Wind Power Project, Hardscrabble (NY) Wind Power Project, Dairy Hills (NY) Wind Farm, Fenner (NY) Wind Power Project, Maple Ridge (NY) Wind Power Project, Statewide (NY) Wireless Network Project, Tompkins County (NY) Public Safety Communications System Project, PG&E Athens (NY) Generating Project, ANP Ramapo (NY) Energy Project, Reliant Astoria (NY) Repowering Project, Flat Rock 230 kV Transmission Line Project (NY). TransEnergie Cross Sound (NY and CT) Cable Electric Transmission Project, E-183 Transmission Line Relocation Project (RI), Rhode Island Reliability Project, Southern Rhode Island Transmission Project, Interstate (RI and MA) Reliability Project, Central Hudson (NY) A and C Line Rebuild Project, and Neptune Regional (NY) Transmission System Project. My curriculum vitae (CV) is attached.

Q. Have you previously testified before state permitting agencies?

A. Yes, I provided testimony before the New Hampshire Site Evaluation Committee (SEC) regarding the visual impacts of the Groton Wind Project, and the Rhode Island Energy Facility Siting Board (EFSB) regarding the visual impacts of the Interstate Reliability Project, Rhode Island Reliability Project and the Southern Rhode Island Transmission Project. I also provided testimony to the New York State (NYS) Public Service Commission regarding the visual impacts of the Central Hudson A and C Line Rebuild Project, the Ramapo and Astoria Generating Projects, and the Flat Rock Transmission Line Project.

Q. Are you familiar with the proposed Wild Meadows Wind Power Project (the "Project")?

A. Yes, EDR was engaged by Atlantic Wind, LLC to assess the aesthetic/visual impact of the Project.

<u>Visual Impact Assessment</u>

Q. Please describe the methodology that was used for conducting an assessment of the Wild Meadows Project's visual impacts.

A. A VIA is used to determine the extent of a Project's potential visibility and to assess the significance of visual impacts associated with a Project using an accepted impact assessment methodology. For the Wild Meadows Project, EDR used standard analyses of potential project visibility, and evaluated visual impact using a simple rating system based on methodology developed by the U.S. Department of Interior Bureau of Land Management (BLM). The VIA prepared for the Wild Meadows Wind

Project includes identification of visually sensitive resources, characterization of landscape similarity zones, identification of viewer groups, viewshed mapping, confirmatory visual assessment fieldwork, visual simulations, and visual impact evaluation. These are generally accepted methods and components of a VIA and were accepted by the New Hampshire Site Evaluation Committee (SEC) on the Groton Wind Project.

The VIA methodology used on this Project provides a comprehensive means of evaluating existing visual character and aesthetic quality and the ability of a landscape to accommodate visual change. Visual simulations with and without Project conditions were used to determine the Project's degree of contrast with the existing landscape and physical surroundings.

Q. What is the extent of the defined study area that was evaluated in your analysis?

A. The study area for the VIA consisted of a 10-mile radius around the location of the proposed turbines. This study area is consistent with the study area used for the Groton Wind Project and other wind projects in New Hampshire reviewed by the SEC, and includes a total of approximately 391 square miles.

Q. Please describe the contents of the VIA.

A. The VIA for the proposed Wild Meadows Wind Project addresses:

1. Visually sensitive sites and intensive land uses within the study area;
2. Landscape Similarity Zones within the study area;
3. Viewer groups within the study area;

4. Visibility of the proposed wind turbines within the study area;
5. Appearance of the proposed wind turbines upon completion of the Project, based on photographic simulations;
6. The nature and degree of visual change resulting from construction of the Project; and
7. Proposed mitigation that could reduce potential visual impacts.

Q. Please describe the specific analytical techniques utilized in the VIA.

A. The VIA for the proposed Wild Meadows Wind Power Project includes:

1. The identification of public resources of state and local significance within a 10-mile radius of the proposed turbines. Public resources considered to be of state significance include sites and districts listed on the National Register of Historic Places, New Hampshire State Parks, state designated scenic areas, state forests, state wildlife management areas, major water bodies, and designated trails. Local recreational/natural areas, cemeteries, schools, heavily used roads and areas of concentrated human settlement are considered resources of local significance. Landscape character within the study area was also defined, based on the existing pattern of land cover (as indicated in the U.S. Geological Survey [USGS] National Land Cover Dataset [NLCD]), and observed land use and user activity. This analysis resulted in the definition of 14 distinct landscape similarity zones (LSZ) within the study area. LSZs are areas of similar landscape/aesthetic character based upon patterns of landform, vegetation, water resources, land use, and user activity.

2. Specific user groups within the study area were identified to evaluate

viewer sensitivity and assure the selection of appropriate representative viewpoints during the visual impact evaluation.

3. As an initial step in evaluating potential Project visibility, a topographic viewshed analysis was performed for the proposed wind turbines. The topographic viewshed analysis utilized USGS digital elevation model (DEM) data, the height of the proposed turbines, and a computer program (ESRI ArcView® with the Spatial Analyst extension) to determine locations where the Project could potentially be visible, discounting any screening provided by trees or man-made structures. The ArcView program defines the viewshed by reading every cell of the DEM data and assigning a value based upon visibility from observation points throughout the 10-mile study area. The resulting topographic viewshed maps define the maximum area from which any portion of any turbine within the completed Project could potentially be seen within the study area during both daytime and nighttime hours (ignoring the screening effects of existing vegetation and structures). Potential daytime visibility was based on a blade tip height of 492 feet, while potential nighttime visibility was based on the FAA obstruction warning light height of 318 feet (assuming at this point that any individual turbine in the array could be lighted).

4. To more accurately account for the screening effect of forest vegetation, a vegetation viewshed analysis was also prepared for the proposed turbines. The vegetation viewshed analysis involved creation of a vegetation layer based on the location of mapped forest vegetation as indicated in the USGS NLCD, with an assumed elevation of 40 feet. This layer was added to the digital elevation model to produce a

base layer for the viewshed analysis, as described above. Once the viewshed analysis was completed, the areas covered by the forest vegetation layer were designated as "not visible" on the resulting data layer to reflect the fact that views from within mapped forested areas will generally be screened by mature overstory trees.

5. To verify the accuracy of the viewshed analysis in predicting where actual views of the proposed Project are likely to occur, EDR staff conducted field reviews of the visual study area. The purpose of these reviews was to document the presence or absence of open views toward the Project site from publicly-accessible vantage points within a 10-mile radius of the proposed turbines. Photo documentation of potential Project visibility was obtained from 291 representative viewpoints within the study area. Existing ridges and meteorological towers on the Project site were used as locational and scale references when verifying potential Project visibility in the field.

6. From the 291 viewpoints documented during field review, photos from 21 viewpoints were selected for use in the development of visual simulations. Viewpoints were selected because they provided open views of the turbines from identified aesthetic resources, and/or were representative of the viewer/user groups and LSZs within the study area that are most likely to have views of the proposed Project.

7. To illustrate the anticipated visual changes associated with the proposed Project, digital models of the proposed turbines were prepared based on plans and specifications provided by Atlantic Wind. The models were used to create realistic photographic simulations of the completed Project (i.e. the turbines and associated vegetation clearing) from each of the selected viewpoints using AutoCAD® and

AutoDesk 3D Studio Max® software. Aerial photographs and GPS data collected in the field were used to create an AutoCAD® drawing of the Project. The two dimensional AutoCAD data was then imported into 3D Studio Max®, and three-dimensional components (cameras, modeled turbines, etc.) were added. These data were superimposed over photographs from each of the viewpoints, and minor camera changes (height, roll, precise lens setting) were made to align all known reference points within the view. This process ensures that Project elements are shown in proportion, perspective, and proper relation to the existing landscape.

At this point in the analysis, a "wire frame" model of the facility and known reference points was included in each of the photographs. The proposed exterior color/finish of the turbines was then added to the model and the appropriate sun angle was simulated based on the specific date, time and location (latitude and longitude) at which each photo was taken. This information allows the computer to accurately illustrate highlights, shading and shadows for each individual turbine shown in the view. All simulations show the turbines with rotors oriented toward the northwest, which is generally the prevailing wind direction in the area.

8. The visual impact assessment methodology utilized on this Project involved completion of a simple visual contrast rating form developed by EDR based on methods utilized by the U.S. Department of the Interior BLM. This visual contrast rating form is an updated version of the form that was used by EDR and accepted by the SEC on the Groton Wind Project, and is attached to my prefiled testimony. *See* Attachment JDH2. The procedure involves using a numerical contrast rating system to compare

representative views with and without the proposed Project in place and quantifying visual contrast. The form also provides for the description of existing scenic quality, viewer sensitivity, and variable effects such as viewing angles and atmospheric conditions, in addition to the actual rating of contrast between the proposed Project and the existing view. A panel of three registered landscape architects from EDR's staff evaluated the visual impact of the proposed Project using the simplified BLM methodology. The VIA evaluation involved viewing and rating 11"x17" color prints of the views with and without the Project in place from each of the selected representative viewpoints.

Q. What conclusions did you reach as a result of the VIA analysis?

A. From the VIA, we concluded that the proposed Project is likely to be visible from only a very small portion of the visual study area. However, it will be visible from several identified aesthetic resources. While it is likely that the Project will have an effect on the visual/aesthetic character of some views within the study area, we do not believe that those effects are unreasonably adverse.

Our specific findings and conclusions are as follows:

- Topographic viewshed analysis (which assumes no trees or vegetation) indicates that the maximum area of potential visibility for the proposed turbines is approximately 46.6% of the 10-mile radius study area, discounting the screening provided by existing forest vegetation and buildings. In other words, 53.4% of the study area will be fully screened from view of the Project by topography above.

- Vegetation viewshed analysis, which considers the screening effect of mapped forest vegetation and more accurately reflects the likely extent of Project visibility, indicates that less than 4% of the 10 mile study area should have potential views of the proposed turbines.
- Field review revealed that actual Project visibility is likely to be much more limited than suggested by topographic viewshed mapping. This is due to the fact that screening provided by buildings is significant in village and hamlet areas, and trees within rural portions of the study area typically limit long distance views. Consistent with the results of the vegetation viewshed analysis, field review confirmed that visibility of the Project is very limited within the study area due to the prevalence of mature forest vegetation.

Open views of the Project were concentrated to the south and east of the Project site, with a few scattered open views documented to the north and west. The closest open views of the site were documented on Wild Meadows Road in the Town of Grafton; Grafton, Washburn, and Cass Mill Roads in the Town of Alexandria, and Bohonnon Road and Forbes Mountain Road in the Town of Danbury. The most numerous open views were available in agricultural areas in the Town of Danbury and Alexandria, and from the eastern shoreline of Newfound Lake. Newfound Lake itself represents the largest area from which open, unscreened views of the Project will be available. The Project will be screened from view along the west shore of the lake. However, the eastern shore, and areas where clearings in the forest have been created on the hills that border the lake to the east (primarily residential yards in the Town of Bridgewater) will likely have open views of the Project, albeit at a distance of over 5 miles away.

In village and hamlet areas, where population is concentrated, views of the Project site are generally well-screened by buildings, street trees, yard trees, and/or adjacent areas of the forest. No open views were documented from the downtown areas of New Hampton, Hebron, Canaan, or Canaan Center, other than one long distance view across Canaan Street Lake. Open views from the downtown area of Bristol were also very limited, even in areas that lacked foreground screening, due to the presence of an intervening forested ridge to the west. Several open views were documented from the hamlet areas of Danbury and Alexandria. However, views within the village and hamlet areas were in all cases tightly framed or partially blocked by buildings, street tress, and/or surrounding wooded hills.

Few open views were documented from the more heavily traveled highways that traverse the study area. No open views were observed from State Routes 118 or 4A, or Interstate Route 93. Despite its proximity to the Project site, views of the Project site from U.S. Route 4 were typically blocked by intervening forested ridges, even where gravel pits and other clearings adjacent to the highway provided open views in the direction of the Project site. These areas may offer occasional, limited views of the upper portions of some turbines.

Views from State Route 3A within the study area were almost always well screened by adjacent roadside vegetation and structures. The highway offering the greatest opportunities for views of the Project is State Route 104. Although often screened by forest, open fields in a few locations along Route 104 in the Towns of Alexandria, Danbury, and Bristol will offer at least partial views of the Project. A large open field north of Route 104 in Danbury provides the most open, expansive view of the Project from any of the heavily-used highways within the study area.

Elsewhere within the study area, open views were generally limited to isolated locations in some valleys and on slopes oriented toward the Project site, where clearings in the forest overstory associated with residential yards, water bodies, agricultural fields, or utility corridors, provided outward views.

Although field review focused on the identification of sites with potential views of the proposed Project, it is worth reiterating that field investigation confirmed that views toward the Project site were screened throughout the vast majority of the visual study area. Rural portions of this area were generally screened by the mountainous topography and forest vegetation. Where views of the surrounding landscape were available in rural, forested areas, these views tended to be narrow openings in the forest canopy that offered limited or fleeting outward views. These openings are typically in association with a rural roadway, utility line corridor or residential yard.

Public resources of potential statewide significance with open views toward the Project site included portions of Cardigan Mountain State Forest/Park where multiple views are available from the trails and overlooks on the bald summit and upper slopes of Mount Cardigan, South Peak and Firescrew Mountain. Broad, open (in places 360 degree) views of the surrounding landscape, including the Project site and the built Groton Wind Farm are available from multiple locations on the exposed portions of these peaks. Trails leading up to the summit of Mount Cardigan from trailheads in the state forest to the west, and on the AMC property to the east, generally run through mature forest and are well screened. Partially screened open views in the direction of the proposed Project were documented from an area of mowed lawn adjacent to the AMC Cardigan Lodge and in the vicinity of designated campsites to the west of the lodge. No open ground-level views are available from the lodge itself or its parking lot.

Views from the southern and western shorelines of Newfound Lake are well screened by forest vegetation, buildings and/or topography, which rises steeply from the lakeshore. No open views were documented from Wellington State Park, although the Project site comes into view above the shoreline trees as one proceeds out into the lake from the Park’s boat launch. The most open views of the Project site were available from the surface of Newfound Lake, the eastern shoreline of the lake, and clearings on the west-facing slopes immediately to the east. These locations which range in distance from approximately 4 miles to over 8 miles from the nearest proposed turbine site, offer unobscured views of the background ridges/hilltops where the turbines are proposed to be located, and in many of these areas, all or portions of the majority of the proposed turbines will be visible.

Open views toward the Project site were also documented from some locations within the Murray Hill Summer Home Historic District in the Town of Hill. Other public resources or tourist destinations with open views toward the Project site include the parking lot of Ruggles Mine, the ski trails at Ragged Mountain Ski Area, the golf course at Ragged Mountain, and several small lakes and ponds. Sites that receive significant public use with potential open views of the Project include the Alexandria Town Hall, Danbury Town Hall, and Bristol Elementary School.

Public resources of potential statewide significance where no open views toward the Project site were documented included the Pemigewasset River within the Franklin Falls Reservoir Recreational Resource Area, several of the National or State-listed historic sites (e.g., the Hebron Village Historic District, Hill Center Church, Gordon-Nash Library, New Hampton Community Church, Dana Meeting House, and sites in East Grafton), the New Hampton and New Hampton-Bridgewater Scenic Easements, Grafton Pond, Kilton Pond, the Newfound River, and all of the State Forests and WMA’s visited during field review. In addition, no open views toward the Project were identified for many resources of local significance, including the hamlet areas of Hebron, Groton, Hill Center East Grafton, Grafton, South Danbury, Orange, or Franklin, as well as several schools, municipal buildings, and local recreational facilities.

- Visual simulations prepared from sensitive sites and representative landscape settings within the study area showed a wide range of Project visibility and visual contrast. As shown in the simulations, in most cases where open views are available, the Project will be viewed on a forested background ridge. In many of the views featured in the simulations, the Project resulted in the addition of man-made features to a primarily undeveloped view. This change resulted in perceived contrast with land use and viewer activity in forested and residential settings, but appeared compatible with working agricultural landscapes.
- Evaluation of these simulations by a panel of three licensed EDR landscape architects indicates the Project's overall contrast with the visual/aesthetic character of the area will be highly variable. Composite contrast ratings for individual daytime viewpoints ranged from 0.3 to 3.3 on the scale of 0 (insignificant) to 4 (strong), and averaged 2.3 (moderate). This likely reflects the variety of circumstances under which the Project will be viewed, and the differing perspectives of the individual rating panel members. However, appreciable contrast (scores of 2.5 to 3.5) was noted for nine of the 20 daytime

viewpoints. In general, the highest contrast scores were received by views where the turbines were relatively close to the viewer, were completely or substantially unscreened, occupied a significant portion of the view, and/or presented substantial contrast with the landscape features or viewer activities occurring at the site. For those viewpoints with the highest contrast rating, rating panel comments indicated that the Project presented appreciable to strong contrast with multiple features of the existing landscape, in particular land use and viewer activity.

- Based upon rating panel review of nighttime simulations, the turbines and a standard array of FAA warning lights could result in a nighttime visual impact on certain viewers. Composite contrast rating scores for nighttime simulations ranged from 1.4 to 3.0. This range of contrast was related to how many lighted turbines were visible, what other sources of lighting were present in the view, the extent of screening provided by structures and trees, and nighttime viewer activity/sensitivity. While night lighting will likely be perceived negatively by rural residents and vacationers in locations where they currently experience dark nighttime skies, nighttime visibility/visual impact will be limited due to the abundance of mature trees that screen the Project from many homes, and the concentration of residences in village and hamlet areas, and along highways, where existing lights already compromise dark skies and compete for viewer attention.

- While the contrast presented by the proposed Project may be considered to represent an adverse impact on scenic quality in some locations, based on experience with currently operating wind power projects elsewhere, public reaction to the Project is likely to be highly variable based on viewer proximity to the turbines, the affected landscape, and the viewer's personal attitude regarding wind power. Recreational surveys conducted for wind power projects in Maine consistently indicate that the projects may result in a perceived decrease in scenic quality, but are unlikely to diminish the recreational experience for most users, or reduce the likelihood of their returning to the area in the future. Surveys from other locations with operating wind projects generally indicate strong public support for the projects. This may reflect the fact that wind turbines are not, in and of themselves, unattractive and have a positive connotation for many viewers.

Q. Have mitigation measures been implemented to reduce the Project's visual impact?

A. Yes. The following measures have been incorporated into the Project design:

- The initial Project design, including 37 turbines, was reduced to 23 turbines (a 38% reduction).
- The turbines eliminated from the original Project design were those proposed to be closest to Mount Cardigan.

- The Project will be located in a forested area that essentially eliminates the opportunity for foreground views from public vantage points, and limits potential Project visibility to a small portion of the surrounding area.
- New access road construction will be minimized by utilizing existing logging roads whenever possible, and forest clearing along the proposed access roads and at turbine sites will be minimized to the extent practicable.
- The placement of manufacturer's logos or other markings on the turbines will be prohibited.
- The proposed substations will be located at least 350 feet off of the nearest public road and will be well screened by surrounding forest vegetation. The stations will also be located adjacent to an existing high voltage transmission corridor. These project components are well removed from any significant public resources and should present little if any adverse visual impact.
- The proposed Operations and Maintenance facility will be located approximately 1,800 feet from the nearest public road and will be well screened by forest vegetation. It therefore will present little if any adverse visual impact.
- The Project will use the minimum number of aviation warning lights (currently assumed to be 13 of the 23 turbines), and longest permissible off cycle allowed by FAA guidance.
- The Project will be decommissioned and removed at the end of its operational life.

In addition, the following recommendations are provided based on the results of the VIA:

1. Explore the feasibility of utilizing radar-activated FAA warning lights that would only go on only when an airplane is actually approaching the Project. While such

systems are not currently approved by the FAA, they may be in the future, and if employed on the Project, could substantially reduce nighttime visual impacts.

2. Evaluate construction techniques that could further reduce the extent of tree clearing required, and allow revegetation of trees wherever they would not interfere with Project operations and safety.

Shadow Flicker Analysis

Q. Please describe "Shadow Flicker."

A. Shadow flicker refers to the shadows that a wind turbine casts over structures and observers at times of the day when the sun is directly behind the turbine rotor from an observer's position. Shadow flicker is most pronounced in northern latitudes during winter months because of the lower angle of the sun in the winter sky. However, it is possible to encounter shadow flicker anywhere for brief periods after sunrise and before sunset. During intervals of sunshine, wind turbine generators will cast a shadow on surrounding areas as the rotor blades pass in front of the sun, causing a flickering effect while the rotor is in motion. Shadow flicker does not occur when fog or clouds obscure the sun, or when turbines are not operating.

Q. What is the concern relative to shadow flicker?

A. Shadow flicker can be experienced by residents living near wind turbines when the turbine is located in proximity to a residence (i.e., within 10 rotor diameters, or approximately 1,120 meters or 3,675 feet for this Project), and the turbine rotor is between low angle sunlight and the residence. The distance between a wind turbine and a potential shadow flicker receptor affects the intensity of the shadows cast by the blades, and therefore the intensity of flickering. Shadows cast close to a turbine will be more intense, distinct and focused. This is because a greater proportion of the sun's disc is intermittently blocked by the turbine. Obstacles such as terrain, vegetation, and/or buildings occurring between residences and wind turbines may significantly reduce or eliminate shadow flicker effects. The primary concern with shadow flicker is the annoyance it could cause for the occupants of premises adjacent to the turbines.

Q. How is the amount of shadow flicker from a wind power project calculated?

A. Predicted shadow flicker effects are expressed in terms of frequency (hours per year) at receptor locations. The location of shadow flicker can be predicted quite accurately using computer modeling programs and input data defining a "worst case" scenario. A worst case scenario would occur only when there are no clouds or fog, wind conditions allow continuous turbine operation, and the turbine rotor is continuously perpendicular to the sun and between the observer/residence and the sun. This analysis is thus very conservative (i.e. a "worst case" scenario), because it is not what residents would actually experience given that the turbines are not in continuous operation, are not always aligned perpendicular to the sun, and are not always between the residence and the sun. In addition, sunlight conditions vary daily and seasonally, sun intensity and duration varies seasonally, and obstacles that block shadows (terrain, vegetation and buildings) exist in the landscape.

Q. How was the Wild Meadows Wind Project's potential shadow flicker evaluated?

A. The Wild Meadows shadow flicker modeling analysis was conducted using *WindPRO 2.8.579* software (WindPro), and associated shadow module. This is a widely accepted modeling software package developed specifically for the design and evaluation of wind power projects which has been accepted on previous New Hampshire wind projects including the Granite Reliable Energy, Antrim and Groton Projects. On the Wild Meadows Project, a conservative maximum distance of potential effect of 1,200 meters was used for the analysis to ensure that all potentially impacted structures were evaluated. Other input variables and assumptions used in the analysis are outlined on pages 5 and 6 of the Shadow Flicker Report included as Appendix 35 submitted with the Application in this proceeding. Based on these variables, WindPro was used to calculate the theoretical number of hours per year that shadow flicker would occur at any given location in the vicinity of the proposed Project. It should be noted that at a distance beyond 10 rotor diameters (maximum of 1,120 m or 3,675 feet for this Project), shadow flicker effects are essentially undetectable. Therefore, the analysis presented herein is expected to be an inclusive (and conservative) projection of the shadow flicker effects of the proposed Wild Meadows Wind Power Project.

Q. What were the results of this evaluation?

A. Output from the model is presented in the Shadow Flicker Report, and includes the following information:

- Calculated shadow-flicker time (days per year, maximum hours per day, and total hours per year when shadow flicker is expected) at each of the 27 receptors located within 1,200 meters of a proposed turbine.

- Tabulated and plotted time of day that structures are predicted to receive shadow flicker.
- Shadow isolines, which are used to create maps showing turbine locations, receptors, and projected shadow-flicker duration (hours per year) without taking into consideration the effect of screening provided by vegetation and structures.

In summary, of the 27 structures identified and evaluated for effects from shadow flicker in this study:

- 8 (30%) of the receptors are not expected to experience any shadow flicker,
- 0 (0%) of the receptors may be affected 0-1 hour/year,
- 15 (56%) of the receptors may be affected 1-10 hours/year,
- 2 (7%) of the receptors may be affected 10-20 hours/year,
- 1 (4%) of the receptors may be affected 20-30 hours/year,
- 1 (4%) of the receptors may be affected for more than 30 hours/year.

As these results indicate, 86% of the receptors within the study area are predicted to receive less than 10 hours of shadow flicker per year. At most receptor locations shadow flicker will occur in the winter primarily in the early morning or late afternoon and will generally last no more than 30 minutes. The maximum daily duration of shadow flicker predicted at any receptor within the study area is 43 minutes (at a summer cabin owned by a Project participant).

It should also be reiterated that these calculations do not take into account the screening effects associated with existing site-specific conditions such as vegetation and/or buildings. Furthermore, this analysis assumes that there are windows on every side of the identified structures, and all identified structures are receptors/residences. Therefore, the predicted levels of shadow flicker at these receptors are almost certainly higher than the actual level that will be experienced.

Q. How do these results compare to established regulations and thresholds for shadow flicker from wind power projects?

A. No existing national, state, county, or local standards exist for frequency or duration of shadow flicker from wind turbines at the Project site. However, standards developed by some states (including the New Hampshire Office of Energy and Planning) and countries have suggested 30 hours of shadow flicker per year as the threshold of significant impact, or the point at which shadow flicker is commonly perceived as an annoyance. Accordingly, a threshold of 30 hours of shadow flicker per year was used in this analysis to evaluate potential shadow flicker impacts to area residences. As indicated above, only one receptor (receptor D-34) is predicted to exceed this threshold. This structure is a summer cabin owned by a Project participant. Of the four receptors predicted to potentially receive greater than 10 hours of shadow flicker per year, only once receptor (receptor G-16) is not a participating landowner. The vegetation viewshed analysis conducted by EDR indicates that receptor G-16 should not have views of the Project and, therefore, is not expected to experience perceptible shadow flicker. Field review of this structure confirmed the presence of abundant forest screening on all sides, which should block any shadow flicker created by the Project. Viewshed analysis indicates that, of the structures predicted to receive 10 or more hours of shadow flicker, only receptor G-19 could have an open view of the proposed turbines. Receptor G-19 is a non-residential structure owned by a Project participant. The remaining 23 structures within the study area (86%) are predicted to receive no more than 10 hours of shadow flicker annually. Consequently, no significant adverse impacts from shadow flicker are expected as a result of the Project.

Q. In your opinion, will this Project have an unreasonable adverse effect on aesthetics?

A. No. Based upon the results of EDR's VIA and Shadow Flicker Study discussed above, the Project will not have an unreasonable adverse effect on aesthetics. As noted in the answer to the immediately preceding question, the aesthetic impact associated with the Project's anticipated shadow flicker will be below the commonly-accepted threshold of 30 hours per year at all non-participating residences.

As discussed earlier in this prefiled testimony and in greater detail in the VIA report, viewshed analysis indicates that only a small percentage (less than 4%) of the locations within a 10-mile radius of the Project will have the potential to view portions of one or more of the proposed turbines. Field review confirmed that forest vegetation effectively screens views in most areas, and that where open views are available, often only a portion of the Project will be visible. EDR's evaluation of 21 visual simulations showing the most open views available within the study area indicates that, while appreciable to strong visual contrast could occur in a few locations within the 10-mile radius study area, opinions regarding the Project's impact on aesthetics are likely to be highly variable and will be influenced by the viewers' location, activity, and personal attitudes regarding the turbines' appearance and wind power generally. Based on the results of various studies, as well as EDR's experience with public reaction to operating wind power projects elsewhere, it is unlikely that the Project will substantially impact the experience of most viewers, or reduce the likelihood of their returning to the area in the future.

In addition, the Project sponsor has undertaken various mitigation measures designed to reduce potential adverse visual impacts. The most significant of these is the reduction of the proposed Project size from 37 turbines to 23 turbines (a 38% reduction). Given the various mitigation measures proposed or under consideration, it is clear that Atlantic Wind has not failed to take generally available mitigation steps which a reasonable person would take to improve the harmony of the proposed Project with its surroundings.

Therefore, based on the standards applied in New Hampshire and the results presented in the VIA, the Wild Meadows Wind Project will not have an undue or unreasonable adverse visual impact.

Q. Does this complete your testimony?

A. Yes it does.

ATTACHMENT JDH 1

CURRICULUM VITAE OF JOHN D. HECKLAU

John D. Hecklau
Principal

education

State University of New York, College of Environmental Science and Forestry, Syracuse, New York, *Master of Science in Environmental and Forest Biology,* Specializing in Wildlife Biology, 1982.

Middlebury College, Middlebury, Vermont, *Bachelor of Arts in Biology*, 1979.

professional affiliations

Member, The Wildlife Society.
Certified Wildlife Biologist, The Wildlife Society.
Planning Board Member/Chairman, Town of Kirkland, New York.
Member, American Wind Energy Association

certification

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employment history

Principal, Environmental Design & Research, Landscape Architecture and Engineering, P.C., Syracuse, New York 2008 to Present.

Principal/Senior Ecologist, Environmental Design & Research, Syracuse, New York, 1995 to Present.

Ecologist, Environmental Design & Research, Syracuse, New York, 1989 - 1994.

Self-Employed Environmental Consultant, John D. Hecklau, Clinton, New York, 1988.

Resource Manager, Environmental Programs Division, New York State Power Authority, Marcy, New York, 1984 - 1987.

Wildlife Biologist, Connecticut Department of Environmental Protection, Burlington, Connecticut, 1983 -1984.

Wildlife Consultant, Central Park Conservancy, New York, New York, 1982 - 1983.

publications/presentations

Presenter, Herkimer-Oneida Counties Comprehensive Planning Program / Land Use Training Conference, *Marcellus Shale: Local Municipal Options*, October 2011.

Presenter, Land Use Planning Workshop, *The Benefits of Sustainable Community Planning & Design*, Jefferson Community College *Center* for Community Studies, April 2011.

Hecklau, J. 2010. *Technical Considerations in the Preparation of Visual Simulations of Off-Shore Wind Power Projects.* Presentation at the American Wind Energy Association North American Off-Shore Wind Conference & Exhibition. October 5-7, 2010, Atlantic City NJ.

Hecklau, J. and J. Gagliano. *Local Review of Commercial Wind Power Projects.* Presentation at Onondaga County Planning Federation Conference. January 21, 2009, Syracuse, NY.

Hecklau, J. and M. Scipioni. *Measuring Success of Wetland Mitigation & Monitoring.* Presentation at Sustainable Solutions. June 12, 2008, Rochester, NY. American Society of Landscape Architects, New York Upstate Chapter Annual Conference.

Hecklau, J. and B. Brazell. *State and Environmental Quality Review Act & Public Participation.* Presentation at Wind Energy Conference. April 5, 2008, Herkimer County Community College. Sponsored by Herkimer-Oneida Counties Comprehensive Planning Program.

Hecklau, J. 2006. *Evaluating the Visual Impacts of Wind Power Projects.* North American Wind Power. 3 (June): 48-52.

Hecklau, J. *Visual Characteristics of Wind Turbines.* Presentation at Technical Considerations in Siting Wind Developments Research Meeting. December 1-2, 2005, Washington, DC. Sponsored by the National Wind Coordinating Committee.

Hecklau, J. *Evaluating Visual/Aesthetic Impacts of Wind Power Projects.* Presentation at the Second Wind Power Project Siting Workshop, Siting Wind Power Projects in the Eastern U.S. March 8-9, 2005 Boston, MA. Sponsored by the American Wind Energy Association (AWEA).

Lamanna, B. and J. Hecklau. 2002. *The Windmills of Madison County.* New York State Conservationist. 56(5): 8-11.

Hecklau, J. *Overview of Wind Permitting Frameworks in Different Settings. Case Study 1: Madison, NY.* Presentation at New England Wind Power Siting Workshop, October 24, 2001, Boston, MA. Sponsored by the National Wind Coordinating Committee.

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Liverman, E.T., J.D. Hecklau and C. Palmero. 1987. *Minimization of soil erosion and siltation during construction of the Marcy-South 345kV transmission facilities.* pp. 241-253. In Erosion Control: You're Gambling Without It. Proc. of Conf. XVII. International Erosion Control Assoc., Pinole, CA. 335 pp.

project experience

Wild Meadows and Groton Wind Farms – Oversaw preparation of Visual Impact Assessments (VIAs) and Shadow Flicker Analyses for two commercial wind power projects in New Hampshire. VIAs included viewshed analysis, photo documentation and visual simulations. Also assisted with public outreach efforts and state Site Evaluation Committee proceedings, including preparation of pre-filed testimony, response to discovery requests, and participation in a technical session and adjudicatory hearings as an expert witness.

Block Island Wind Farm – Oversaw preparation of Visual Impact Assessments (VIAs) for the proposed Block Island Wind Farm and associated on-shore transmission facilities. The wind farm is a proposed 30 MW facility located in the Atlantic Ocean, 3 miles off the coast of Block Island, Rhode Island. On-shore facilities include electrical lines, switchyards, and substations. The project involved the preparation of 28 daytime and nighttime simulations of the offshore turbines from viewpoints on Block Island and the mainland. Simulations of the above-ground on-shore components of the project were also prepared, including landscaping and architectural façade treatments of the switchyards. VIAs also included inventory of visually sensitive resources, viewshed analysis, cross section analysis, and evaluation of visual impact by a panel of landscape architects. In addition to the VIAs, managed preparation of various presentation graphics for public outreach purposes, including poster boards, animated daytime and nighttime simulation, an interactive web site, and an animated "fly-through" video of the wind farm.

Eastover Road New 230/115kV Station and Transmission Line Loops – Prepared a variety of environmental studies, reports and permit applications in support of a new National Grid electric substation in Rensellaer County, New York. Project included an alternatives analysis, state and federal wetland delineation and permitting, a Visual Impact Assessment, cultural resource investigations, a Part 102 report, and State Environmental Quality Review Act (SEQRA) compliance. Also oversaw preparation of preliminary grading plans, stormwater management plan, planting plans, and wetland mitigation plans for the project.

Hardscrabble and Hoosac Wind Power Projects – Managed environmental compliance monitoring during construction of a 19-turbine wind power project in Berkshire and Franklin Counties, Massachusetts and a 37-turbine wind power project in Herkimer County, New York. Assisted with preparation of the Environmental Compliance Manuals and provided compliance training to project contractors. Oversaw and assisted EDR field staff with daily on-site monitoring, weekly Stormwater Pollution Prevention Plan (SWPPP) inspections, preparing reports, coordinating resolution of compliance issues with Construction Site Manager and contractors, and assuring compliance with local, state, and federal permit conditions.

CWM Wetland Permitting – Conducted and oversaw multiple wetland delineation and permitting efforts on several potential landfill expansion sites at the CWM Chemical Services facility in Model City, New York. Jurisdictional wetlands on site were identified and delineated in accordance with the 1987 Corps of Engineers Wetland Manual, and delineation reports were prepared and submitted to the U.S. Army Corps of Engineers. Also participated in agency jurisdictional determinations and development of wetland mitigation area designs, including a 4.5 acre wetland mitigation area incorporated into a compensatory flood storage basin. Also provided monitoring of mitigation area success in accordance with wetland permit requirements.

Deerfield Wind Power Project– Served as project manager for the preparation of a National Environmental Policy Act (NEPA) compliant Environmental Impact Statement (EIS) for the first wind power project proposed on U.S. Department of Agricultural (USDA) Forest Service land. The project involves the proposed construction of 17 2.0 MW wind turbines on forested ridges in the Green Mountain National Forest. Project activities included preparation of a Public Information Plan, significant public outreach, project scoping, coordination with Forest Service staff, and review of subconsultant resource reports for inclusion in the EIS. A draft supplemental draft, and final EIS were prepared for the project. Responses to over 500 public comments on the draft EIS and 1,000 comments on the supplemental draft were prepared.

New England East-West Solution Project – Coordinated preparation of Visual Impact Assessments (VIAs) for multiple National Grid transmission system improvement projects in Rhode Island and Massachusetts. The transmission system improvements involve upgrade of existing transmission lines, construction of new transmission lines, construction of new substations, and existing substation upgrades. Prepared VIAs for each project that included the identification of existing visually sensitive resources, photo documentation of existing views, and description of existing landscape character along over 75 miles of proposed transmission line route. Viewshed analyses of existing and proposed facilities were conducted, and over 20 visual simulations were prepared and rated by a professional panel of landscape architects. VIA reports were included in applications submitted to the State Utility Siting Boards. Also prepared pre-filed visual testimony, responded to discover requests, and provided testimony before the Rhode Island Energy Facility Siting Board.

Blenheim-Gilboa Pumped Storage Project – Oversaw design, construction, and post-construction monitoring of 6+ acres of wetland mitigation areas to compensate for impacts associated with slope stabilization activities at the New York Power Authority's Blenheim-Gilboa Pumped Storage Power Project in Schoharie County, New York. Mitigation plans required installation of an impervious bentonite liner, and incorporated a pedestrian path and bridge system to provide enhanced recreational and educational opportunities at the Power Authority's visitor's center. Performed five years of follow-up monitoring to document successful development of wetland characteristics.

Southern Rhode Island Transmission Project – Oversaw preparation of the Visual Impact Assessment (VIA) and Supplemental VIA prepared for the proposed upgrade and extension of approximately 26 miles of an existing National Grid 115 kV transmission line in southern Rhode Island. The effort consisted of fieldwork, definition of landscape similarity zones and viewer groups, identification of sensitive resources/receptors, development of viewshed maps and visual simulations, impact evaluation, and preparation of the VIA report. Also provided expert witness testimony to the Rhode Island Energy Facility Siting Board.

Cohocton and Marble River Wind Power Projects – Coordinated State Environmental Quality Review Act (SEQRA) compliance for these commercial wind power projects in Steuben County and Clinton County, New York. Work on these projects included project layout/environmental field review to assure that impacts on wetlands, agricultural land and ecological resources were minimized. Conducted or oversaw all environmental support studies on these projects and incorporated the results of these studies into Draft Environmental Impact Statements. Prepared Supplemental Draft Environmental Impact Statements to address project changes, and Final Environmental Impact Statements to address all public and agency comments on both of these projects. Also completed state and federal wetland permitting for the Cohocton Project.

Commercial Wind Power Project Visual Impact Assessments – Coordinated preparation of Visual Impact Assessments (VIAs) for 15 commercial wind power projects in Upstate New York. The VIAs for these projects the visual character and significant aesthetic resources with a 5 or 10 mile visual study area. Viewshed analysis, line-of-sight cross sections, field review, and computer-assisted visual simulations were used to evaluate the potential visibility and visual impact of these projects. Notable projects include the Madison, Fenner, Maple Ridge, Jordanville, Hardscrabble, Cohocton, Dutch Hill, Dairy Hills, Howard, Munnsville, Alabama Ledge and Roaring Brook projects, totaling over 1,400 MW of proposed wind power.

Maple Ridge Wind Power Project – Coordinated State Environmental Quality Review Act (SEQRA) compliance, including preparation of Draft and Final Environmental Impact Statements (DEIS/FEIS) for the largest commercial wind power project in the Northeast. Oversaw production of all support studies and directly prepared ecological, wetlands, agricultural, and visual studies for 300 MW wind power project on the Tug Hill Plateau, Lewis County, New York. Incorporate study results into the DEIS and responded to all public and agency comment in the FEIS. Also assisted with state and federal wetland permitting on the project.

Maple Ridge 230 kV Transmission Line Project – Oversaw preparation of Article VII Application to New York State Public Service Commission for a 10.3-mile-long 230 kV transmission line corridor in Lewis County, New York. Conducted ecological, wetland, and visual fieldwork, prepared Visual Impact Assessment report, and provided expert witness testimony on ecological and visual issues.

Munnsville, Fenner, and Madison Wind Power Projects – Prepared expanded Environmental Assessment Forms (EAFs) for these three commercial wind power projects in Madison County, New York. Work on the projects included project layout/environmental field review to assure that wetland impacts were avoided and impacts to agricultural and ecological resources minimized. Conducted or coordinated support studies addressing potential visual, cultural, noise, ecological, avian and agricultural impacts. Summarized results into expanded EAFs. On each of these projects the Lead Agency issued a Negative Declaration under SEQRA, indicating that no significant adverse environmental impacts were anticipated. Monitored environmental compliance during construction of the Munnsville and Madison Projects.

LIPA Offshore Wind Park – Coordinated preliminary visual studies associated with a 150 MW offshore wind power project being proposed by the Long Island Power Authority (LIPA). Project included preparation of visual simulations from heavily used beaches and state parks on the South shore of Long Island, New York. Graphics were used for public information and outreach efforts.

Cape Wind Project – Oversaw production of visual simulations and other graphics/analysis for proposed 130-turbine offshore wind power facility near Cape Cod, Massachusetts. Prepared visual methodology write-up for project Environmental Impact Review and presented methodology at a public/agency forum sponsored by the Massachusetts Technology Forum. The project's visual impact was a sensitive issue, subject to intense scrutiny. Graphics for project were featured in New York Times Magazine article.

E-183 115 kV Transmission Line Relocation Project – Oversaw preparation of a Visual Impact Assessment (VIA) of the proposed relocation of approximately 1.2 miles of existing overhead transmission line in the cities of Providence and East Providence, Rhode Island. VIA included viewshed analysis of existing and proposed towers, line-of-sight cross sections, field evaluation/photo documentation, preparation of visual simulations, and visual impact evaluation using the ACOE VRAP methodology.

Conjunction Empire Connection Transmission Line Corridor -Oversaw preparation of ecological and visual inventories and impact evaluations undertaken in support of the Article VII Application for a proposed DC transmission line running parallel the New York State Thruway from south of Albany to New York City. The visual study assessed potential impacts of proposed overhead segments as well as converter stations for proposed underground transmission line segments. Met extremely tight 30-day schedule for completion of studies.

Reliant Energy Astoria Repowering Project – Conducted Visual Impact Assessment for proposed repowering of the existing Astoria Generating Project in Queens, New York. The study involved identification of landscape similarity zones and viewer groups, viewshed mapping, cross sections, and visual simulations. Assisted with development of visual impact mitigation options, and provided expert witness testimony.

TransEnergie Cross-Sound Cable Project – Coordinated study and prepared Visual Impact Assessment (VIA) report assessing visual impacts of submarine cable crossing of Long Island Sound. VIA focused on the visual impact of above-ground transition stations and associated structures in New Haven, Connecticut and Shoreham, New York.

Neptune Regional Transmission System Project – Coordinated study and prepared Visual Impact Assessment (VIA) report assessing visual impacts of aboveground components of submarine/underground transmission line in New York City metropolitan area. VIA focused on the visual impact of transition stations in Manhattan and on Long Island.

Ramapo Energy Project – Coordinated preparation of comprehensive visual impact analysis for a proposed 1,100 MW gas-fired power plant proposed by American National Power in Rockland County, New York. Study involved background data collection, viewshed mapping, line-of-sight cross sections, field evaluation, visual simulations, evaluation of visual impacts using the U.S. Army Corps of Engineers methodology, and exploration of various visual mitigation measures. Wrote the Visual Impact Assessment report and assisted with preparation of the visual section of the Article X Application and provided expert witness testimony. Also assisted with ecological investigations, and preparation of Application text and testimony dealing with wildlife issues.

Athens Power Project – Evaluated visual resources and visual impacts associated with construction of a 1,080 MW power plant proposed by PG&E National Energy Group. Also delineated state and federal wetlands and documented ecological conditions on the project site and along proposed off-site utility (gas, water, and electric transmission) corridors associated with the project. Assisted with field data collection, agency liaison, and preparation of a wetland delineation report and functional analysis. Oversaw preparation of the Ecological Resources and Visual Resources sections of the Article X Application, and provided expert witness testimony on potential ecological impacts. Project was the first permitted under New York's Article X power plant siting regulations.

St. Lawrence Gas – Prepared Environmental Impact Assessment Reports for proposed natural gas distribution systems in Lewis County and St. Lawrence County, New York. Reports included an inventory of environmental resources within the proposed franchise areas, as well as assessment of anticipated impacts and proposed mitigation measures. Lewis County project involved wetland delineation and permitting, and assistance with preparation of construction drawings.

Avoca Natural Gas Storage Project – Evaluated the environmental impacts of a proposed natural gas storage project in Steuben and Schuyler Counties, New York. Project included wetland delineation, vegetation, fish and wildlife inventory (including identification of endangered species and critical habitats), viewshed/visibility analysis and preparation of ecological resource reports for the Federal Energy Regulatory Commission (FERC) license applications. Reports described ecological resources within study area, along with potential impacts to these resources resulting from construction and operation of the project, and proposed means of mitigating adverse impacts.

ATTACHMENT JDH 2

VISUAL CONTRAST RATING FORM

Visual Impact Rating Form

Wild Meadows Wind Farm [EDR Project 12068]

Viewpoint #:	**Viewpoint Location:**
Your Name:	**Date:**
Landscape Similarity Zone (LSZ):	**Viewer Type** *check as many as apply* ☐Resident ☐Traveler ☐Recreational ☐Other ___________________________
Designated Aesthetic Resources: ☐Yes ☐No	**Describe:**

VIEWPOINT DESCRIPTION: *Please describe this view in your own words.*

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VIEWPOINT SENSITIVITY: *Rate the scenic quality and viewer exposure for this view.*

SCENIC QUALITY: *please rate existing scenic quality* ☐Low ☐Moderate ☐High	**VIEWER EXPOSURE:** *frequency and duration of view* ☐ Continuous ☐Repeated/Regular ☐Occasional/Brief ☐Rare

CONTRAST RATING: *Rate the level of contrast between the proposed structures and the existing view.*

COMPONENT	***SCORE***	***DESCRIPTION OF CONTRAST***
Landform		
Vegetation		
Land Use		
Water *		
Sky		
Viewer Activity		
TOTAL		*Total all scores above.*
AVERAGE		*Average all scores above.*

** If no water is visible in the view, please enter "N/A" in the 'Score".*

Variable factors that may have influenced rating (atmospheric conditions, season, etc.):

____

Perceived effect on scenic quality / viewer enjoyment:

____

____

____

____

____

Contrast Rating Score Chart

0	**Insignificant**
0.5	
1	**Minimal**
1.5	
2	**Moderate**
2.5	
3	**Appreciable**
3.5	
4	**Strong**

THE STATE OF NEW HAMPSHIRE
BEFORE THE
SITE EVALUATION COMMITTEE

DOCKET NO. 2013-

APPLICATION OF ATLANTIC WIND LLC
FOR CERTIFICATE OF SITE AND FACILITY

PRE-FILED DIRECT TESTIMONY OF ADAM J. GRAVEL ON BEHALF OF ATLANTIC WIND LLC

December, 2013

Qualifications – Adam Gravel

Q. Please state your name and business address.

A. Adam Gravel. 30 Park Drive, Topsham, Maine, 04086.

Q. Who is your current employer and what position do you hold?

A. I am employed by Stantec Consulting ("Stantec") as a Project Manager. I am responsible for coordinating and conducting wildlife use and impact assessment surveys with a specific focus on large-scale avian and bat studies associated with wind power projects.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to explain and summarize the results of field surveys conducted by Stantec in 2009, 2010, and 2011 on behalf of Atlantic Wind LLC (Atlantic Wind) for the Project. For those portions of the Project area not surveyed in previous years (including Forbes Mountain) additional wildlife surveys have been initiated, including on-going raptor migration and game camera surveys in 2013. Complete presentations of the methods, analysis, and results of each survey are contained in the following eight reports, which are included as Appendices to Atlantic Wind's permit application: The results of the on-going 2013 raptor surveys and game camera surveys will be provided separately once complete.

- Fall 2009 Radar and Acoustic Surveys (Appendix 41);
- 2010 Remote Camera Survey (Appendix 47);
- Spring 2010 Avian and Bat Survey Report (Appendix 42);
- 2010 Spring and Fall Raptor Migration Surveys (Appendix 44);
- 2011 Mist Net Survey Report (Appendix 45);
- Northern Long-eared Bat Habitat Requirements – Literature Review and Annotated Bibliography, *Revised 2012* (Appendix 43);
- Bird and Bat Risk Assessment: Assessing Risk to Birds and Bats at the Proposed Wild Meadows Wind Project, Merrimack and Grafton Counties, New Hampshire (Appendix 40); and
- Study Plan for Post-Construction Monitoring (Appendix 46).

The following is a brief description of the methodology, investigations, and consultations related to the individual bird and bat surveys and risk assessment. My testimony will describe the results of those studies related to (1) threatened and endangered species; (2) nocturnal migration activity; (3) raptors; (4) breeding birds; and (5) bats.

Q. Please describe Stantec and its experience in relation to avian and bat studies, including risk assessments.

A. Stantec is an environmental consulting company that provides services to a variety of sectors, including the wind industry. Between 2002 and 2013, Stantec[1] has conducted over 390 distinct seasons of agency required pre-construction avian and bat studies on behalf of proposed wind projects in twelve states, from Texas to Maine, and including New Hampshire. These studies, which have included nocturnal radar surveys, acoustic bat monitoring, diurnal raptor surveys, breeding bird surveys, and targeted rare species surveys, were conducted at the request of state and federal regulatory agencies and followed agency approved methods or guidelines. The Wild Meadows Wind Project (Project) is the fifth utility-scale project in New Hampshire for which Stantec has conducted pre-construction avian, bat and other wildlife studies.

Stantec maintains regular contact with State and Federal resource agencies and seek involvement with regional and national organizations whose sole purpose is to better understand and minimize potential wind energy-associated wildlife impacts. Stantec has directly participated in the development and review of proposed guidelines and monitoring protocols sponsored by several State and Federal agencies; including Pennsylvania, New York, Vermont, Maine, and New Hampshire.

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[1] All field work, reporting, and permitting activities for the Groton Wind Project (the "Project") performed prior to October 1, 2007, were conducted by Woodlot Alternatives, Inc. ("Woodlot"). On October 1, 2007, Woodlot was acquired by Stantec. Unless otherwise noted, when I refer to Stantec, I am referring collectively to both Woodlot and Stantec, and work conducted under either company name.

Based on the results of on-site field surveys, Stantec has also prepared screening-level avian and bat risk assessments for a variety of wind projects and also has designed and conducted agency-approved post-construction surveys. Stantec has completed post-construction bird and bat mortality surveys at existing wind projects in New Hampshire, Maine, Vermont, New York, West Virginia, Pennsylvania, Utah, and Washington. The post-construction efforts have allowed Stantec to further refine survey methodology to provide more comprehensive data sets to the regulatory agencies and the regulated community. Post-construction surveys are particularly helpful to determine overall impacts to bird and bat species.

Q. What are your background and qualifications?

A. In 2003, I earned my Bachelor of Science in Wildlife Management from the University of New Hampshire. I was hired by Woodlot Alternatives, Inc. (now Stantec) in 2004 as a Project Technician and radar ornithologist and was promoted to Project Manager in 2006. Currently, I am the Director of the Ecological Services Division in the Topsham, Maine office of Stantec. I am responsible for coordinating and conducting wildlife use and impact assessment surveys with a specific focus on wildlife studies associated with wind power projects. In addition, I have been a Certified Wildlife Biologist since 2008, a nationally recognized certification for wildlife professionals through the Wildlife Society.

I have conducted and coordinated environmental studies as part of State and Federal permitting requirements for over 100 wind development projects from Maine to

Virginia. These studies include daytime raptor migration, nocturnal radar migration, acoustic bat detector, and breeding bird surveys designed to assess potential direct impacts from proposed wind energy projects. I have also assessed the potential indirect (non-collision related) impacts of projects on wildlife, including habitat impacts and fragmentation effects, impacts to rare species, and impacts to common, local wildlife communities. Other surveys have included remote camera surveys and winter track surveys.

My experience in New Hampshire includes managing and conducting pre-construction and post construction nocturnal radar and acoustic bat surveys, diurnal raptor migration and breeding bird surveys, rare plant and natural community surveys, and winter tracking surveys for State-listed species. I have consulted with State and Federal agencies to identify and discuss potential resources of concern at proposed projects and also have developed field surveys to address agency concerns for wildlife. I have conducted these studies for the only three permitted wind projects in the State of New Hampshire.

Q. Are you familiar with and have you been to the Project site that is the subject of this Application?

A. Yes, I am familiar with the Project site. Acting as a Project consultant, Stantec conducted a number of surveys within the Project area. The surveys were conducted as part of State and Federal permitting processes and included investigations of the Project area ridgelines and areas proposed for wind turbines. These investigations occurred over three years starting in 2009 and involved several Stantec biologists and ecologists, including myself. I have spent a significant amount of time at the Project site selecting survey locations, and setting up field surveys and equipment, as well as conducting some of those surveys. Over the course of these surveys, I have visited the areas along the ridgelines proposed as part of the Project.

On-Site Surveys

Q. Explain how Stantec developed survey methods for the on-site surveys.

A. New Hampshire does not have formal pre-construction survey guidelines for proposed wind projects. Therefore, the types, length, and timing of surveys were based principally on Stantec's extensive experience conducting these surveys for proposed wind projects. The Project surveys were consistent with studies conducted in New Hampshire at other proposed wind projects and included supplemental surveys not conducted for these other projects. The methodologies for the initial wildlife surveys were reviewed and approved by the New Hampshire Fish and Game Department and U.S. Fish and Wildlife Service in April, 2010. Communication with the agencies regarding methodologies for additional wildlife surveys for the Project has continued into 2013. In addition, survey effort and methods were consistent with recommended guidelines used in other states (e.g., Vermont and New York).

Stantec and Atlantic Wind worked with State and Federal resource agencies to incorporate agency recommendations into surveys that were conducted for the Project.

Initially a work plan was developed by Stantec and Atlantic Wind and submitted to State and Federal agencies for discussion and comment. The work plan was developed based on Iberdrola's Corporate Avian and Bat Protection Plan (Appendix 22), which the U.S. Fish and Wildlife Service (USFWS) has endorsed.

On April 1, 2010, Atlantic Wind and Stantec met with staff from the New Hampshire Fish and Game Department ("NHFGD") and USFWS in Concord, New Hampshire to discuss the proposed scope of work for bird and bat studies as well as Project studies that were completed in 2009. No comments on this proposed work plan were received from USFWS. NHFGD recommended that surveys to assess the potential presence or absence of American marten (*Martes americana*) as well as mist netting surveys to assess the potential presence or absence of endangered bat species be added to the work plan scope. The work plan was subsequently revised to include remote camera surveys for American marten, mist netting surveys for bats, and a northern long-eared bat (*Myotis septentrionalis*) habitat assessment and literature review. Revisions to the work plan were based on comments received from NHFGD during the April 1, 2010 meeting as well as an additional meeting with NHFGD to discuss the mist netting survey and northern long-eared bat habitat assessment protocol on March 31, 2011. *Proposed Work Plan for Avian and Bat Studies at the proposed Wild Meadows Wind Project.* <u>See</u> Appendix 23 to the Application.

Q. Please provide a brief description of the studies conducted at the Project site.

A. Stantec conducted pre-construction bird and bat surveys at the Project to document various aspects of migratory and resident bird and bat activity within the Project area. A review of habitat requirements for the northern long-eared bat also was completed. In addition, a remote camera survey was conducted to document the potential presence of American marten within the Project area. These surveys were conducted to assist Atlantic Wind in project design and to inform the permitting process for the Project. Surveys were conducted in:

- Fall 2009 [Radar and Acoustic Surveys];
- Spring, Summer and Fall 2010 [Radar and Acoustic & Raptor Surveys];
- Late Summer 2010 to Early Winter 2011. [August 5, 2010, through January 6, 2011 Remote Camera Survey]; and
- Summer 2011 [June 26 through August 8, 2011Mist net surveys].

In 2009, nocturnal migration surveys and acoustic bat surveys were conducted. Stantec used marine surveillance radar, the same type and model used at the other projects in New Hampshire to survey and document nocturnal migration activity within the Project area. This survey provided the location, numbers, and flight patterns (timing, flight direction, and flight height) of nocturnal migrants during the fall migratory period. The 2009 acoustic bat surveys were conducted to document bat activity and species composition just above tree canopy. Surveys were conducted from the east side of Braley Hill, northern end of Tinkham Hill and the southern portion of Melvin Mountain, which is now outside the current project area. The three individual detectors were deployed on portable towers with the detector on Braley Hill redeployed in a tree after the collapse of the portable tower.

In 2010, surveys were expanded to include spring and fall raptor migration surveys and summer breeding bird surveys. The 2010 acoustic bat surveys included detectors deployed at heights below and above tree canopy in temporary meteorological (met) towers, as well as near the lower end of the turbine rotor zone. Remote camera surveys also began in the late summer of 2010 and extended through early winter 2011 to document the potential presence of American marten[2].

In 2011, mist net surveys were conducted to document the bat species present along the Project ridgelines with a focus on northern long-eared bats, which have been documented in Mud Mine located near the northeastern corner of the Project area. NHFGD requested these surveys to document the potential presence of long-eared bats because this species has undergone significant population declines as a result of White Nose Syndrome.

Specific details of the methods and results of studies conducted during each year are provided in Appendices 40 to 47 of the Application. Table 2-1 in the Bird and Bat

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[2] Because remote camera surveys did not detect the presence of American marten in the Project area and the species is not anticipated to occur in proximity to the Project, this document will not further reference this study. The 2010 Remote Camera Survey is provided in Appendix 47 of the application.

Risk Assessment for the Wild Meadows Wind Project (Assessing Risk to Birds and Bats at the Proposed Wild Meadows Wind Project, Merrimack and Grafton Counties, New Hampshire: Appendix 40 to the Application) provides a comprehensive list of bird and bat related surveys and the range of dates during which each survey was conducted.

Bird and Bat Risk Assessment

Q. Please provide a general description of the bird and bat risk assessment.

A. Following completion of the 2009, 2010, and 2011 bird and bat surveys, Stantec prepared a bird and bat risk assessment for the Project. This document combined the results of the 2009, 2010, and 2011 bird and bat surveys with regional information on local and migratory bird and bat populations, and then compared results of on-site surveys to those of similar regional surveys. The bird and bat risk assessment ultimately used these data to predict the levels of risk presented by the Project to various bird and bat communities. The risk assessment followed a "weight-of-evidence" approach. This approach, which has been used for other risk assessments for wind projects in the region and is an agency accepted approach to assessing risk and simultaneously evaluates multiple, diverse survey methods and considers the strengths and weaknesses of each. Level of risk for each species or group evaluated was predicted by taking into account its abundance in the Project area, the likelihood of exposure to wind turbines based on known behaviors, and patterns of impacts to the particular species or groups as documented at existing wind power facilities. The analysis also presented confidence levels in individual lines of evidence used to determine levels of risk. Potential impacts to four target groups were analyzed within the risk assessment. The Project is expected to have low impacts on raptors, migratory passerines, and breeding birds, and low to moderate impacts on bats.

The ultimate conclusion reached as the result of the risk assessment is that the Project will not have an unreasonable adverse impact to any bird or bat populations. Bird and bat mortality at the Project is expected to be within the range of mortality observed at other Projects in the region. In New England, bat mortality has generally been very low in comparison to other regions in the U.S., particularly the mid-Atlantic and Appalachian states. Bird mortality is also expected to be comparable to other Projects in New England which have generally observed very low mortality, particularly in comparison to some projects in New York and in the Great Lakes Plains.

Threatened or Endangered Species

Q. Were any State or Federally-listed threatened or endangered species documented during on-site bird and bat surveys?

A. Yes. One state-listed endangered species and one state-listed threatened species were observed during the 2010 raptor migration surveys. These were the state-threatened bald eagle (*Haliaeetus leucocephalus*) and state-endangered northern harrier (*Circus cyaneus*).

During the spring 2010 raptor migration surveys, one bald eagle was observed, but did not fly within the Project area.

During the fall 2010 raptor migrations surveys, bald eagle (n=7) and northern harrier (n=2) were observed. Six of the bald eagle observations occurred within the Project area, and two birds flew at heights below the proposed turbines. One of the northern harrier observations occurred in the Project area and the bird flew below the height of the proposed turbines.

Five *Myotis* call sequences (2.6% of total call sequences) and 202 *Myotis* call sequences (10.2% of total call sequences) were detected, respectively, during the 2009 and 2010 acoustic bat surveys. Bats in the genus Myotis cannot be distinguished to species based upon acoustic surveys so the presence of the eastern small-footed bat (*Myotis leibii*), a state-listed as endangered species, could not be conclusively determined with acoustic surveys. Eastern small-footed bats were not captured during mist netting surveys.

No federally-listed threatened or endangered species were observed during any of the on-site surveys.

Q. Are state or federally-listed threatened or endangered bird and bat species expected to breed, reside in, or use the Project area as primary habitat?

No. Although state-listed threatened and endangered species (mentioned above) were observed in the Project area during the spring and fall 2010 raptor migration survey, they were observed infrequently and for brief periods of time indicating that they likely do not reside there.

The bald eagle observations occurred during the migration season when birds encountered the Project area while migrating to their breeding or wintering grounds. These migrating species generally were observed flying in a linear flight direction and passed through the area relatively quickly. Furthermore, the primary breeding habitat for bald eagles consists of large open water bodies, which are not present within the Project area. Based upon information provided by the New Hampshire Natural Heritage Bureau ("NHNHB"), the closest resource to the Project area where wintering bald eagles are regularly observed and where a nesting pair of bald eagles has been documented (last observation 2012) is Newfound Lake which is approximately 5 miles northeast of project area at its closest point.

The northern harrier observations also occurred during the migration season when birds encountered the Project area while migrating to their breeding or wintering grounds. These migrating species generally were observed flying in a linear flight direction and passed through the area relatively quickly. Northern harrier typically nest in and forage over marshes and fields; habitats that are not present within the project area. Based upon information provided by the NHNHB, the closest resource to the Project area where breeding northern harriers have been documented is Danbury Bog which is approximately 4 miles south of project area at its closest point.

There were no federally-listed threatened or endangered species observed in the Project area during any of the bird and bat field surveys. As discussed below, the Project will not have an unreasonable adverse impact on threatened or endangered species.

<u>Nocturnal Migration Activity</u>

Q. Please describe nocturnal migration at or near turbine heights documented during the fall 2009 and spring 2010 nocturnal radar migration surveys.

The radar was located on the summit of Melvin Mountain and provided good visibility of the surrounding airspace to characterize migration. Melvin Mountain is no longer part of the Project area following a reconfiguration of the turbine layout in 2013; however, this location still provides an adequate characterization of local migration as numerous other surveys have demonstrated that nocturnal migration occurs in a broad frontal pattern. The radar was deployed in a clearing at an elevation of approximately 661 m (2,170′). The antenna was placed on an elevated platform at a height of 7 m (23') so that the surrounding trees did not obstruct the radars view of the surrounding airspace. The radar location provided a good view of the airspace in most directions, including to the east where topography drops abruptly to the adjacent valley. This resulted in a good “radar view,” which permitted the radar to detect targets at and in some areas below the horizontal plane of the radar, thus sampling the majority of the surrounding airspace within the radar’s range setting. This location provided favorable conditions for unobstructed views of the surrounding airspace within the range settings used for the radar surveys.

The fall 2009 nocturnal radar surveys at the Project documented a generally southwestern flight direction (225°), which is typical of fall migration. This flight direction is nearly parallel to the ridgelines of the Project area and similar to flight direction and orientation observed at other wind project in New England. The mean overall passage rate for the fall 2009 surveys was 980 ± 39 targets per kilometer per hour (t/km/hr). The spring 2010 nocturnal radar surveys documented a generally northeast flight direction (56°), which is typical of spring migration. The mean overall passage rate for the spring 2010 surveys was 467 ± 24 t/km/hr.

With respect to the height of migration activity, flight heights of nocturnal migrants were consistently above the proposed turbines' maximum height of 150 m (492′). During the fall 2009 survey, the seasonal mean flight height was 362 ± 1 m (1186′) above the radar site with 19 percent of the targets flying below 150 m. Flight heights of nocturnal migrants during the spring 2010 surveys were very similar to the fall 2009 surveys. During the spring 2010 surveys, the seasonal mean flight height was 387 ± 2 m (1,270± 5′) above the radar site. As with the fall 2009 surveys, the percent of targets flying below 150 m was 19 percent. More details of the methods and results of the fall 2009 and spring 2010 radar surveys are contained in Appendices 41 and 42 to the Application.

Q. Please describe the conclusions you have reached in the bird and bat risk assessment regarding nocturnal migrants.

When compared to other publically available radar surveys conducted on forested ridgelines in the northeast, fall radar surveys at the Project documented higher numbers of nocturnal migrants in the air space above the ridgelines whereas the spring radar surveys documented typical numbers of nocturnal migrants when compared to similar surveys (*see* Appendix A, Table 5 of the Fall 2009 Radar and Acoustic Survey Report and the Spring 2010 Avian and Bat Survey Report, Appendices 41 and 42 to the Application). Although the seasonal mean passage rate during the fall survey was higher than similar surveys, the average nightly passage rates at the Project (384 t/km/hr to 2442 t/km/hr) were within the range of those recorded for other publicly available studies (2 t/km/hr to 2463 t/km/hr).

Project flight heights - when compared to the results of nocturnal radar surveys conducted at other sites in New Hampshire - were very similar. During the fall of 2006 and spring of 2007, Stantec conducted nocturnal radar surveys at the Lempster Wind Project on 32 nights and 30 nights, respectively. Average flight heights at Lempster Wind Project were 387 m during the fall surveys and 358 m during the spring surveys. During the spring and fall of 2007, Stantec conducted nocturnal radar surveys at the Granite Reliable Wind Project ("GRP") site on 30 nights and 29 nights, respectively. Average flight heights at GRP were 332 m during spring surveys and 455 m during fall surveys. Stantec also conducted nocturnal radar surveys at the Groton Wind Project in the spring and fall of 2008 on 40 and 45 nights, respectively. Average flight heights at the Groton Wind Project were 321 m during the spring surveys and 342 m during the fall surveys. This pattern is similar across radar surveys in New Hampshire and the northeast, and suggests that birds may be moving across the state and region at similar heights and do not appear to be influenced by topography. Overall, this pattern suggests that factors influencing rates of nocturnal migration are occurring on a more regional scale than a project-specific scale.

Results from an ever-increasing number of post-construction mortality surveys at active wind projects suggest that mortality of nocturnally migrating songbirds is highly variable and episodic, apparently related more to random events such as unusual weather patterns or facility design features such as the presence of bright lights, rather than predictable, seasonal migration events. For example, although not a wind project, a mortality event documented at Backbone Mountain, in Tucker County, West Virginia, on September 29, 2008, in which nearly 500 songbirds collided with a school building within a period of a few hours, apparently was related to the presence of newly installed lighting and foggy conditions. This demonstrates that other developments can pose collision risk to nocturnal migrants and that these collision events are related to random weather events and design features such as incandescent lights.

Although nocturnally migrating passerines are expected to pass over the Project area during spring and fall migration periods, most of these individuals are flying at consistently high altitudes above the height of the proposed turbines, as has been documented in the vast majority of recent radar surveys conducted at proposed wind facilities in the northeast. A literature review also suggests that, while impacts to nocturnally migrating passerines occur at most wind energy facilities, very small numbers of birds have collided with turbines relative to the large numbers of nocturnally migrating passerines. For example, the first year of post-construction monitoring at the Lempster Wind Project, which had comparably lower fall pre-construction passage rates that those at the Project, but higher spring pre-construction radar passage rates, documented very low bird mortality.

For nocturnally migrating passerines, the Risk Assessment—the literature review and the on-site radar surveys—predicts that collision mortality will likely occur, but that the magnitude of impact is likely to be low. Impacts to this group are expected to low primarily because the majority of the migrants are passing above the height of the proposed turbines and because those species most frequently involved in collisions at existing wind projects are regionally abundant. Based upon post-construction surveys results at existing wind projects, impacts for migratory bats are expected to be low to moderate with the potential for mortality expected to be higher during fall migration.

Raptors

Q. Please summarize the results of the diurnal raptor surveys.

A. Diurnal raptor surveys were conducted in the spring and fall of 2010.

- Spring 2010 raptor migration surveys took place on 11 days (152.75 observation hours) from April 15 through May 26, 2010.

- Fall raptor migration surveys occurred on 10 days (137.5 observation hours) from September 14 to October 13, 2010.

The spring and fall survey efforts were timed to sample peak migration periods. The surveys targeted days with weather conditions favorable for migration. To maximize the amount of coverage of the Project area, surveys were conducted simultaneously with two observers: one located at the temporary met tower clearing on Melvin Mountain (West Observation Site ["WOS"]) and one at the south end of the field adjacent to Grants Pond (East Observation Site ["EOS"][3]. Each survey day included surveyors at each location, although due to travel logistics, total survey hours at the WOS were slightly less than at the EOS.

In the spring, a total of 266 raptors observations were made: 62 observations from the WOS and 204 observations from the EOS. Five of these observations were made simultaneously between the observers at the WOS and EOS; therefore, these birds were double-counted in the total raptors observed. Ten percent (n = 6) of the observations from the WOS occurred within the Project area, and eighty-two percent (n = 168) of the observations from the EOS occurred within the Project area. The seasonal passage rate for WOS site was 0.82 raptor observations per hour (raptors/hr). The seasonal passage rate for the EOS was 2.65 raptors/hr. These raptor observations included birds from 10 different species.

[3] One survey day in the spring (April 15) was conducted at Tinkham Hill rather than the field adjacent to Grants Pond. All other EOS surveys occurred from the Grants Pond field, which had better views of the Project area.

In the fall, a total of 346 raptor observations were made: 51 observations from the WOS and 295 from the EOS. Five of these observations were simultaneous observations between the observers at the two different sites; therefore, these birds were double-counted in the total raptors observed. The seasonal passage rate for the WOS was 0.76 raptors/hr; the seasonal passage rate for the EOS was 4.2 raptors/hr. These raptor observations included birds from 12 different species. It is not uncommon for the total number of observations and the total number of species observed during the fall surveys to exceed those of the spring surveys. This difference is due in part to the recruitment of the year's young into the population as well as seasonal weather conditions, which include the passage of cold fronts in fall. These results follow a general pattern of raptor migration passage rates. *See* Appendix B, Tables 1 and 2 of Appendix 44 to the Application.

A total of 13 species were observed during the spring and fall raptor surveys at the Project. In addition, some observations identified to the level of genus but did not identify species including unidentified accipiter, unidentified buteo, and unidentified raptor. Turkey vultures (*Cathartes aura*) were the most commonly observed species during the spring from both observation sites (WOS, n = 34; EOS, n = 107). At the WOS, American kestrel (*Falco sparverius*; n=7) was the second most commonly observed species, and at the EOS red-tailed hawk (*Buteo jamaicensis*; n=44) was the second most commonly observed species. During the fall surveys, broad-winged hawk (*Buteo platypterus*; n=19) and red-tailed hawk (n=14) were the most commonly observed species at the WOS, and red-tailed hawks were the most commonly observed species (n=110), followed by turkey vulture (n=53) at the EOS. Based upon total fall observations from both sites, the most commonly observed species were red-tailed hawk (n = 124) and broad-winged hawk (n = 62).

In the spring, the daily passage rates at the WOS[4], ranged from 0.29 raptors/hr (March 25 and 26) to 1.60 raptors/hr (April 15) and daily passage rates at the EOS ranged from 0.29 raptors/hr (April 15 at Tinkham Hill) to 6.0 raptors/hr (May 6 at Grants Pond). In the fall, the daily passage rates at the WOS ranged from 0.14 raptors/hr (September 15 and October 6) to 2.71 raptors/hr (September 14) and daily passage rates at the EOS ranged from 0.57 raptors/hr (October 6) to 8.86 (September 29) raptors/hr. These passage rates are within the range of pre-construction raptor surveys conducted in the northeast.

In comparison to surveys at regional hawk watch sites, and despite similar levels of effort in some cases, passage rates at the Project were relatively low. No “large” migration events were observed. It is important to note that not many proposed projects have conducted simultaneous raptor surveys during pre-construction raptor surveys, nor do many established Hawk Migration Association of North America’s (“HMANA”) sites have two observers in different areas conducting surveys simultaneously. In addition, it is noteworthy that the results of the pre-construction raptor surveys documented at the Project were similar to pre-construction survey results found at the Lempster Wind

[4] As of 2013, the WOS is considered outside of the Project area.

Project and Groton Wind Project. No raptor fatalities were documented at the Lempster Wind Project during post-construction surveys in 2009 or 2010 and one red-tailed hawk fatality was documented at the Groton Wind Project during 2013 post-construction surveys[5].

[5] The results of the 2013 post-construction monitoring at the Groton Wind Project are preliminary.

Table 1. Publicly available raptor fatalities reported at 45 studies at 31 operational projects in the eastern U.S. from 1997-2012.

Massachusetts	**1**
osprey	1
Maine	**1**
red-tailed hawk	1
New York	**38**
American kestrel	2
broad-winged hawk	3
Cooper's hawk	1
red-tailed hawk	25
sharp-shinned hawk	6
turkey vulture	1
New Hampshire	**1**
red-tailed hawk	1
Maryland	**3**
turkey vulture	2
unidentified raptor	1
Pennsylvania	**0**
Tennessee	**0**
Vermont	**1**
sharp-shinned hawk	1
West Virginia	**6**
red-tailed hawk	1
sharp-shinned hawk	1
turkey vulture	4
TOTAL	**51**

The majority of raptors observed within the Project area during surveys at the Project area were flying below the maximum turbine height. In the spring, 83 percent (n = 5) of the birds observed from the WOS and within the Project area occurred at flight heights below the proposed maximum turbine height. Of the birds observed from the EOS and within the Project area, 84% (n = 142) occurred at flight heights below the proposed maximum turbine height. In the fall, 60 percent (n = 3) of the birds observed from the WOS and within the Project area occurred at flight heights below the proposed maximum turbine height. Of the birds observed from the EOS and within the Project area, 67 percent (n = 159) occurred at flight heights below the proposed maximum turbine height. Within the Project area, the majority of raptors were observed soaring or gliding over the upper slopes of the ridges or parallel to the ridges. For complete details of the methods and results of the spring and fall 2010 raptor surveys, see Appendix 44 to the Application.

Q. Please describe the conclusions you have reached in the Bird and Bat Risk Assessment with regard to raptors.

On-site raptor surveys documented relatively low levels of raptor migration in comparison to other regional sites at which monitoring has taken place. Specifically, daily raptor observation rates at the Project were lower than the results from several years of monitoring at a local regional hawk watch site. Although raptors were observed flying at elevations below the maximum height of the proposed turbines within the Project area, data from publicly available post-construction monitoring surveys at operational wind projects in the eastern United Sates indicate that raptors are at low risk for collision with modern wind turbines. Based upon publicly available data, a total of five raptor fatalities have been documented at operational wind projects in New England, including one red-tailed hawk that was electrocuted by a power line.

Field surveys and literature review did not identify features of the Project that suggest an increased risk to raptors. Although small numbers of eagles appear to use the Project area during fall and spring, and limited telemetry data suggest that individual golden eagles may pass through the vicinity of the Project, eagles are not known to nest within the Project area, and eagle mortality has not been documented at any other existing facility in the eastern United States.

Based on the field surveys conducted on-site and the results of the risk assessment, the Project will not have an unreasonable adverse impact to raptors.

<u>Bats</u>

Q. Please describe the acoustic bat surveys and mist net surveys conducted as part of the on-site surveys.

A. Stantec conducted acoustic bat surveys at the Project in the fall of 2009 and the spring/summer of 2010. Acoustic bat surveys took place at the Project from August 19 through October 22, 2009, and April 8 through August 19, 2010. In 2009, a total of three detectors were deployed: one on Melvin Mountain (no longer part of the current Project area), one on Tinkham Hill and one on Braley Hill north of Tinkham Hill. The three individual detectors initially were deployed on portable towers at 15 m (49') above the ground with the detector on Braley Hill redeployed in a tree at a height of 10 m (33') after the collapse of the portable tower. In 2010, detectors were deployed on temporary met towers for all or a majority of the survey period. A temporary 60-m tall met tower was present on Braley Hill throughout the April to August survey period, and temporary met towers were installed on Tinkham Hill and Melvin Mountain on May 12. Three detectors were deployed at each of these locations once met towers were available: one at approximately 3 m (10′) above ground; one at approximately 15 m (49′) above ground; and one at approximately 45 m (148′) above ground. Prior to erection of met towers, "low" detectors were deployed in a portable tower on Melvin Mountain and on branches of a tall tree on Tinkham Hill.

Acoustic surveys in 2009 recorded a total of 191 call sequences over the course of 178 detector nights for an overall average of 1.1 bat call sequences per detector night. Bat activity levels were highest in August and September and dropped significantly in October when only four call sequences were recorded. Activity levels of bats varied between detectors and between nights, as is typical in acoustic surveys. Individual detection rates ranged from 0.9 bat call sequences per detector night at the Melvin Mountain detector to 1.2 at the Tinkham Hill detector. Bats within the guild that includes big brown (*Eptesicus fuscus*) and silver-haired (*Lasionycteris noctivagans*) bats were the most frequently recorded.

Acoustic surveys in 2010 recorded a total of 1,980 bat call sequences over the course of 1097 detector nights for an overall average of 1.8 bat call sequences per detector night. Call volumes were considerably higher at the ground level detectors (2.9 to 5.2 calls per detector night) than at detectors mounted in the met towers (0.3 to 0.6

calls per detector night). This result suggests greater levels of bat activity near the ground than above the tree canopy. Combined, the 3 ground level detectors recorded an overall activity rate of 4.2 calls per detector night, and the 6 met tower detectors recorded an overall activity rate of 0.4 calls per detector night. By month, overall activity levels increased steadily between April and June, peaked in July, and declined in August. Of the calls that could be identified to species or guild, the guild including big brown and silver-haired bats was the most frequently recorded. Species composition differed between ground level and elevated detectors, with *Myotis* species detected only near ground level and hoary bats (*Lasiurus cinereus*) detected primarily above canopy height.

Patterns in acoustic bat survey results documented at the Project, including differing species composition and activity levels between ground-level and met tower detectors, variability in activity levels between detectors and nights, and seasonal patterns in activity levels, were similar to those documented in many acoustic bat surveys conducted in the northeast. See Appendix B Table 4 of the Fall 2009 Radar and Acoustic Surveys Report and Appendix B Table 10 of the Spring 2010 Avian and Bat Survey Report, Appendix 42 to the Application.

In addition to acoustic bat surveys, mist net surveys were conducted in the Project area. The NHFGD requested mist net surveys to document the potential presence of endangered bat species within the Project area. This request was made principally because surveys of Mud Mine, which is located near the northeast corner of the Project area, had documented the presence of northern long-eared bats, a species being discussed for listing at both the state and federal level[6]. Proposed listing of this species reflect significant population declines as a result of White Nose Syndrome.

In 2011, mist net surveys were conducted on 10 nights from June 26 through August 8. Surveys were conducted from five locations, including two locations in proximity, but outside of the current Project area[7]. Survey sites were selected based upon availability/proximity of long-eared bat habitat and the presence of travel corridors where net sets could be deployed. Mist nets were deployed on the summit of Melvin Mountain, but nets were deployed slightly below the summits on Tinkham Hill, Braley Hill, and Forbes Mountain where better canopy closure existed. Because Crane Mountain had been recently harvested, mist net sets were deployed along a forest road at the southern portion of the parcel. Mist net sets were placed across potential travel corridors such as small access roads, logging trails and ATV trails. At each net site, two mono-filament nylon mist-net sets were spaced at least 30 m (98′) apart and were vertically stacked three nets (7.8 m [25.6′]) high to fill the flight corridor.

One bat, a juvenile female big brown bat, was the only bat captured during the 50.5 survey hours at the 5 sites. The bat was captured at the Braley Hill site on July 21.

Q. Has Stantec researched or analyzed the effect of wind projects on bats generally? If so, please describe that research and/or analysis.

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[6] On October 2, 2013, the USFWS formally proposed the northern long-eared bat for listing as federally endangered.
[7] Melvin Mountain and Crane Mountain are located outside, but in proximity to the current Project area.

A. Stantec conducted a review of available literature addressing potential impacts of wind power development on bat species. This review focused on literature that addressed impacts from projects proposed in the eastern United States. Unfortunately, impacts to bat species vary considerably at the regional level. Thus conclusions to be drawn from the literature review should be considered with this variation in mind.

Mortality of nine different bat species has been documented at wind energy facilities in the eastern United States (Kunz *et al.* 2007a), with most fatalities occurring during what is generally considered the fall migration period of August to November (Cryan 2003, Cryan and Brown 2007, Johnson *et al.* 2005), with more significant mortality events occurring in the mid-Atlantic states than in the northern states. Species documented in the east include little brown bat (*Myotis lucifugus*), northern long-eared bat, Indiana bat (*M. sodalis*), tri-colored bat (*Perimyotis subflavus),*[8] hoary bat, silver-haired bat, eastern red bat (*Lasiurus borealis*), seminole bat (*L. seminolus*) and big brown bat. With the exception of tri-colored bat, the species most commonly known to collide with wind turbines are long-distance migrants, which travel dramatically greater migration distances than other North American species (Cryan 2003, Cryan *et al.* 2004, Cryan and Brown 2007). Hoary, red, and silver-haired bats are closely related members of the Lasiurus and Lasionycteris genera, and it has been hypothesized that the migratory behavior of these species leads to their propensity to strike wind turbines (Cryan and

[8] The eastern pipistrelle is now called the tri-colored bat.

Brown 2007; Kunz *et al.* 2007a, 2007b). Of the nine eastern species documented in post-construction mortality surveys, the Indiana bat and seminole bat do not occur in New Hampshire (BCI 2001). The species of bats involved in collisions at these New England projects included silver-haired bat, hoary bat, eastern red bat, big brown bat, tri-colored bat, and little brown bat (Table 2).

Table 2. Bat fatalities reported at 14 studies at 10 operational projects in New England from 2007-2013.

Maine	
big brown bat	5
eastern red bat	16
hoary bat	44
little brown bat	7
red bat	1
silver-haired bat	34
unidentified bat	3
unidentified tree bat	1
New Hampshire	
big brown bat	5
eastern red bat	4
hoary bat	20
little brown bat	1
silver-haired bat	20
tri-colored bat	2
Vermont	
hoary	47
red bat	26
silver-haired bat	14
Total	**250**

While uncertainty and a considerable range exist in total estimates of mortality at wind projects, at least one published article suggests that bat biologists are concerned about the possibility that collision mortality (including all mortality related to collision with turbines, turbine towers, or as the result of potential barotrauma—pressure differences near moving turbine blades) could contribute to cumulative impacts to populations of certain bat species (Kunz *et al.* 2007a). Further, in July 2008, the North American Symposium on Bat Research ("NASBR") drafted a resolution expressing concern that utility-scale wind energy facilities "could pose biologically significant cumulative impacts for some species of bats unless solutions are found." While not opposed to wind power, the NASBR stressed the importance of transparent, hypothesis-based monitoring and research at sites with the highest potential to impact bats in order to better understand patterns and causes of bat collision mortality and to develop methods to mitigate these impacts.

The Project is located near Mud Mine where 2007 surveys identified 57 northern long-eared bats (NHNHB 2013), but otherwise is not in a region or area having rare bats and is not considered an area with the highest potential to impact bats. With regard to the northern long-eared bat, a literature review and habitat assessment also was completed. The literature review suggests that the most probable areas of northern long-eared bat habitat will be in hardwood or mixed forests with primarily closed canopies and mid-decay stage, large-diameter snags. Tinkham Hill and Braley Hill both have ample trails and corridors on them that provided suitable mist net sites and both contain a number of large diameter American beech (*Fagus grandifolia*) snags that could provide suitable roosting habitat. On top of the Tinkham Hill ridge there are only a few roost tree options to the east of the summit. Mapping and field visits indicates that Forbes Mountain has unlogged hardwood stands on the upper slopes of the ridge, and unlogged hardwood and mixed stands on the lower elevations. However, much of the Forbes Mountain portion of the Project has been actively logged in recent years and unlogged stands are generally restricted to inaccessible areas (i.e., steep slopes or ledge). In addition, a Risk Assessment was prepared using the best available information from on-site surveys as well documented data from post-construction studies at developed projects.

Q. Please describe the conclusions Stantec has reached regarding the Project's anticipated impacts on bats.

A. The bird and bat risk assessment concludes that potential impacts to bats at the Project likely will follow patterns similar to those documented at other facilities, particularly those in New England, and mortality is expected to be lower than that observed at wind projects in mid–Atlantic states. To the extent there are impacts to bats, the risk assessment concludes that those impacts likely will consist principally of collision mortality during the spring and particularly the fall migration seasons. Long-distance migratory species are expected to be the most vulnerable to collision mortality, as they appear more vulnerable to collision mortality than other species based on available post-construction survey results and were well represented in the results of acoustic surveys conducted at the Project. The risk assessment ultimately concludes that the Project will not have an unreasonable adverse impact to bats.

The only state-listed bat species that may occur within the vicinity of the Project is the small-footed bat, but the northern long-eared bat, which was recently proposed for listing by the USFWS, may also occur in proximity to the Project. Species within the genus *Myotis*, including both the eastern small-footed bat and the northern long-eared bat, are not distinguishable from each other based on acoustic surveys, and mist net surveys did not capture either of these species within the Project area. Based upon these surveys, it cannot be conclusively determined if either of these species are present in the Project area. However, the small-footed bat roosts in habitats defined by rocky talus slopes or cliff faces, none of which were documented in the Project area. *Myotis* species, including the eastern small-footed bat and long-eared bat, are thought to primarily feed and fly below the tree canopy based on their small size and foraging habits. As such, collision mortality is not expected to constitute as great a risk to these species in comparison to migratory species, which appear more prone to collision. To date, post-construction studies at existing wind projects have documented very few fatalities of bat species listed in New Hampshire. Post-construction monitoring surveys at New England facilities including the Lempster Wind Project and Groton Wind Project have not documented mortality of eastern small-footed bat. Furthermore, only two fatalities of eastern small-footed bats have been reported at wind facilities in North America. These fatalities occurred at two separate facilities in Ontario, Canada: one located in agricultural fields near Lake Huron and one located in an area characterized by agricultural fields and forested woodlot habitat (Jacques Whitford-Stantec 2009 and James 2007).

<u>Breeding Birds</u>

Q. Please explain the results of the breeding bird survey conducted in the Project area.

A. Breeding bird surveys took place along the ridgelines of the Project and within control areas. A total of 35 species were documented in the Project area at 21 point-count locations, which were distributed across all major habitat types present in the Project area. A total of 27 species were detected in the control areas at 6 point count locations. Within the Project area, species with the greatest numbers of individuals detected were dark-eyed junco (*Junco hyemalis*), ovenbird (*Seiurus aurocapilla*), and chestnut-sided warbler (*Dendroica pensylvanica*). Results indicate that, among the habitats sampled, hardwood forest points, including forest stands at various stages of regeneration, had the greatest number of individuals detected, the highest diversity of species, and the most even distribution of species across points sampled within this habitat. At the control areas, hermit thrush (*Catharus guttatus*), dark-eyed junco, and white-throated sparrow (*Zonotrichia albicollis*) were the species with the greatest number of individuals detected. Results indicate that, among the habitats sampled, conifer forest points including forest stands at various stages of regeneration had the greatest number of individuals detected, the highest diversity of species, and the most even distribution of species across points sampled within this habitat. Of the 42 total species documented during the 2010 surveys, all are generally common and regionally abundant, and are generally representative of the habitats in which they were detected. There were no state or federally endangered or threatened species; however, there was one special concern species (American kestrel) observed flying over one of the Project area survey points.

Q. What conclusions have you drawn based on the field surveys and risk assessment with respect to breeding birds?

A. Breeding bird surveys documented a relatively low diversity of breeding birds within the Project area, with the most frequently detected species being those that are common in the region. There was not an unusually high species diversity or large numbers of birds documented during surveys. While development of the Project would result in habitat loss and clearing along the ridgelines, these types of impacts currently exist within the Project area in the form of historic timber clearing and an existing road network. Development of the Project is therefore not expected to cause dramatic shifts in the abundance, diversity, or distribution of the breeding bird population. Indirect impacts to breeding birds are expected to vary based on the habitat needs of individual species; those associated with forest interior habitats will be affected more, and those associated with edge or disturbed habitats will be affected less.

While collision mortality has been demonstrated for resident breeding birds, it is generally thought that collision mortality affects migrating birds to a greater extent based on the timing of fatalities during post-construction monitoring at existing wind facilities. Likelihood of collision is presumably related to a combination of overall abundance and species-specific flight behaviors. Results of on-site surveys suggest that the Project area does not support any rare bird species, and while a small number of breeding birds may collide with turbines, the magnitude of these impacts is expected to be minor, and population level impacts for any single species are not anticipated as a result of the Project. Generally, direct and indirect impacts to breeding birds at the Project are expected to be limited to a small amount of collision mortality and slight shifts in the distribution of breeding bird species within the Project area. Thus, the Project will not have an unreasonable adverse impact to breeding birds.

<u>Conclusion</u>

Q. Please describe in general the conclusions you reached in the bird and bat risk assessment?

A. The primary forms of ecological risk associated with the Project are direct collision mortality of birds and bats, and indirect impacts associated with habitat loss, fragmentation, or displacement. Ecological risk to birds and bats associated with the Project is likely to vary by species group and time of year, among many other factors. Foremost among the potential impacts are collision mortality of nocturnally migrating songbirds and long-distance migratory bats. The severity of these impacts is expected to be influenced by weather variables and timing of migration events and will likely fluctuate seasonally, with the greatest levels of mortality occurring during the late summer/fall migration period.

Impacts to raptors are expected to be minimal at the Project, given the low rates of raptor collision mortality documented in the eastern United States. Although bald eagles were documented in the Project area during surveys, no eagle mortality has been documented at any wind facility in New England. Furthermore, there were very few observations of these species over the Project area ridgelines during raptor migration surveys. Potential direct and indirect impacts to breeding birds are also expected to be minimal. On-site surveys documented relatively low breeding bird diversity, and construction of the Project is not expected to eliminate any types of habitat. Collision mortality of breeding birds is also expected to occur at low levels.

The ultimate conclusion reached in conducting the risk assessment is that the Project will not have an unreasonable adverse impact to any bird or bat populations.

Q. Are the projected impacts to the groups of species studied unique to the Project area as compared to projected or actual impacts for wind projects in the northeast?

A. Wind facilities generally have the potential to impact birds and bats in the form of direct collision mortality and indirect displacement or habitat loss. The degree to which a particular wind facility is expected to impact birds and bats is largely related to the abundance of birds and bats in the Project area, the potential for these species to be exposed to wind turbines, and the sensitivity of habitat present within the site to disturbance. Habitats and species composition of birds and bats observed at the Project are likely typical of those found on other moderate elevation forested ridges in New Hampshire.

In comparing potential impacts at the Project to operational wind projects in New England, it is expected that bird and bat mortality will be similar, but will be lower than those found in Mid-Atlantic States, particularly for bats.

Estimates of bird mortality at wind projects in New England:

- Searsburg, Vermont, 1997, 0 b/t/yr (no birds found during searches);
- MMA turbine, Massachusetts, 2006, 2.15 b/t/yr;
- Mars Hill, Maine, 2007, 0.44 to 2.5 b/t/yr;
- Mars Hill, Maine, 2008, 2.4 to 2.65 b/t/yr;
- Lempster, New Hampshire, 2009, spring: 0.80 b/t/sp and fall: 5.95 b/t/sp;
- Lempster, New Hampshire, 2010, spring: 1.16 b/t/sp and fall: 4.12 b/t/sp;
- Stetson Mountain I, Maine, 2009, 4.03 b/t/yr;
- Stetson Mountain II, 2010, 2.14 b/t/yr;
- Stetson Mountain I, 2011, 1.77 b/t/yr;
- Stetson Mountain II, 2012, 2.83 b/t/yr;
- Kibby, Maine, 2011, spring: 0.72 b/t/sp and fall: 0.29 b/t/sp;
- Rollins, Maine, 2012, 2.94 b/t/yr;
- Record Hill, Maine, 2012, 8.46 b/t/yr;
- Sheffield, Vermont, 2012, 13.17 b/t/yr; and
- Granite Reliable, New Hampshire, 2012, 2.0-2.8 b/t/yr.

Estimates of bat mortality at wind projects in New England:

- Searsburg, Vermont, 1997, 0 b/t/yr (no bats found during searches);
- MMA turbine, Massachusetts, 2006, 0 b/t/yr (no bats found during searches);
- Mars Hill, Maine, 2007, 0.43 to 4.4 b/t/yr;
- Mars Hill, Maine, 2008, 0.17 to 0.68 b/t/yr;
- Lempster, New Hampshire, 2009, spring: 0.58 b/t/sp and fall: 5.51 b/t/sp;
- Lempster, New Hampshire, 2010, spring: 0 b/t/sp and fall: 7.13 b/t/sp;
- Stetson Mountain I, Maine, 2009, 2.11 b/t/yr;
- Stetson Mountain II, 2010, 2.48 b/t/yr;
- Stetson Mountain I, 2011, 0.43 b/t/yr;
- Stetson Mountain II, 2012, 2.06 b/t/yr;
- Kibby, Maine, 2011, spring: 0 b/t/sp and fall: 0.37 b/t/sp;
- Rollins, Maine, 2012, 0.18 b/t/yr;
- Record Hill, Maine, 2012, 6.78 b/t/yr;
- Sheffield, Vermont, 2012, 14.65 b/t/yr, and
- Granite Reliable, New Hampshire, 2012, 2.6-3.0 b/t/yr.

Although the Project will not have an unreasonable adverse impact on any bird or bat populations, Atlantic Wind intends to implement an adaptive management strategy once the Project is operational. The body of knowledge associated with how birds and bats interact with wind development in the northeast is continuing to grow. In addition, the population status of individual species is dynamic and influenced by a wide range environmental, biological and anthropogenic changes. An adaptive management strategy will allow decisions and actions to be tailored to specific a problem/circumstance, should it arise (e.g., a specific species, location, weather pattern, wind speed, or season), at the specific point in time at which it occurs.

Decisions made under adaptive management strategy will be based upon the formal post-construction monitoring results (proposed to occur during the first two years of operation) as well as incidental observation of mortality documented by facility personnel. Post-construction results and incidental mortality will be reported to the NHFGD and USFWS, and these agencies will be consulted should a biologically significant event occur. A biologically significant event would include the individual injury or death of a listed species or an eagle, or the large scale injury or death of any avian or bat species or groups. Consultation with these agencies will be held to determine whether the reported event (or other matter of concern) is isolated, and if further action is feasible or required.

Q. Does this conclude your testimony?

A. Yes.

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(NHNHB) New Hampshire Natural Heritage Bureau. 2013. NH Natural Heritage Bureau (NHB) Datacheck Results Letter: Towns of Danbury, Grafton, Alexandria, Orange; dated 11/6/2013.

Adam J. Gravel

Project Manager, Certified Wildlife Biologist

Stantec

Mr. Gravel is a Project Manager at Stantec responsible for coordinating ecological inventories and environmental resource evaluations, including wildlife surveys, avian and bat impact evaluations, and habitat studies. Mr. Gravel has most recently been involved in organizing and conducting large-scale natural resource investigations associated with wind power and transmission projects. He has provided permitting and expert testimonial support to several New England wind projects and managed Stantec's New England based wildlife biologists. His field biology experience has allowed him to conduct avian radar surveys, breeding-bird surveys, winter track surveys, bat surveys, raptor surveys, and natural community surveys in Maine, New Hampshire, Vermont, Pennsylvania, Ohio, West Virginia, Virginia, and New York. Mr. Gravel takes an innovative, solution oriented approach to survey design and implementation which has enabled Stantec to conduct ecological surveys in some of the Northeast's most remote and challenging locations.

PROFESSIONAL EXPERIENCE

- Stantec Consulting. 2007-present. Project Manager.
- Woodlot Alternatives, Inc. 2004-2007. Project Manager.
- New Hampshire Division of Forests and Lands. 2003. Field Research Technician.
- University of New Hampshire. 2002-2003. Research Lab Technician.
- University of New Hampshire. 2002. Field Research Assistant.

EDUCATION

BS, Wildlife Management, University of New Hampshire, Durham, New Hampshire, 2003

40-hour HAZWOPER Certified, OSHA, Topsham, Maine, 2012

REGISTRATIONS

Certified Wildlife Biologist, The Wildlife Society

PROJECT EXPERIENCE

Natural Resource Services

Georgia Mountain Community Wind Project, Milton, Vermont

As Project Manager for this proposed 4.5 megawatt wind project, Mr. Gravel coordinated a nocturnal migration study using X-band radar. He also provided support for the Section 248 process, including participation in meetings with Vermont Agency of Natural Resources biologists and development of a work scope for nocturnal radar surveys. Mr. Gravel prepared and submitted pre-filed testimony and responses to discovery requests, and he provided expert witness testimony during subsequent evidentiary hearings before the Vermont Public Service Board.

Groton Wind Project, Grafton County, New Hampshire

Mr. Gravel is Project Manager for the proposed Groton Wind Project, which will consist of up to 25 2.0 MW turbines on the forested ridges of Tenney and Fletcher Mountains in the Sunapee Uplands of New Hampshire. He has coordinated numerous studies to address wildlife-related issues present in the vicinity of the project, including avian radar studies, acoustic bat surveys, and Breeding Bird Surveys (BBS) using the United States Fish and Wildlife Service BBS methods. Mr. Gravel worked with the New Hampshire Fish and Game Department to develop protocol and perform spring and fall raptor surveys, and collaborated with New Hampshire Audubon to conduct monitoring of peregrine falcons near the project area. He was involved in the drafting of an avian risk assessment that evaluated the potential impacts to birds and bats as a result of the project and provided expert witness testimony and support during the New Hampshire Site Evaluation Committee process.

Adam J. Gravel

Project Manager, Certified Wildlife Biologist

Highland Wind Project, Somerset County, Maine

Highland is a proposed wind energy facility consisting of 48 turbines. Mr. Gravel acted as Technical Lead during the planning process and was responsible for wildlife studies including nocturnal radar migration surveys, acoustic bat surveys, raptor migration surveys, and rare threatened or endangered species surveys. He acted a liaison between the client and state and federal resource agencies to develop work plans and avoidance and minimization measures during the planning phase of the project. Mr. Gravel also assisted in generating permit application materials for the project.

Mars Hill Wind Farm, Aroostook County, Maine

Mars Hill is a 28 turbine wind energy facility situated on a low-elevation ridge in Aroostook County, Maine. Mr. Gravel acted as Technical Lead during the planning process and was responsible for avian and bat studies including nocturnal radar migration surveys, acoustic bat surveys, raptor migration surveys, and morning bird stopover surveys. He also assisted in the design of a post-construction avian and bat monitoring program.

Wind Farm Development Bird and Bat Surveys and Impact Studies, Mid-Atlantic, New England, Pennsylvania, Ohio, and New York

Mr. Gravel has managed and conducted pre-construction wildlife impact assessments at proposed wind energy projects at multiple sites in the Mid-Atlantic, New England, Pennsylvania, Ohio, West Virginia and New York. These assessments include habitat analyses, critical issues analyses, nocturnal migration surveys using marine radar, acoustic bat surveys, breeding bird surveys, raptor migration surveys, and ecological community characterizations. Mr. Gravel has effectively served as liaison between clients and regulatory agencies to ensure that studies and monitoring plans are in accordance with federal and state guidelines. Study results and determinations of risk have been provided to clients to assist with their project planning and permit applications in compliance with applicable local, state, and federal natural resource regulations. Mr. Gravel has also provided expert witness testimony for projects in Vermont and New Hampshire.

Hounsfield Wind Farm, Galloo Island, New York

As Project Manager for the nocturnal migration surveys conducted to determine site suitability for this proposed wind energy project located on Galloo Island in Lake Ontario. Mr. Gravel negotiated and designed a marine radar survey reflective of the unique location of this island site. Solutions to transport, maintenance, and site coverage were carefully determined in order to produce one of the most extensive migration surveys to date, successfully documenting avian abundance, flight patterns, and flight altitudes surrounding the site. Mr. Gravel and his project team were praised for their thoroughness and insights provided to state agencies.

Granite Reliable Wind Park, Coos County, New Hampshire

Mr. Gravel has acted as the Project Manager on this long-term project, supervising and conducting a variety of natural resource surveys to assess potential concerns raised by the proposed project. Surveys included several seasons of nocturnal radar surveys, wetland and vernal pool reconnaissance surveys, multiple seasons of acoustic bat surveys, rare plant surveys, a raptor migration survey, and a Natural Community Characterization. A winter track survey was also conducted within the project site to document occurrence of American marten (State Threatened) and Canada Lynx (Federally Threatened). Mr. Gravel gave several agency presentations to summarize the multiple seasons of environmental surveys and their implications for the project and he has provided expert witness testimony regarding the work conducted at the site.

Stetson Mountain Wind Farm, Washington County, Maine

Stetson is a 57 MW generation facility consisting of 38 turbines on a 6.5-mile, low-elevation ridge in Washington County, Maine. Mr. Gravel acted as Technical Lead responsible for avian and bat studies during the planning process and assisted in the design of a post-construction avian and bat monitoring program.

** denotes projects completed with other firms*

Adam J. Gravel

Project Manager, Certified Wildlife Biologist

Lempster Wind Project, New Hampshire

As the Project Manager, Mr. Gravel was responsible for coordinating and conducting environmental surveys and providing permitting support for this 24 MW wind project, the first in New Hampshire. Tasks included developing and negotiating work plans with agencies, performing avian and bat studies, rare species investigations, vernal pool surveys, and providing testimonial support. Mr. Gravel was also involved in the initial development of post-construction bird and bat monitoring protocols for the project.

Record Hill Wind Farm, Maine

Mr. Gravel acted as Project Manager for the Record Hill wind project, which is a 22-turbine, 55 MW wind project on a forested ridge environment in the western mountains of Maine. For this project, he coordinated planning and feasibility studies, wetland delineations, wildlife impact studies, noise and visual impact assessments, and helped to coordinate all state and Federal environmental permitting.

Adam J. Gravel

Project Manager, Certified Wildlife Biologist

PUBLICATIONS

Pelletier, S.K., G.C. Kendrick, T.S. Peterson, and A.J. Gravel. Atlantic Offshore Bird & Bat Pilot Study: 2009 Results. *Poster Presentation at AWEA Offshore Energy Conference, Atlantic City, New Jersey*, 2010.

Pelletier, S., G. Kendrick, G. Giumarro, T. Peterson, and A. Gravel. Gulf of Maine Offshore Bat and Bird Project. *Poster Presentation at AWEA Offshore Energy Conference; Boston, Massachusetts*, 2009.

Giumarro, G. and A. Gravel. Assessing The Risk Of Avian And Bat Mortality At Commercial Wind Farms. *Presentation at the Windpower 2009 Conference and Exhibition, Chicago, Illinois*, 2009.

Pelletier, S.K., A.J. Gravel, and T.S. Peterson. Nocturnal avian flight heights relative to risk of collision with wind turbines. *Poster presentation at the NWCC Wind Wildlife Research Meeting VII in Milwaukee, Wisconsin*, 2008.

Pelletier, S.K., C.W. Meinke, T.S. Peterson, and A.J. Gravel. 2008. Radar and acoustic bat surveys in pre and post-construction bird and bat mortality monitoring. *Poster presentation at the 2008 American Wind Energy Association conference in Los Angeles, California*, 2008.

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THE STATE OF NEW HAMPSHIRE
BEFORE THE
SITE EVALUATION COMMITTEE

DOCKET NO. 2013-

APPLICATION OF ATLANTIC WIND, LLC
FOR A CERTIFICATE OF SITE AND FACILITY

PREFILED DIRECT TESTIMONY OF SARAH D. ALLEN
ON BEHALF OF
ATLANTIC WIND, LLC

December, 2013

Qualifications

Q. Please state your name and business address.

A. My name is Sarah D. Allen. My business address is 25 Nashua Rd, Bedford, NH 03110

Q. Who is your current employer and what position do you hold?

A. I am employed by Normandeau Associates Inc. as a Principal Wetland Scientist in the Wetland/Terrestrial Group.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to support the water resource and wildlife habitat information in Atlantic Wind's Wild Meadows Wind Project SEC Application. I am Normandeau's Project Manager for the Wild Meadows Project. My testimony describes the resources mapped and evaluated on the site, the Project's efforts to reduce impacts to wetland and wildlife resources, and the assessment of remaining unavoidable impacts resulting from the final design. I also address the Project's proposed compensatory mitigation for those unavoidable impacts.

Q. What are your background and qualifications?

A. I have been in the natural resource field for my entire professional career, beginning with a BS in Wildlife Biology from the University of Vermont in 1979. I have since worked in salt marsh ecology research for 7 years for the Marine Biological Laboratory in Woods Hole, MA, and received my MS in Natural Resources (Wetland Ecology) from the University of Rhode Island in 1989. I have been at Normandeau since that time in the Terrestrial/Wetlands Group, where I have provided field identification and evaluation of wetlands and wildlife; wetland mitigation and restoration design, implementation and monitoring; and local, state and federal permitting. I am a Professional Wetland Scientist under the Society of Wetland Scientists, and am a New Hampshire Certified Wetland Scientist (#83). I am currently serving on the New Hampshire Association of Wetland Scientists Board as the Education Chair, and served for 16 years on the Conservation Commission in the Town of Warner.

Q. **Have you testified before the New Hampshire Site Evaluation Committee previously?**

A. I have not**.**

Q. Are you familiar with the Project that is the subject of this Application?

A. Yes, I am very familiar with the Wild Meadows Wind Project lands, having overseen the delineation of all wetlands by Normandeau staff, and provided quality control for most of those delineations. I have walked most areas of the Project with our staff wildlife biologists. I have led multiple natural resource agency site walks with NH Department of Environmental Services (NH DES), US Army Corps of Engineers (USACE), and US Environmental Protection Agency (USEPA) to review the resources and discuss the project. Normandeau worked with Atlantic Wind and Horizons Engineering through many design stages of the project, to ensure that evaluation of natural resource related issues was integrated into the project design.

Q. Please describe your studies.

A. Normandeau was contracted to provide water resource delineations, functional assessments, impact assessments and compensatory mitigation design for in the approximately 2,000-acre study area. These resources include jurisdictional wetlands; perennial, intermittent and ephemeral streams; and vernal pools. Our site work began in Spring, 2010, and continued through Fall, 2013. During that 4 year period, Normandeau biologists delineated new project lands as different configurations of turbines were considered. During the delineation process we systematically surveyed the study area for jurisdictional water resources, flagged the boundaries of all water resources encountered, and collected data on a variety of characteristics. For wetlands, we recorded vegetation, soils and hydrology, determined hydrogeomorphic setting, evaluated functions and values, made note of the surrounding habitat, recorded wildlife sign, and noted any signs of disturbance. For streams, we estimated the flow regime (perennial, intermittent or ephemeral), the slope, substrate, surrounding habitat and canopy cover. For vernal pools, we recorded the number of obligate vernal pool amphibians and/or their eggs, other organisms that use vernal pool habitat, the estimated or observed edge of spring high water, vegetation in and around the edge of the pools, substrates, and noted any signs of disturbance. Pools or depressions that were observed during fall surveys as likely capable of providing vernal pool habitat in the spring were labelled as potential vernal pools and revisited under suitable spring conditions for full documentation. All water resources were mapped using GPS units capable of sub-meter accuracy, and photodocumented.

In the office, the water resources data were plotted in GIS and the delineator who did the field work reviewed the map for accuracy. All data were recorded and saved in a database. A senior wetland scientist reviewed the wetlands in the field by spot checking delineations and reviewing data for accuracy. Changes were recorded with GPS and transferred into the database. Vernal pools were ranked as highest value (A), intermediate value (B) or least value (C) based on factors including the level of use by obligate vernal pools species, the pool's hydroperiod, and level of disturbance. We also plotted resource buffers associated with streams and vernal pools. Based on agency guidance during pre-application meetings, buffers of 20, 50, and 100 feet were assigned to ephemeral, intermittent, and perennial streams, respectively, and proposed impacts within the buffers were quantified. Proposed impacts within the vernal pool envelope (0-100 feet from the delineated high water mark of the vernal pool) and the vernal pool buffer (100-250 feet) were also quantified. The USACE vernal pool guidelines require that impacts to the vernal pool envelope and buffer be avoided where possible.

Q. Please explain the results of your studies

A. In total, the water resource study area extended approximately 2,000 acres over three ridges and in the lowlands in between. The area is predominantly forested, and much of the land is in active timber management. As a result, the site is a mosaic of forest age classes, ranging from recently harvested within the last four years to mature second-growth forest. The section of the site near Golden Valley Road is maintained as hayfields by multiple mowings annually.

The project has avoided all permanent direct impacts to perennial streams through careful project design and engineering. Temporary direct impacts of 0.04 acres are proposed to two perennial streams under the electrical collector due to clearing of the 75-foot wide corridor. In addition, several intermittent and ephemeral streams were unavoidable, resulting in some direct and secondary impacts. Permanent direct impacts to four intermittent stream segments total approximately 0.03 acres, with 0.18 acres of temporary direct impacts also proposed. Secondary impacts include approximately 0.19 acres of impact, mostly associated with vegetation clearing. For ephemeral streams, which are not regulated as streams by the NHDES but are by the USACE, approximately 0.16 and 0.07 acres of permanent and temporary direct impacts are proposed. Some stream buffer impacts were unavoidable given the abundance of ephemeral and intermitted stream segments delineated within the project area. As a result, the project will permanently impact approximately 4.5 acres of perennial, intermittent, and ephemeral stream buffers, with an additional 0.5 acres of temporary impacts.

Approximately 70 acres of wetlands were delineated, the majority of which were characterized as forested (47%), followed by emergent (21%) and various combinations of either emergent, forested or scrub-shrub (24%). Historically, a large percentage of the delineated wetlands have been impacted by logging, including the construction of haul roads and log yards, and log skidder operations. After extensive avoidance and minimization within the 150-acre limit of disturbance, the project will result in unavoidable permanent impacts to only about 1.1 acres of wetlands and streams with an additional 0.8 acres of temporary impacts. The most common principal functions and values identified across the impacted wetlands include wildlife habitat, floodflow alteration, groundwater discharge, sediment retention, nutrient removal and sediment/shoreline stabilization.

The majority of the vernal pools are man-made (48 pools, or 49%) or influenced by anthropogenic activities (22 pools, or 23%) with 27 pools (28%) considered natural. This is consistent with the level of disturbance observed within the study area associated with current and historical logging activity. Twelve (12%) of these pools are ranked as highest value (A) pools, 43 (44%) are ranked as intermediate value (B) pools, and 42 (43%) are ranked as least value (C) pools. Wood frogs, spotted salamanders and Jefferson/blue-spotted salamander hybrids were the only primary vernal pool indicators identified. Several secondary indicators were also observed within many pools, including caddisfly, true fly and aquatic beetle larvae. Impacts to vernal pools were avoided and minimized as described above for surface waters and wetlands. Direct and secondary impacts to all of the highest value (A) pools were successfully avoided, while direct impacts to two intermediate value (B) and two least value (C) pools were unavoidable. Permanent secondary impacts to three vernal pools total 1,384 SF (0.03 acres).

Impacts to the 100-foot vernal pool envelope and the 250-foot vernal buffer were also evaluated. Although all reasonable avoidance measures were taken, permanent and temporary impacts to the vernal pool envelope of seventeen pools total approximately 4.57 and 0.29 acres, respectively. Permanent and temporary impacts to the 250-foot buffer total 26.50 and 0.99 acres, respectively. Impacts that exceed 25% of the 250-foot buffer are considered potentially deleterious by the USACE to vernal pool amphibians during the terrestrial phases of their life cycle. Twenty-seven pools had impacts within the vernal pool buffer, with only nine having impacts exceeding 25%. Of the nine pools with greater than 25% of their 250-foot buffer impacted, two were classified as A (highest value) five were B, and two were C.

Q. Please describe the consideration that the Applicant and its consultants have given to wetland issues associated with the Project.

A. Atlantic Wind and Horizons Engineers have made multiple, iterative design changes to avoid and minimize impacts to water resources where possible. The proposed locations of the turbines were shifted multiple times to avoid resource impacts, including abandoning the entire Melvin ridge in Grafton, in part due to extensive wetland, vernal pool and stream impacts. All new access roads were located to avoid impacts entirely, or to cross wetlands or streams at a narrow point if they could not be avoided. Direct permanent impacts total only 1.3% of the 70 acres of delineated wetlands. All impacts to perennial streams have been avoided. Three crossings of Wild Meadows Brook were avoided by abandoning Melvin and shifting the access road from Golden Valley Road to the south. One of the most common impacts involved crossings of the numerous narrow forested drainages, mostly ephemeral streams, on the side slopes of the ridges associated with the Project. In these cases, the engineers have incorporated either small culverts or "stone sandwich" structures into the roadway which will allow water to continue to flow down the drainage as it currently does. This will help to minimize the potential effect on downslope wetlands and streams.

Direct impacts to 96% of the delineated vernal pools were avoided, and unavoidable impacts were minimized where feasible. Direct and secondary impacts to all of the highest value (A) pools were successfully avoided, while direct impacts to two intermediate value (B) and two least value (C) pools were unavoidable. The effects of the project on vernal pool amphibians are expected to be relatively minimal, given the linear configuration of the project; the narrow, no-curb, gravel roads; and light level of vehicle use on the roads during project operation.

Q. Please describe the assessment of wildlife habitat completed for the Project site.

A. Habitat assessment surveys were conducted by a Certified Wildlife Biologist in the spring and fall of 2010, spring of 2011, and spring and summer of 2012. Normandeau staff biologists conducting other field work (water resource surveys) also recorded habitat and wildlife observations throughout the site. General habitat features were noted, as well as unique and/or high value habitat features. In addition to habitat observations, evidence of wildlife were noted, including observation (visual and audio), feeding activity (e.g., browse), travel paths/corridors, burrows or dens, and scat. All field work was focused on the area that was surveyed for wetlands and vernal pools. The area surveyed for these resources consisted of roughly 1,610 acres, and encompassed the total possible envelope of disturbance due to Project construction.

The habitat present in and around the proposed Wild Meadows Wind Project is typical of New Hampshire's Central Highlands region, and consists of cover types that are common throughout this region of the state. The bird, mammal, amphibian and reptile species observed during wetlands and habitat surveys were also commonly occurring species, typical of forested habitats in central NH. Because of the ridgeline topography and steep slopes, streams in the project site are predominantly ephemeral and intermittent and wetlands tend to be small, encompassing a relatively small portion of the overall acreage of the project site. Although vernal pools are present throughout the site, they are not abundant and also tend to be small. Rocky outcrops are present in numerous locations along the ridgelines within the Project Footprint, and provide a small amount of a relatively unique habitat type.

Based on field observations and the NH Wildlife Action Plan habitat rankings, the habitat quality of the unfragmented forested block in which the Project is proposed is relatively high. Due to the logging activities, forest stands in and around the site exhibit a wide range of age classes from recently cut to young and mature second growth. Most stands include some large diameter trees, creating a diversity of habitat conditions which can in turn support a diversity of wildlife species. The wildlife species observed or likely to occur are commonly associated with northern hardwood-conifer forest types, especially those that benefit from a mosaic of hardwood forest age classes. Neither the construction-related nor operations-related impacts associated with the project are expected to significantly reduce the habitat value of the project area for the wildlife species known or likely to be present. The known biology of the species present in and around the project site suggests that they will acclimate to the low intensity disturbance associated with operations, and any impacts to those species will be negligible. In general, while the proposed project may cause the temporary or permanent displacement or mortality of some individual animals, it is not expected to have a population level effect on species known to be present in the region.

Q. What steps has Atlantic Wind, LLC taken to mitigate the impact of the Project on wetlands and wildlife?

A. Atlantic Wind and Normandeau met with the natural resource regulatory agencies, including NHDES, USACE, and USEPA on multiple occasions to discuss the project and to identify a suitable, appropriate compensatory mitigation package. Early in the process, both Atlantic Wind and the agencies agreed that permittee-responsible on-site mitigation was the preferred option for this project. Also through agency discussion, we were able to identify the important components of a compensatory mitigation parcel for this project. To summarize, the mitigation parcel should include high value wildlife habitat; be in close proximity to existing conservation land; have a potential threat from development; have a willing landowner; have a willing easement holder; and be in close proximity to, or include portions of, the impacted lands. Atlantic Wind looked at several parcels within the unfragmented habitat block that surrounds the proposed project in an attempt to identify the best site. Atlantic Wind identified three sites that offered a range of beneficial components. The 223-acre Patten Brook parcel met preliminary agency approval and was taken forward for compensatory mitigation. Highlights of the mitigation location are that it:

- Includes sections of a large perennial stream (Patten Brook) which drains to Newfound Lake;
- Includes additional small perennial, intermittent and ephemeral streams, wetlands and at least one vernal pool;
- contains several significant wildlife features, including a NHF&G-mapped deer wintering area and a bat hibernaculum listed by NHNHB;
- approximately 25% of the site is modelled by WAP as Highest Priority Habitat in the State;
- is connected at its northwest corner to SPNHF's Forest's Butman parcel (486 acres). In addition, a 787-acre Forest Legacy Tract managed by DRED lies north of the Butman tract and approximately one-half mile north of the proposed Patten Brook parcel. When combined, the three parcels would create a 1496-acre block of conservation lands; and
- is potentially subject to development threats along Washburn Road due to the extensive road frontage that the parcel has.

Atlantic Wind is proposing to protect the Patten Brook parcel through a conservation easement. The landowners, H & H Investments, Inc, have indicated their willingness to enter into negotiations to sell a conservation easement on the parcel. DRED's Forest and Lands Division has indicated a willingness to hold the easement. The details of the easement have yet to be finalized but will be based on the components included in the easement template provided by NHDES. Atlantic Wind has agreed to provide the deed research and a full ground survey of the parcel boundary. NHDES's required Preliminary Mitigation Agreement between Atlantic Wind and NHDES has been signed by both parties.

Q. In your opinion will this Project have an unreasonable adverse effect?

A. No. The project has carefully integrated natural resource issues and minimizing impacts where feasible and reasonable. Most high value water resources have been avoided, and impacts to the buffers of those resources minimized. The dominant wetland and wildlife habitat impacts are forest fragmentation and impacts to buffer zones of vernal pools and streams, but the significance of those impacts is relatively low. During construction, the disturbance and direct habitat loss will result in alteration of habitats and displacement and mortality to some individual wildlife, but no adverse effects to wildlife populations are expected. After construction and during operations, the project design will mitigate for water resource impacts by controlling and treating runoff in numerous small treatment areas, essentially mimicking existing flows. Forest fragmentation impacts also will be relatively low after construction as the construction roads are narrowed to low gravel access roads, and natural vegetation recovers along the roadsides. All wildlife species known to occur in the project area are likely to freely pass through the site, given the linear nature of the roads and turbine pads, and the very light human traffic expected at the site. The added benefit of conserving the 223-acre Patten Brook site will protect quality wildlife habitat, including a deer wintering area and a bat hibernaculum in an era of declining bat populations; protect a part of the Newfound Lake watershed from development; and expand an existing block of conservation lands. In balance, I think the adverse effects of the project on water resources and wildlife habitat are reasonable, and are fairly mitigated.

Q. Are there any other comments you would like to make at this time?

A. No

Q. Does this conclude your prefiled testimony?

A. Yes.

NORMANDEAU
environmental consultants

SARAH D. ALLEN, PWS/NHCWS

Principal Scientist, Wetlands/Terrestrial

Ms. Allen has a broad background in wetland and wildlife services, gained from over 25 years in natural resource research and consulting. She has technical experience in coastal and inland wetland delineation, functional assessment, mitigation design, botanical and wildlife surveys, and rare species surveys. She has been involved in all stages of local, state and federal permitting, including agency coordination, permit preparation and regulatory review. At Normandeau, she has managed numerous projects; participated in EIS/R preparation; given presentations to professional and public audiences; and provided expert testimony at regulatory hearings.

EDUCATION

M.S., Natural Resources Science, (Wetland Ecology), University of Rhode Island
B.S., Wildlife Biology, University of Vermont

PROFESSIONAL EXPERIENCE

1989-Present	Normandeau Associates
1986-1989	University of Rhode Island
1985-1986	K-V Associates, Inc.
1983-1985	Woods Hole Oceanographic Institution
1979-1985	Boston University Marine Program

PROFESSIONAL CERTIFICATIONS

- Professional Wetlands Scientist. Society of Wetlands Scientists (1995)
- Certified Wetlands Scientist. NH Association of Natural Resource Scientists (1999)

PROFESSIONAL AFFILIATIONS

- Society of Wetland Scientists
- Estuarine Research Federation
- New Hampshire Association of Natural Resource Scientists
- Maine Association of Wetland Scientists
- Association of Massachusetts Wetland Scientsts.

SELECTED PROJECT EXPERIENCE

Confidential Client (2013) – Environmental and cultural resource review and permitting for a 13-mile proposed new transmission line in NH. Permits will include NH Site Evaluation Committee, NH DES Wetlands, and Corps of Engineers Section 404. Project Manager.

Atlantic Wind (2010-Present) - Natural resource studies and permitting for potential wind farm, including wetlands, vernal pools, and wildlife. Permits will include NH Wetlands, Site Evaluation Committee and Corps of Engineers Section 404. Project Manager.

TransCanada Hydro Northeast Inc. (2012-present) – FERC hydropower relicensing for 3 projects on the Connecticut River. Managed preparation of terrestrial/wetlands components of the Preliminary Application Documents, study plan preparation, and stakeholder review. Managed study plans for rare plant species. Terrestrial/ Wetland Task Manager.

PB Americas (2009-Present) - Whittier Bridge/I-95 improvement for MA DOT. Provided wetland and vernal pool surveys, wildlife and rare species assessments and mitigation to support an expedited permitting process for replacing an impaired bridge. Assisted in preparation of EA and MA Wetlands Protection Act and Corps of Engineers Section 404 permits. Wetlands Task Manager.

FPL Hydro Maine (2008-2011) - Brassua Lake relicensing. Conducted terrestrial, aquatic and wetland vegetation, as well as mammalian and amphibian studies to support relicensing. Task Manager.

Ragged Mountain Expansion Environmental Assessment (2007-present) - Comprehensive evaluation of environmental effects of ski area expansion; NEPA documentation; and Corps of Engineers Section 404 and NH DES wetlands permitting. Project Manager.

FirstLight Power Resources (2006-Present) – Bulls Bridge and Falls Village Critical Habitat Monitoring. Implemented a FERC license requirement of monitoring and provide management recommendations for 26 listed rare plant and terrestrial invertebrate species occurring within the study limits of two hydroelectric projects. Project Manager.

Friends of Scarborough Marsh (2003-2010) - Libby River Salt Marsh Restoration post-construction monitoring. Long-term monitoring of vegetation, hydrology and wildlife on restored tidal marsh. Project Manager.

Waste Management, Inc. (1990-Present) - Natural resource permitting and mitigation for four landfill expansions, Norridgewock, ME. Project Manager

UPC Vermont Wind (2004-2005) - Breeding bird surveys over 7 remote peaks in northeastern VT for proposed 20-turbine wind energy facility. Project Manager/Ecologist.

Maine Department of Transportation (2004-2005) - Gorham Bypass. Search and alternatives analysis for mitigation site to compensate for 22 acres of wetland impact due to highway expansion. Gorham, ME, Project Manager/Ecologist.

Clipper Windpower (2005-2008) - Paragon Project. Bird studies for 40-turbine proposed wind energy facility in the central plateau of NY. Field surveys include migratory and resident raptors, passerines, waterfowl and wading birds, caprimulgids. Project Manager/Ecologist.

PB Power (2003-2005) - Yadkin hydroelectric relicensing. Wetlands and terrestrial mapping and assessment to support FERC relicensing on 4 reservoirs on Yadkin River, NC. Also included surveys for rare and invasive species, technical presentations to stakeholders. Ecologist/Task Manager.

US Army Corps of Engineers (2002-2004) - Scarborough Marsh Restoration Project, Scarborough, ME. Development of restoration plan, feasibility study and EA to restore 135 acres of degraded salt marsh. Included dredging analysis, and assisted Corps with MCASES cost-benefit analysis Project Manager.

Lennar (2002-2004) - Tritown Wildlife Surveys, South Weymouth, MA. Rare turtle trapping and tracking, surveys of vernal pools, grassland birds, and dragonflies at 1500-acre former naval air station. Wildlife Ecologist.

EA Engineering, Science, and Technology (2002-2004) - Nonquitt Marsh Restoration Project, South Dartmouth, MA. Collected baseline vegetation, fish and macroinvertebrate data, and contributed to restoration plan for severely tidally restricted marsh. Project Manager.

Bath Iron Works (ME) (1997-2003) - Facility Expansion, Environmental Studies and Permitting. Wetlands Impact Assessment and Mitigation Design and Construction. Task Manager.

Friends of Scarborough Marsh (2000-2002) - Scarborough Marsh and Watershed Restoration and Enhancement Strategy, Scarborough, ME Evaluation of 3000-acre salt marsh and its watershed and prioritizing restoration, enhancement, and acquisition goals. Project Manager.

Massachusetts Wetland Restoration Program (2000-2002) - South Cape Beach Marsh Restoration, Mashpee, MA. Collected baseline biological data and developed preliminary restoration plan for tidally restricted salt marsh. Ecologist.

State of New Hampshire (1999) - Cannon Mountain EIS (NH). High-altitude bird surveys for several state-listed species, Bicknell's thrush and northern goshawk. Wildlife Ecologist.

Bechtel/Parsons Brinckerhoff (1992-1999) - Central Artery/Third Harbor Tunnel; Wetlands Assessment and Mitigation Design. Wetland Ecologist.

Maine Audubon Society (1996) - Vernal Pool Mapping Pilot Study. Comparison of aerial photointerpretation and NWI mapping to identify vernal pools in 2 ecologically distinct regions in Maine. Project Manager.

Massport, Boston, MA (1993-1995) - Large Dredge Disposal Facility; Alternatives Analysis and Terrestrial Site Selection. Wetland and Terrestrial Ecologist.

NH Office of State Planning (1992) - Salt Marsh Mitigation Monitoring Manual. Project Manager.

SELECTED PRESENTATIONS

Allen, S.D. 2003. Preserving salinity gradients during restoration of a Coastal Wetland on Cape Cod. Inaugural Conference on Coastal and Estuarine Habitat Restoration, Baltimore, MD.

Allen, S.D. 2001. Restoration of a near-fresh tidal marsh on the Kennebec River, ME. Annual conference, Society of Wetland Scientist, Chicago, IL.

Allen, S.D., E.A. Day, and J. West. 1996. Vernal pool creation in New England. Annual conference, Society for Ecological Restoration, New Brunswick, NJ.

Allen, S.D., L.E. Carbonneau, R.R. Bryan, and D. Scott. 1994. Assessing plant condition during wetland mitigation site construction and monitoring. Annual conference, Society of Wetland Scientists, Portland, OR.

Allen, S.D. 1992. Relationships among hydrology vegetation and soils in red maple swamps and the relevance to Federal wetland delineation methods. Invited speaker. Annual conference, Northeastern Branch of American Society of Agronomy, Storrs, CT.

SELECTED PEER-REVIEWED ARTICLES AND PUBLICATIONS

Allen, S.D. 1989. Relationships among hydrology, vegetation, and soils in transition zones of Rhode Island red maple swamps. M.S. Thesis, University of Rhode Island. 109 pp.

Allen, S.D., F.C. Golet, A.F. Davis, and T.E. Sokoloski. 1989. Soil-vegetation correlations in transition zones of Rhode Island red maple swamps. U.S. Fish Wildl. Serv. Biol. Rep. 89(8). 47 pp.

Valiela, I., J. Teal, S. Allen, R. Van Etten, and S. Volkmann. 1985. Decomposition in salt marsh ecosystems: the phases and major factors affecting disappearance of above-ground organic matter. J. Ex. Mar. Biol. Ecol. 89:29-54.

Valiela, I., J.M. Teal, C. Cogswell, J. Hartman, S. Allen, R. Van Etten, and D. Goehringer. 1989. Some long-term consequences of sewage contamination in salt-marsh ecosystems. Pages 301-316 in P.J. Godfrey, E.R. Kaynor, and S. Pelczarski (eds.). Ecological considerations in wetlands treatment of municipal wastewaters. Van Nostrand Reinhold Co., New York. 473 pp.

THE STATE OF NEW HAMPSHIRE
BEFORE THE
SITE EVALUATION COMMITTEE

DOCKET NO. 2013-

APPLICATION OF ATLANTIC WIND, LLC
FOR A CERTIFICATE OF SITE AND FACILITY

PREFILED DIRECT TESTIMONY OF RITA WALSH
ON BEHALF OF
ATLANTIC WIND, LLC

December, 2013

Qualifications

Q. Please state your name and business address.

A. Rita Walsh, 101 Walnut Street, Watertown, MA 02472

Q. Who is your current employer and what position do you hold?

A. I am employed by Vanasse Hangen Brustlin, Inc. (VHB), as a Senior Preservation Planner.

Q. What are your background and qualifications?

A. I have a B.A. and M.S. in Historic Preservation, from the University of Michigan and University of Vermont, respectively. I have 31 years of historic preservation experience, including historic property survey, NRHP nominations and eligibility evaluations, and Section 106, state, and local historic preservation law expertise. I have been involved in over 40 projects in NH, which have mostly been comprised of compliance, documentation, and planning projects. I have been employed 8.5 years at VHB and am the head of the Cultural Resources Group.

Q. Have you testified before the New Hampshire Site Evaluation Committee previously?

A. No. However, I have provided expert testimony to several agencies, including the Boston Landmarks Commission (MA), Beverly Historic District Commission (MA) (demolition delay review); Waltham Historic District Commission (MA) (proposed changes to a historic bridge); Vermont Act 250 district commission (moving of historic building in project area); Huntington Historic Preservation Commission (building not significant); and state historic preservation review boards (National Register nominations).

Purpose of Testimony and Overview of the Project

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to discuss the Historic Resources survey that was performed for the Wild Meadows Wind Project, and provide the findings of the survey efforts.

Q. Are you familiar with the Project that is the subject of this Application?

A. Yes, I am. In my role as Project Manager for Historic Resources surveys, I am supervising, and also participated in, the work of the Architectural Historians who have completed the preliminary phase of the historic architectural survey for purposes of compliance with Section 106 of the National Historic Preservation Act ("NHPA"). We performed several field visits to acquaint ourselves with the area and to photograph and map properties over 50 years old within the 3-mile APE for the Project Area Form.

Impact on Historic Sites

Q. Have you studied the historical resources existing in the vicinity of the proposed Wild Meadows Wind Project?

A. Yes, we have completed a historic architectural survey in the form of a NH DHR Project Area Form.

Q. Please describe your studies.

A. The historic architectural survey was performed to identify historic properties listed in or determined eligible for the National Register of Historic Places ("NRHP") and the New Hampshire State Register of Historic Places within a 3-mile area of potential effects ("APE") for visual effects or viewshed. The APE is the area in which the proposed Project has the potential to have visual effects that could diminish the setting of a historic property, where the property's setting is a central feature of NRHP eligibility. As part of the work, VHB completed a site file check at the New Hampshire Division of Historical Resources ("NH DHR") to research previously identified historic properties listed and/or eligible for listing in the National Register and New Hampshire State Register within the APE.

Extensive historic research and field survey was also conducted to present an overview of the historical development of the towns within the 3-mile APE and to present a discussion of the types and styles of buildings and structures within the APE. The purpose of the research for this Project Area Form was to understand the historic contexts that have defined the areas and associated properties included within the 3-mile APE; to identify previously documented properties; to conduct fieldwork to identify properties especially those over 50 years old that are associated with the contexts; and to define the relevant historic contexts for which properties' settings are significant.

A site file search at the New Hampshire Division of Historical Resources was conducted in August 2012, in order to identify all previously recorded resources in the 3-mile APE (inventoried, those subject to an eligibility determination, and those on the State or National Register) and the 5-mile radius (only properties listed or determined eligible for the National Register of Historic Places).

The majority of the information pertaining to the relevant historic contexts was derived from histories of the towns and the counties; historic maps, industrial and agricultural schedules of the U.S. census, information derived from National Register nominations and inventory forms, and information from the Internet on pertinent topics. Research was conducted at the NH State Library, NH State Archives, and the New Hampshire Historical Society. Maps, local histories, and other sources obtained at the state repositories provided a substantial amount of information about the history of the area and its development.

A reconnaissance survey of every accessible road within the 3-mile APE was performed to understand the property types and to estimate dates of construction; locate and photograph all previously documented properties; to look intensively at the properties in the viewshed areas that were over 50 years old; and to photograph representative properties outside of the viewshed areas within the 3-mile APE. Photographs were taken of individual buildings in order to capture representative buildings and structures within the 3-mile APE. All photographs were taken from a public right-of-way and no entry was attempted on properties which had long driveways, were not visible from the road, were gated to discourage entry, or displayed no trespassing signs or in other ways indicated that entry was not desired.

For the purposes of compliance with Section 106 of the NHPA, the United States Army Corps of Engineers ("USACE") is acting as the lead federal agency for this undertaking. The USACE is consulting with the NH DHR through this process. All reports and submittals for the Project Area Form have been completed and will be reviewed by the USACE and the NH DHR. A copy of the Project Area Form has been included with the Application as Appendix 38.

Q. Please explain the results of your studies.

A. The fieldwork yielded sixty-three (63) properties over 50 years old (the standard threshold date for considering the National Register eligibility of a property) in the viewshed areas (those areas in which the turbines would be visible). However, it should be noted that visibility of the proposed project area may range from visibility of the tip of one turbine blade, to a full view of multiple turbines. Of these 63 properties, 46 were eliminated from consideration for further investigation and National Register eligibility assessments due to integrity issues or no association with relevant historic contexts for which setting would be a significant element. Seventeen (17) individual properties were initially suggested for further investigation to confirm their association with the relevant historic contexts discussed in the Project Area Form for which setting is an important element in their potential National Register eligibility.

Very little is known about the individual histories of the buildings within the visibility (viewshed) areas at this time. The analysis undertaken to provide these recommendations relied strongly on physical characteristics of the properties, and their similarities to nearby buildings for which an association to the relevant historic contexts was confirmed by documentary sources. The primary purpose of further investigation efforts would be to confirm whether properties are indeed associated with the relevant historic contexts.

There is only one property listed in the National Register or previously determined eligible that is located in the viewshed areas that may be visually affected by the proposed project. The house on Murray Hill Road (VHB-HIL-003) has already been identified as a contributing resource to the Murray Hill Summer Home District, and the district has already been recognized for its mountain views as a significant characteristic under Criterion A and in the context of the nomination's "Other: Summer Vacation Home" area of significance.

The potential indirect impact on these properties needs to be evaluated by the USACE and NH DHR to ultimately determine whether further investigation is warranted followed by a determination of effect and subsequent mitigation measures if the effect is found to be adverse.

Q. In your opinion will this Project have an unreasonable adverse effect on historic sites?

A. Based on the preliminary survey findings presented in the PAF, and our current understanding of the Project, we do not believe that this Project will have an unreasonable adverse effect on historic properties. Although the NHPA Section 106 process has not been completed, based upon available information, VHB's experience with projects with indirect visual effects and the manner in which similar potential impacts have been addressed by state and federal regulators in the past, it is our opinion that the proposed Project is unlikely to have an unreasonable adverse effect on any known historic properties. No historic structures will be physically impacted by construction of the proposed Project, and it appears unlikely that the visibility of the Project would diminish any aspects of setting that might contribute to the significance of such historic properties.

Q. What are the remaining steps in the NHPA Section 106 consultative process?

A. The USACE will review the Project Area Form and submit to NH DHR for review. The USACE will then consult with the NH DHR with regards to determinations of eligibility of identified properties for the National Register. Any properties determined eligible for the National Register will then be subject to an effects determination by the USACE and NHDHR. Properties which are determined to have an adverse effect on the characteristics for which they are eligible for the National Register would require mitigation. The forms of mitigation can vary from additional historical documentation, photographic documentation of the property prior to the project's construction, walking tour brochures, interpretive signage or panels, or other measures collectively decided upon by the USACE, NHDHR and any consulting parties.

Q. Does this conclude your prefiled testimony?

A. Yes.

Rita Walsh

Senior Preservation Planner

Rita brings over 31 years' experience to VHB in historic preservation services and cultural resources compliance. She provides expertise in a broad range of services especially historic preservation tax credit applications, Section 106 review, National Register nominations, and historical research.

Rita Walsh is VHB's Senior Preservation Planner and meets the Secretary of the Interior's Professional Qualification Standards for an Architectural Historian and Historian (36 CFR 61). Ms. Walsh's relevant project experience includes the following:

New Hampshire Surveys

Ms. Walsh has overseen and/or prepared New Hampshire Division of Historical Resources (NHDHR) individual and area forms for a number of properties in the state. These forms include individual inventory forms for properties adjacent to NH 33 in Portsmouth, NH; project area, individual and area forms for many properties potentially affected by the Broad Street Parkway in Nashua, NH; area form and individual inventory form for the West Salisbury Historic District and Pingree Bridge in Salisbury, NH; project area forms for the Hampton Beach area in Hampton Beach and Exeter Great Dam area, Exeter, NH; individual form for the Tamworth Inn in Tamworth, NH; and the Portsmouth Middle School and Wentworth School individual inventory forms in Portsmouth, NH.

State-Level Documentation Reports, NH, ME, and MA

Prepared or oversaw NH Historic Property Documentation reports for several buildings and bridges in New Hampshire, which included the ca. 1930 NH 33 bridge in Portsmouth; NH, Pingree Bridge in Salisbury, Boiler House of the Nashua Manufacturing Company, Nashua, NH; Charles and Lena Gordon Residential Building, Nashua, NH; and Isaac Dow Barn in Dover, NH. Prepared or oversaw Maine Historic Building Record reports for the Ferguson Barn in Poland, ME; Knickerbocker Bridge in Boothbay, ME; Piscataquis River Bridge, Howland, ME; New Bridge in York, ME; Avon Mill in Lewiston, ME; and Bowker Double House in Brunswick, ME. Prepared archival photographic documentation reports for numerous buildings in Massachusetts, including the Tileston Paper Mill in Mattapan, MA; Rugg House in Framingham, MA; and Gillette Cigar Factory in Southwick, MA.

Exeter Great Dam Removal Feasibility Study and Impacts Analysis, Exeter, NH

Currently assisting the Town of Exeter, NOAA and other project partners in a feasibility study for either the removal or modification of the existing 1914 Exeter Great Dam. Ms. Walsh's role is to oversee and prepare a Project Area form, individual inventory form for the dam, and to assist NOAA, the potential lead federal agency, on early Section 106 coordination efforts. She is also interacting with the identified consulting parties and with NHDHR to accomplish these coordination efforts.

Broad Street Parkway, Section 106 Services, Nashua, NH

In charge of the efforts to consult with the NHDHR, NHDOT, and the City of Nashua regarding a new Broad Street Parkway alternative. Oversaw inventory efforts for all buildings over 50 years old in the project area and prepared determination of effects sheets for all affected properties. Assisted in the preparation of the Memorandum of Agreement. Oversaw the completion of two NH Historic Property Documentation reports for two of the affected buildings.

Portsmouth Middle School and Wentworth School, Section 106 Services, Portsmouth, NH

Assisted in the preparation of the Request for Project Review form, followed by the completion of New Hampshire Division of Historical Resources individual forms for two school buildings in central Portsmouth. The Wentworth School was proposed for demolition, while significant interior work and a new addition were proposed for the Portsmouth Middle School. Assisted the architect and City of Portsmouth through the compliance process and prepared draft Memorandum of Agreement.

Pingree Bridge Replacement Section 106 Services, West Salisbury, NH
Prepared New Hampshire Division of Historical Resources individual and area inventory forms for the 1893 Pingree Bridge and the surrounding rural area, respectively. Assignment also includes extensive coordination with NHDOT and NHDHR on determination of effects and mitigation measures.

Proposed Hannaford Store Section 106 Services, Kingston, NH
From 2005-2009, Rita provided a number of services to assist the client's proposal to build a Hannaford grocery store at the intersection of Rt. 125 and Main Street in Kingston (which ultimately the client determined not to build). These services included review of local historic district guidelines to determine if the store's design was in accord and preparation of a detailed memo; preparation of a NHDHR Area Form which analyzed and recommended new boundaries for the National Register-eligible district; prepared tables which documented the criteria of effects; coordinated and presented information about the project at the public meetings and preparation of a Memorandum of Agreement and possible mitigation measures.

Homestead Dam Removal Section 106 Services, West Swanzey, NH
Oversaw preparation of an Individual Inventory Form for the Homestead Woolen Mill and Dam and for an Area Form for the West Swanzey Historic District. Prepared tables documenting the criteria of effects. Also prepared the products of two of the mitigation measures, which involved writing the text for a NH Historic Highway Marker and coordination and text preparation for a West Swanzey Historic District walking tour brochure.

Section 106 services, NH Route 33 Bridge Engineering Study, Portsmouth, NH
Researched the presence of previously inventoried above ground resources and compiled archival sources for the area of NH Route 33 between I-95 and Peverly Hill Road. Fieldwork involved photographic documentation, assessment of the condition of previously inventoried resources, and identification of new above ground resources along the corridor. Oversaw preparation of New Hampshire Division of Historical Resources inventory forms for 3 additional properties. Oversaw the preparation of a NH Historic Property Documentation report for the NH Route 33 bridge that was replaced with a new bridge.

Expert Witness Testimony, Blair House, Williston, VT
Provided successful expert witness testimony to the District 4 Environmental Commission regarding impacts to the proposed move of the Blair House, a historic structure as part of the Act 250 state environmental review process. Represented the building's owner who desired to move the building a short distance from its original location at Taft's Corner area of Williston.

Portland North Passenger Rail Extension Cultural Resources Survey and National Register Evaluation, Portland Wye to Yarmouth Junction, ME
Directed field survey of culverts and bridges over 50 years old on a 12-mile segment of an active railroad line between Portland and Yarmouth, ME. This segment is an alternative route for the proposed extension between Portland, Maine and Brunswick,

Maine of the current Boston, Massachusetts to Portland Amtrak-run service. Oversaw preparation of individual inventory forms for all surveyed resources, cultural resources field survey report, and National Register evaluations of all resources. Negotiated abbreviated level of survey which enabled the client, Northern New England Passenger Rail Authority, to receive a one-day turnaround decision on the Section 106 review of this project by the Maine Historic Preservation Commission.

MaineDOT Architectural Historian On-call Services, ME
Manager of a cultural resources team that performs documentation and National Register evaluation of properties affected by MaineDOT projects throughout Maine. Assignments also include determination of effects memos and property documentation as a mitigation measure for a number of projects.

Education

M.S., Historic Preservation, University of Vermont, 1982
B.A., Historic Preservation, University of Michigan, 1979

Affiliations

Preservation Massachusetts, Board member
Historic New England (formerly Society for the Preservation of New England Antiquities)
DOCOMOMO – Documenting and Conserving buildings, sites, and neighborhoods of the Modern Movement, Board member
Vernacular Architecture Forum, Board member
Boston Preservation Alliance, Board member

THE STATE OF NEW HAMPSHIRE
BEFORE THE
SITE EVALUATION COMMITTEE

DOCKET NO. 2013-

APPLICATION OF ATLANTIC WIND, LLC
FOR A CERTIFICATE OF SITE AND FACILITY

PREFILED DIRECT TESTIMONY OF HOPE E. LUHMAN ON BEHALF OF ATLANTIC WIND, LLC

December 2013

Qualifications

Q. Please state your name and business address.

A. My name is Hope E. Luhman. My business address is: The Louis Berger Group, Inc., 20 Corporate Woods Blvd., Albany, New York 12211.

Q. Who is your current employer and what position do you hold?

A. I am employed by The Louis Berger Group, Inc. ("Berger") as a Vice President.

Q. What are your background and qualifications?

A. I have more than 30 years of experience in historic preservation and cultural resource management. I have a Ph.D. in Anthropology from Bryn Mawr College, an M.A. in Anthropology from Bryn Mawr College, an M.A. in Social Relations from Lehigh University, and a B.A. in Anthropology from Muhlenberg College. I am a Registered Professional Archaeologist (RPA) and worked on the Deerfield Wind project in Vermont in the 1990s, the proposed Searsburg Wind project in Vermont, the Coos County and Groton Wind projects in New Hampshire.

Q. Have you testified before the New Hampshire Site Evaluation Committee previously?

A. Yes. I provided pre-filed and live testimony in Docket 2008-04 regarding the impacts of the Granite Reliable Wind Project on historic resources and for the Groton Wind project as well.

<u>Purpose of Testimony and Overview of the Project</u>

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to discuss the archaeological studies that were performed in support of the Wild Meadows Wind Project and the results of those studies.

Q. Are you familiar with the Project that is the subject of this Application?

A. Yes, I am. In my role as Project Manager for the archaeological survey, I am supervising the work of the Archaeologists who have completed the Phase IA archaeological survey, respectively, for purposes of compliance with Section 106 of the National Historic Preservation Act ("NHPA").

<u>Impact on Archaeological Sites</u>

Q. Have you studied the archaeological resources in the vicinity of the proposed Wild Meadows Project?

A. Yes, we have completed a Phase IA archaeological survey.

Q. Please describe your studies.

A. The Phase IA archaeological survey was designed and performed in accordance with professional guidelines and standards including those of the New Hampshire Division of Historic Resources (NH DHR) and provides an initial review of the Project to assess areas of archaeological sensitivity and potential resource management issues. The Phase IA archaeological survey consisted of background research and a pedestrian survey to gain an understanding of previous disturbances, identify and assess areas of archaeological sensitivity, and identify any extant archaeological sites in the area of potential effect (APE).

This report has been completed and will be reviewed by the USACE and the NH DHR. A copy of this report has been included with the Application as Appendix 36.

Q. Please explain the results of your studies.

A. Background research was conducted for the Project in October 2012, January 2013, and October 2013. Pedestrian surveys were conducted October 14-16, 2012, May 2-3, 2013, and October 9-10, 2013. Several stone foundations and associated features and mining pits were observed in and adjacent to portions of the APE. A total of four areas are considered to possess a moderate to high archaeological sensitivity for resources associated with observed historical features and four areas were identified as having low to moderate sensitivity for pre-contact archaeological resources. Overall, the majority of the APE is considered to possess little potential to contain pre-contact archaeological resources; however, some areas are worth investigating for pre-contact resources, particularly those on relatively level terrain, and near potable water.

Based on the findings of the Phase IA archaeological survey, it is the opinion of Louis Berger archaeologists that a Phase IB archaeological survey of the area associated with ground disturbance be conducted to identify archaeological resources that could be affected by project construction. It is proposed that this work will be conducted during spring/summer 2013 in consultation with the USACE and the NH DHR and that the Applicant will provide information as to whether archaeological sites are present within the archaeological APE or the area associated with any proposed ground disturbance once the Phase IB survey is complete. Such information will provide the basis for determining the need for further work or mitigation (e.g., Phase II/site evaluation investigation, Phase III/data recovery excavation).

Q. In your opinion will this Project have an unreasonable adverse effect on historic sites?

A. Based on the preliminary survey findings and our current understanding of the Project, we do not believe that this Project will have an unreasonable adverse effect on archaeological resources. Although our investigations are not yet complete, based upon available information, Louis Berger's experience at other projects, and the manner in which similar potential impacts have been addressed by state and federal regulators in the past, it is our opinion that the proposed Project will not have an unreasonable adverse effect on any significant archaeological resources.

Q. Are there any other comments you would like to make at this time?

A. No.

Q. Does this conclude your prefiled testimony?

A. Yes.

Hope Luhman PhD, RPA

VICE PRESIDENT

Firm
Louis Berger

Education
Education:
PhD, Anthropology, Bryn Mawr College, 1991
MA, Anthropology, Bryn Mawr College, 1988
Graduate Program, City University of New York, 1983-1985
Graduate Tutorial in Social Anthropology, King's College, Cambridge University, 1982
MA, Social Relations, Lehigh University, 1982
BA, Anthropology, Muhlenberg College, 1980

Registrations/Certifications
Accredited by the Register of Professional Archaeologists (RPA) (Documents Research, Field Research, Historical Archaeology, Museology, and Teaching)
State of Hawaii Permit No. 13-27

Professional Associations
American Anthropological Association
California Archaeological Society
Connecticut Archaeological Society
Council for Northeast Historical Archaeology
Massachusetts Archaeological Society
Missouri Archaeological Society
New Hampshire Archaeological Society
New York Archaeological Council
New York State Archaeological Association
Pennsylvania Archaeological Council
Sigma Xi, the Scientific Research Society
Society for American Archaeology
Society for Applied Anthropology
Society for Hawaiian Archaeology
Society for Historical Archaeology
Society for Industrial Archaeology
Society for Pennsylvania Archaeology
Transportation Research Board, Committee on Historic and Archaeological Preservation in Transportation (ADC50)
Vermont Archaeological Society

Awards
American Cultural Resources Association Government Award presented to the Pennsylvania Department of Transportation, Merit Badge in Archaeology: Boy Scout Troop 21, Mansfield, Pennsylvania, 2000. Merit Badge Counselor and program designer, public education component of Phase III Investigation of Site 36Ti116 associated with the State Route 6015 Relocation and Improvements, Tioga County, Pennsylvania.

Years of Experience 31
Years with Firm 19

Professional Summary
Dr. Luhman joined Louis Berger in 1994 as an archaeologist and became a vice president of the company in 2012, with overall responsibility for Louis Berger's nationwide cultural resource management practice. She has the ability to commit the resources of the firm on an immediate response basis, with access to the full range of corporate support. In addition, Dr. Luhman manages archaeological, architectural, and historic preservation planning projects involving historic and precontact resources , nationwide and engages in general business development. She coordinates interdisciplinary and multitask studies; interfaces with reviewing agencies, clients, and subconsultants;

participates in public outreach and education programs; contributes to technical reports; prepares agreement documents and special exhibits; and provides expert witness testimony. Dr. Luhman has experience working with federal, state and local agencies, private developers, commercial entities, and utilities.

Selected Louis Berger Experience

Energy

Green Mountain Power, Cultural Resource Survey, Towns of Georgia and Milton, Georgia/Milton Substation and Transmission Project, Chittenden and Franklin Counties, Vermont. Project manager. Cultural resource services in support of Section 248 filing for a 6-mile electrical transmission maintenance and upgrade project**.** 2013

Iberdrola Renewables, Wild Meadows Wind Project, Cultural Resource Services. Project manager. 2011-present

National Grid, Alternatives Analysis, Documentation and Interpretive Signage, Glenwood Station No.2, Glenwood Landing, New York. Project manager. As part of the New York State regulatory process, a complete alternative reuse and redevelopment analysis was prepared for an early twentieth-century power station on Long Island. This effort was followed by a HAER Level II equivalent documentation and the development of an interpretive panel on the history of electric generation at the site. This work required extensive research into the history of electric generation on Long Island and the design of power plants. 2011-2013

Master Services Agreement, Vermont Transco, L.L.C., Cultural Resource Services. Agreement contract to provide archaeological and historical professional and consulting services. Contract manager. 2011-present. Examples of completed or ongoing projects include the following.

> Vermont Gas Systems Addison Natural Gas Expansion Project, Chittenden and Addison Counties, Vermont. Senior field supervisor. Third-party review of submitted reports, maps, and other documentation of archaeological investigations of a new 42-mile pipeline project in northwestern Vermont. 2012-ongoing
>
> K-41 Structure Replacement and Maintenance Project, Franklin and Orleans Counties, Vermont. Senior field supervisor. Field assessment, archaeological site and National Register review, and memorandum preparation in support of Section 248 filing for a 51-mile electrical transmission maintenance and upgrade project. 2012-ongoing

Northeast Utilities, Annual Shoreline Inspection and Cultural Resources Consultation, New Hampshire. Project manager. 2012

Derby Wind Archaeological Resource Assessment for the Proposed Derby Line Wind Project in Derby, Orleans County, Vermont. Project manager. 2012

Archaeological Resource Assessment, Proposed Nordic Windpower Project, Stamford, Bennington County, Vermont. Project manager. 2012

Casella Waste Systems, Inc., **Archaeological Services for the Coventry Solar Project, Town of Coventry, Orleans County, Vermont.** Project Manager. 2012.

National Grid, On-Call Cultural Resources Services, Northeast/New England. **Contract/project manager. Contract/project manager/principal investigator.** Seven work orders completed under a two-year contract to provide archaeological and historical professional and consulting services. Examples of completed projects given below. 2009-2011

- Site-file Review and Map Preparation, A24 (115kV) Improvement Project, Bridgewater Substation (Pleasant Street, Bridgewater) – Proposed Municipal Substation (Bird Road, Mansfield), Towns of Bridgewater, West Bridgewater, Easton and Mansfield - Bristol County, Massachusetts.

- Site-file Review and Map Preparation, Auburn Street Substation Rebuilding Project, Town of Whitman, Plymouth County, Massachusetts.

PPL Electric Utilities, Brunner Island-West Shore 230kV Transmission Line Project, Pennsylvania. Quality assurance/quality control. Conducted cultural resource due diligence for this proposed transmission line project. This project is approximately 16 miles long and is part of the PJM Regional Transmission Expansion Plan. 2011

PPL Electric Utilities, Manor-Graceton 230kV Transmission Line Project, Pennsylvania. Quality assurance/quality control. Conducted cultural resource due diligence for this proposed transmission line project between Conestoga Township, Lancaster County, and the Pennsylvania-Maryland border in Peach Bottom Township, York County. This segment of the line is approximately 14.5 miles long and is being replaced/supplemented as part of the PPL Electric Utilities Assess Optimization Strategy program. 2011

PPL Electric Utilities, Otter Creek–Conastone 230kV Transmission Line Project, Pennsylvania. Quality assurance/quality control. Conducted cultural resource due diligence for this transmission line project between Chanceford Township and the Pennsylvania-Maryland border in Hopewell Township. This segment of line is approximately 12 miles long and is being replaced/supplemented as part of the PPL Electric Utilities Assess Optimization Strategy program. 2011

PPL Electric Utilities, Martins Creek-Siegfried 230kV Transmission Line, Northampton County, Pennsylvania. Quality assurance/quality control. Conducted cultural resource due diligence for this proposed rebuild of a portion of 230kV line between the Siegfried Substation and the last structure in Northampton County. The line is being replaced/supplemented as part of the PPL Electric Utilities Assess Optimization Strategy program. 2011

Green Mountain Power, Archaeological and Architectural Survey, Proposed Gorge Gas Turbine Project, Town of Colchester, Chittenden County, Vermont. Project manager. 2011

Dominion Transmission, Inc.. Phase I Archaeological Survey, Proposed Pipeline Corrosion Project, Town of Rotterdam, Schenectady County, New York. Project manager. 2011

Vermont Transco, L.L.C., Archaeological and Architectural Surveys, Proposed Bennington Substation, Town of Bennington, Bennington County, Vermont. **Principal investigator.** 2010-2012

Vermont Transco, L.L.C., Archaeological and Architectural Surveys, Proposed Georgia Substation, Town of Georgia, Franklin County, Vermont. **Project manager**. 2010-2012

Great Bay Hydro Corporation, Archaeological Resource Assessment, West Charleston Development Repowering Project, Charleston, Orleans County, Vermont. Project manager. 2010

Vermont Electric Power Company, Inc. (VELCO), Archaeological Sensitivity Assessment and Phase IB Archaeological Survey, Proposed Champlain Wind Link, Plattsburgh and Beekmantown, Clinton County, New York and Addison, Chittenden, Grand Isle, Orange and Washington Counties, Vermont. Project manager. 2009-2012

Groton Wind, LLC, Archaeological and Architectural Survey, Groton Wind Project, Town of Groton, Grafton County, New Hampshire. Project manager. 2009-present

Mason & Associates/National Grid USA, Archaeological Reconnaissance and Intensive (Locational) Survey, 115kV K-163 Transmission Line Project, Towns of Groveland, West Newbury, Merrimac and Amesbury, Essex County, Massachusetts. Project manager. 2007-2010

VELCO, Cultural Resource Services, Archaeological Resource Assessment, Phase IB Archaeological Survey, Historical Architectural Investigations, Determinations of Eligibility and Effects Analysis, Southern Loop 345kV Line Project, Windham and Windsor Counties, Vermont. Project manager. 2007-2010

VELCO, Archaeological Services, Archaeological Resource Assessment, Phase IB Archaeological Survey, Geomorphological Investigations/Deep Testing, Site Avoidance Plans, and Phase II Investigations, East Avenue Loop Project, Burlington and Williston, Chittenden County, Vermont. Project manager. 2007-2010

VELCO, Archaeological Services, Northwest Reliability Project, Addison and Chittenden Counties, Vermont. Project manager. 2006-2010

VELCO, Archaeological Services, Lamoille County 115kV Project, Lamoille and Washington Counties, Vermont. Project manager. 2006-2010

Vermont Transco, LLC, Archaeological Resource Assessment and Phase IB Archaeological Survey, Proposed Newport Substation, Town of Derby and City of Newport, Orleans County, Vermont. **Project manager.** 2009

Green Mountain Power Corporation, Archaeological Resource Assessment and Phase IB Archaeological Survey, Green Mountain Power Solar BG Project, Montpelier, Washington County, Vermont. **Project manager.** 2009

Public Service Company of New Hampshire for New Hampshire Department of Environmental Services, Phase IA Archaeological Survey, Proposed IPC Upper Dam Removal, Town of Bristol, Grafton County, New Hampshire. **Project manager.** 2009

Public Service of New Hampshire, Phase I Archaeological Survey, Canaan Hydroelectric Project (FERC Project No. 7528), Canaan, Essex County, Vermont and Stewartstown, Coos County, New Hampshire. **Project manager/principal investigator**. 2009

Vermont Transco, LLC, Archaeological Resource Assessment (ARA) and Phase I Archaeological Investigation for the Proposed Lyndonville Substation Project, Lyndonville, Caledonia County, Vermont. **Project manager.** 2008-2009

Northeast Utilities, Phase IA Archaeological Sensitivity Assessment, Proposed Remediation Project, Ashuelot River and Mill Creek, Town of Keene, Cheshire County, New Hampshire. **Project manager.** 2008-2009

MeadWestvaco Corporations for Federal Energy Regulatory Commission (FERC), Willow Mill Hydroelectric Project (FERC Project No. 2985), Historic Properties Management Plan, Lee, Berkshire County, Massachusetts. Project manager. 2008-2009

Village of Orleans, Inc. Electric Department, Archaeological Resource Assessment, Historic Architectural Survey, and Phase I Archaeological Survey, Barton-Orleans 46kV Upgrade, Orleans County, Vermont. **Project manager.** 2008-2009

Iberdrola USA, Phase IA/IB Archaeological Survey, Architectural Survey, Effects Analysis, and Mitigation Deliverables. Lempster Wind Farm, Town of Lempster, Sullivan County, New Hampshire. **Project manager.** 2007-2011

Deerfield Wind, LLC, a subsidiary of Iberdrola Renewables, Inc., Phase IA Archaeological Survey and Historic Resource Screening Study, Archaeological Resource Assessment, Phase IB Archaeological Survey, Historical Architectural Investigations, Determinations of Eligibility and Assessments of Effects, Deerfield Wind Project, Towns of Searsburg and Readsboro, Bennington County, Vermont. **Project manager/co-principal investigator**. 2006-2011

Green Mountain Power Corporation, Archaeological Resource Assessment, Gorge Area Reinforcement Project, South Burlington, Chittenden County, Vermont. **Project manager.** 2008

Vermont Public Power Supply Authority, Archaeological Resources Assessment, Swanton Generation Project, Franklin County, Vermont. **Project manager.** 2008

Granite Reliable Power LLC, Phase IA/IB Archaeological Survey and Architectural Survey, Granite Reliable Power, LLC Proposed Windpark, Coos County, New Hampshire. **Project manager.** 2007-2008

Hatch Energy, Phase I Archaeological Survey for Dominion Transmission, Inc., Storage Factory Project, Tioga County, Pennsylvania. **Project manager.** 2007-2008

Ecology and Environment, Inc., Emergency Phase IB Archaeological Survey, Parking/Staging Areas, Noble Environmental Power Clinton County Windfarm, Clinton County, New York. **Project manager.** 2006

South Carolina Electric and Gas, Neal Shoals Hydroelectric Project: Significant Historic and Archaeological Resources. **Public education/outreach.** 2005

Holyoke Water Power Company, Cultural Resources Management Plan, Holyoke Hydroelectric, Project No. 2004, Massachusetts. Principal investigator. 2001

Green Mountain Power Corporation, Temporary Construction Areas, Essex 19 Rehabilitation Project, Green Mountain Power Corporation, Essex Junction, Chittenden County, Vermont. **Principal investigator.** 1996

South Carolina Electric and Gas, Stevens Creek Hydroelectric Project: When the Past Meets the Future. **Public education/outreach.** Popular report. 1996

Vermont Environmental Research Associates, Green Mountain Power Corporation's Wind Turbine Project, Town of Searsburg, Bennington County, Vermont. **Project manager/principal investigator**. 1994-1995

Federal: Department of Justice

Federal Bureau of Prisons (BOP), Preparing for Facility Activation: A Community Guide, Federal Correctional Institution, Berlin, New Hampshire. **Principal investigator**. 2006-2008

Immigration and Naturalization Service (INS), Phase I and II Archaeological Survey, INS Border Patrol Station, St. Lawrence County, New York. **Principal investigator**. 2001-2002

BOP, Proposed U.S. Penitentiary Site, Canaan Township, Wayne County, Pennsylvania, Phase I Archaeological Survey. **Principal investigator**. 2001-2002

BOP, Displays, Booklets, Monographs for Mitigation, U.S. Penitentiary, Canaan Township, Pennsylvania. **Public education/outreach.** Designed the "Links to the Past" museum-quality exhibit panels, popular history booklets, wayside panels, and historical monographs. 2001-2002

BOP, Buried Beneath Philadelphia: The Archaeology of North 7th and Arch Streets. **Public education/outreach.** Popular report prepared for Phase III data recovery associated with the development of the Philadelphia Metropolitan Detention Center. 1996

Federal: Department of Transportation

U.S. Department of Transportation and U.S. Coast Guard, Cultural Resources Consultation Services-Maine Historic Preservation Commission, Differential Global Positioning System (NDGPS), Patten, Penobscot County, Maine. **Project manager.** 2009-2010

Federal: General Services Administration (GSA)

GSA Northeast and Caribbean Region, Photographic Documentation, Phase IB Archaeological Survey, and Data Recovery Investigations, Proposed U.S. Courthouse, Buffalo, Erie County, New York. **Project manager/principal investigator.** 2005-2010

GSA Region 3, Social Security Administration Building, Easton, Pennsylvania. **Project manager/principal investigator.** Cultural resource sensitivity assessment and Phase IA. 1995

Federal: Military

Phase IA Archaeological Assessments, U.S. Army Reserve, 99th Regional Support Command, Facilities in Delaware, Maryland, Pennsylvania, Virginia, and West Virginia. Project manager. Phase IA assessments per the requirements of Section 110 of the National Historic Preservation Act (NHPA) assessments consisting of field reconnaissance, archival research, and sensitivity models for the potential for archaeological resources. 2012-present

Naval Facilities Engineering Command (NAVFAC) Hawaii, Integrated Cultural Resource Management Plan, Joint Base Pearl Harbor-Hickam, Cold War. Project manager. 2012-present

99th Regional Support Command-US Army Reserve and USACE-Mobile District, Phase I Archeological Survey of the Floyd WET Facility, Floyd, Oneida County, New York. Project manager. Archaeological survey and assistance with tribal consultation activities with the Oneida Indian Nation under the administration of 99th Regional Support Command. 2012.

Cultural Resource Support, EIS, Future Disposition of Hangars 2 and 3 at Fort Wainwright, Alaska, Fairbanks, Alaska. Task manager. Cultural resources task manager, Section 106 support in preparation of NEPA documentation for the future disposition of Hangars 2 and 3 at Fort Wainwright, Alaska, which are contributing elements to a National Historic Landmark (NHL) district. Owing to the historical significance of the hangars, the project requires extensive Section 106 consultation with the AK SHPO, ACHP, and NPS, which is being conducted concurrently with the NEPA process. 2011-2013

Naval Facilities Engineering Command (NAVFAC) Hawaii, FY10 Demolition Footprint Reduction Program, Historic Context Reports, Naval Radio Transmitting Facility Lualualei, Naval Computer and Telecommunications Area Master Station, and Naval Magazine Lualualei, Hawaii. **Contract and project manager/cultural expert (archaeology and research)**. Updating historic contexts for and documentation of facilities that were scheduled for removal as part of the Navy's FY10 Demolition Footprint Reduction Program, undertaken pursuant to stipulations provided in a Memorandum of Agreement between the Commander Navy Region Hawaii and the Hawaii State Historic Preservation Officer. Facilities to be demolished located at Radio Transmitting Facility Lualualei, Naval Magazine Lualualei, and Naval Computer and Telecommunications Station Wahiawa.2010-present

NAVFAC Pacific, Pearl Harbor Historical Context Study, Pearl Harbor Naval Complex, Honolulu, Hawai'i. **Contract and project manager/cultural expert (archaeology and research).** Preparing a historic context on the Pearl Harbor Naval Complex (PHNC) to support facility planning and environmental compliance activities of the Naval Facilities

Engineering Command Navy Region Hawaii (NAVFACNRH). The objective is to provide NAVFACNRH with a comprehensive historical understanding of the base and its environs, which is a critical need for an active base that is also a National Historic Landmark and a national war memorial. The context report, divided into geographical sections of the base, will aid NAVFACNRH in efficiently managing its historical properties/assets in an environment where simple repairs can require approval of the State Historic Preservation Office. 2009-present

New York Army National Guard, Cultural Resource Surveys: New York Army National Guard (NYARNG). **Project manager/principal investigator.** Projects have included Phase IA archaeological surveys for the Rome, Lockport, Jamestown, Dunkirk, Cortland, and Dryden armories; Phase IA and IB surveys for the Walton, Kingston, Leeds, Latham, Orangeburg, Geneseo and proposed Queensbury armories; Phase IB survey for the Auburn Armory; and Phase II and III archaeological investigations for the Kingston Armory. 2003-present

PARS Environmental for 77th Regional Readiness Command, Phase IB Archaeological Survey, Kerry P. Hein United States Army Reserve Center, Town of Shoreham, Suffolk County, New York. **Project manager/principal investigator.** 2008-2009

PARS Environmental for 77th Regional Readiness Command, Section 106 Compliance, Rocky Point/Brookhaven Nike Missile Launch Facility, Shoreham, Suffolk County, New York. **Project manager/principal investigator.** 2008-2009

77th Regional Readiness Command, Phase IA Archaeological Surveys, New York and New Jersey. **Project manager/principal investigator.** 2007

U.S. Army Corps of Engineers (USACE) Mobile, Phase I Archaeological Survey, Fort Totten BRAC, Queens County, New York. **Project manager/principal investigator.** 2006

Engineering Field Activity Northeast, NAVFAC, Archaeological Monitoring, Palmer Hall Geothermal Loop Field, U.S. Merchant Marine Academy, King's Point, New York. **Project manager/principal investigator.** 2005-2006

USACE Wilmington, *Semper Fidelis*: A Brief History of Onslow County, North Carolina, and Marine Corps Base, Camp Lejeune. **Public education/outreach.** Designed 100-page popular history. 2005

U.S. Military Academy (USMA), Cultural Resources Support, Family Housing, USMA, West Point, New York. **Project manager/principal investigator.** 2003

USMA, Cultural Resources Support, 13MP Fiber Optics Program and Telecommunications Closets Installation, USMA, West Point, New York. **Project manager/principal investigator.** 2003

Engineering Field Activity Northeast, NAVFAC, Archaeological Monitoring, Barry Hall Geothermal Loop Field, U.S. Merchant Marine Academy, King's Point, New York. **Principal investigator.** 2003

Engineering Field Activity Northeast, NAVFAC, Cultural Resources Survey, Housing Site, Saratoga Springs, MWR Site, Milton, Scotia Site, Scotia, Naval Support Unit, Saratoga Springs, New York. **Principal investigator.** 2003

Engineering Field Activity Northeast, NAVFAC, Cultural Resources Survey, U.S. Merchant Marine Academy, Kings Point, New York. **Principal investigator.** 2002

NAVFAC Northern Division, Cultural Resources Survey, NWIRP Laser Theodolite Facility (Terry Hill), Manorville, Suffolk County, New York. **Principal investigator.** 2001

USACE Wilmington, U.S. Marine Corps Base, Camp Lejeune, North Carolina: A Self-Guided Tour. **Public education/outreach.** Designed the tour guide of the historic and military sites at Camp Lejeune. 2000

NAVFAC, The Naval Air Warfare Center Aircraft Division, Trenton, New Jersey: Commemorating 47 Years. **Public education/outreach.** Outdoor display board, three-panel exhibit, and a popular report on the history, function, and significance of this former facility. 1999

Greenhorne and O'Mara, Archaeological Monitoring, Repair and Stabilization of the United States Coast Guard Marine Inspection Office (MIO) Seawall, New York, New York. **Project manager/principal investigator.** 1996

Federal: National Park Service

Section 110 Inventory of the Floodplain of Saratoga National Historical Park, Saratoga County, New York. Project manager. Two-year study to inventory archaeological resources across approximately 200 acres of the park adjacent to the Hudson River. Project required following strict HAZWOPER protocols during excavation and in-field artifact decontamination because of potential contamination of soils in portions of the project area. 2011-2012

Denver Service Center (DSC), Direct Labeling of Artifacts Recovered from the Archeological Excavations Conducted at Fort Stanwix National Monument for Willett Center Construction, Oneida County, New York. **Project manager.** 2007-2008

Phase I Archeological Survey, Proposed Mongaup Interpretive Center, Upper Delaware Scenic and Recreational River, Lumberland, Sullivan County, New York. Project manager/co-principal investigator and cultural resource task leader. 2007-2008

Archeological Survey for Roosevelt Farm Lane Rehabilitation Project, Home of Franklin Roosevelt National Historic Site, Hyde Park, Dutchess County, New York. **Project manager.** 2006-2007

Archeological Survey for the Construction Staging, Sediment Dewatering, and Sediment Dispersal Areas, Val-Kill Pond Restoration Project, Eleanor Roosevelt National Historic Site, Hyde Park, Dutchess County, New York. **Project manager.** 2006-2007

National Capital Region, A Confederate Winter Camp. **Public education/outreach.** Designed the brochure to NPS specifications. 2002

Local, County, and State Governments

Rhode Island Historic Preservation and Heritage Commission Compliance Consultation, Pastore and Ladd Centers, Historic Preservation Services. Cultural resource task manager. Ongoing.

Narragansett Bay Commission, Woonasquatucket and Seekonk CSOI Project, Providence County, Rhode Island. Project manager/principal investigator. Archaeological assessment and geoarchaeological investigation of two proposed sewer alignments. 2010-2011

Department of Public Works, City of Waterbury, Historical Documentation, Lewis Fulton Memorial Park Greenhouse, Pine Street, Lewis Fulton Memorial Park, Waterbury, New Haven County, Connecticut. **Project manager.** 2009

Dormitory Authority of the State of New York (DASNY), Report on the Phase II and III Archaeological Investigations, The DASNY Site, 515 Broadway, Albany, Albany County, New York. **Project manager.** 2007-2009

DASNY, Phase IA Newing College Dormitory, State University at Binghamton, Broome County, New York. **Project manager.** 2008

DASNY, Phase IA Archaeological Survey, Chenango Countywide 911 Communications System Upgrade, Chenango County, New York. **Project manager.** 2007

Village of Barton, Cultural Resource Sensitivity Screening, Barton Village Sidewalk Study, Orleans County, Vermont. **Project manager.** 2005

Ammann & Whitney, and New York State Bridge Authority, Cultural Resource Services, Bear Mountain Bridge Cable Strengthening Study, Rockland and Westchester Counties, New York. **Project manager.** 2005

New York State Bridge Authority, Cultural Resource Services, Bear Mountain Bridge over Hudson River, Partial Strengthening of Southwest Backstay. **Project manager.** 2004

New York State Bridge Authority, Kingston-Rhinecliff Bridge, Public Outreach/Information Kiosk. **Principal investigator.** 2004

Luzerne County Engineer's Office, Plymouth/Breslau Bridge Replacement, Plymouth and Hanover Townships, Luzerne County, Pennsylvania, ER No. 88-0516-079. **Principal investigator.** 1994

Private Sector

Hershberg & Hershberg Consulting Engineers, Phase I-III Archaeological Investigations, Data Recovery Plan, Memorandum of Agreement and Compliance Consultation. Proposed Albany RV Project, Town of Latham, Albany County, New York. **Project manager.** 2006-present

Capital District Habitat for Humanity. Project manager. Multiple projects in the Albany Capital district. Tasks included construction monitoring for cultural resources and archaeological trenching to determine the presence of cultural resources. 2011-2013

CR Due Diligence Review, Proposed Warehouse, 2600 S. 98th Street, Edwardsville, Kansas. Project manager/principal investigator. 2012

Columbia Development Companies, LLC, Archaeological Investigations, Wellington Place Development, Albany, Albany County, New York. **Project manager.** Conducted Phase I archaeological survey and conducted monitoring of demolition and contaminated soil removal in archaeological sensitive areas leading to the discovery of seventeenth-century structural elements in vicinity of the former Fort Frederick in Albany New York. 2008-2010

Hershberg & Hershberg, Phase I Archaeological Sensitivity Assessment, Proposed Delaware Avenue Gateway Development, City of Albany, Albany County, New York. Project manager. 2011

Martin Environmental Group, Inc. Northampton Cell Tower Project, City of Northampton, Hampshire County, Massachusetts. Project manager. 2011

Columbia Redevelopment, Archaeological Monitoring, Proposed Wellington Place, Howard Street, City of Albany, Albany County, New York. Project manager. 2011.

Hershberg & Hershberg, Phase IA Archaeological Survey, Proposed Development Madison Avenue and Partridge Street, City of Albany, Albany County, New York. Project manager. 2011

College of St. Rose, Phase IA-II Archaeological Surveys, Proposed Development Madison Avenue and Partridge Street, City of Albany, Albany County, New York. Project manager. 2011

Blue H USA, LLC, Cultural Resource Services, Project Belinda Deepwater Platform for Wind Power, Massachusetts. **Project manager.** 2010

Columbia Development, Phase I Archaeological Survey, Proposed Development 40/50 New Scotland Avenue, Albany, Albany County, New York. **Project manager**. 2009

Chazen Companies, Phase I Archaeological Survey, Water Connection to Saratoga County Water Authority, Town and Village of Stillwater, Saratoga County, New York. **Project manager.** 2009-2012
Platform Realty Group, Phase IB and Phase II Archaeological Survey, Proposed Glass Works Village Project Area, Town of Guilderland, Albany County, New York. **Project manager.** 2008-2012

Outerzone, Ballston Spa, Phase IB / II/III Archaeology Surveys, Outerzone Project, Malta, Saratoga County, New York. **Project manager.** 2007-2011

Millbrook Venture, Additional Phase IB Archaeological Survey and Phase II Site Evaluation, Silo Ridge Resort Community, Dutchess County, New York. **Project manager/principal investigator.** 2006-2013

Silo Ridge Country Club, Phase IA/IB Archaeological Survey, Silo Ridge Resort Community, Dutchess County, New York. **Project manager/principal investigator.** 2006-2013

Hudson Heritage LLC, Phase IB Archaeological Survey, Hudson Heritage Park, Poughkeepsie, Dutchess County, New York. **Project manager/principal investigator.** 2004-2012

Hershberg & Hershberg, Phase IA/IB Archaeological Survey, Proposed Whitehall Road Condominiums, Albany County, New York. **Project manager.** 2007-2010

Chazen Companies, Phase IA Archaeological Survey, Sanitary Sewer Connection, Saratoga County Sewer District Project, Town and Village of Stillwater, Saratoga County, New York. **Project manager.** 2009

Quick Chek Corporation, Phase I Archaeological Survey, Proposed Quick Chek, Village of Goshen, Orange County, New York. **Project manager.** 2009

BBL Construction Services, LLC, Phase I Archaeological Survey, Siena College Residential Hall, Loudonville, Albany County, New York. **Project manager.** 2009

Town of Malta, Level One/Reconnaissance-Level Historic Survey, Town of Malta, Saratoga County, New York. **Project manager.** 2008-2009

Walgreen Company, Cultural Resource Consultation Services, Proposed Walgreen's Development Locations. **Project manager.** 2008-2009

Albany Partners LLC, Data Recovery Excavations, Reserve at Glenville – Site A09302.000139, Site A09302.000140, Site A09302.000141, and Site A09302.000142, Schenectady County, New York. **Project manager/principal investigator.** 2005-2009

Chazen Companies, Phase IA Archaeological Sensitivity Assessment Proposed Improvements, Newburgh Mall, Newburgh, Orange County, New York. **Project manager.** 2008

AngioDynamics, Inc., Phase I Archaeological Survey and Phase II Site Evaluation, AngioDynamics Proposed Office Building, Queensbury, Warren County, New York. **Project manager.** 2008

EBI Consulting, Phase IA Archaeological Survey, Proposed Cell Tower, Washington Hollow II, Pleasant Valley, Dutchess County, New York. **Project manager.** 2008

Columbia Development Companies, Phase I Archaeological Reconnaissance Survey, Proposed Redevelopment, New Scotland Avenue, Albany, Albany County, New York. **Project manager.** 2008

Rhode Island Airport Corporation, Phase I Cultural Resource Survey, Newport State Airport, Town of Middleton, Newport County, Rhode Island. **Project manager.** 2008

Columbia Development Companies, Photographic Documentation Services, Proposed Wellington Hotel Deconstruction, Albany, Albany County, New York. **Project manager.** 2008

Scannell Properties, Phase IA Archaeological Assessment, Proposed Federal Express Ground Albany Commerce, Albany, New York. **Project manager.** 2008

Capital District Habitat for Humanity, Pre-reconnaissance Survey, Albany South End Proposed Development, Albany County, New York. **Project manager.** 2008

Chazen Companies for New York State Office of General Services, Phase I Archaeological Reconnaissance Survey, Harriman State Office Campus, Albany, Albany County, New York. **Project manager.** 2008

Columbia Development Companies, Phase I Archaeological Reconnaissance Survey, Proposed Development, 22 New Scotland Avenue, Albany, Albany County, New York. **Project manager.** 2008

Columbia Development Companies, Phase I Archaeological Reconnaissance Survey, Proposed Development, 16 New Scotland Avenue, Albany, Albany County, New York. **Project manager.** 2008

Interfaith Partnership for the Homeless, Phase IA and Phase IB Archaeological Survey, New Construction, Sheridan Avenue, Albany, Albany County, New York. **Project manager.** 2008

Quick Check Corporation, Pre-reconnaissance Survey, Reed Road/NYS Rt. 17M, Monroe, Orange County, New York. **Project manager.** 2008

New London Road Associates, Inc., Phase IA Cultural Resource Survey, Hoffman Property, Albany County, New York. **Project manager.** 2008

EBI Consulting, Cultural Resource Services for Wireless Carriers, New England. **Contract and project management/principal investigator.** On-call contract for performance of cultural resource surveys in Massachusetts, New Hampshire, Vermont, Connecticut, Rhode Island, New York, and Maine. Archaeological desk reviews, archaeological resource assessment reports, and reconnaissance/intensive surveys have been conducted throughout Massachusetts, New Hampshire, Vermont, Connecticut, Rhode Island, and New York. 2006-2008

Cultural Resource Assessment, Winnipesaukee River Trail, Merrimack County, New Hampshire. **Project manager.** 2007

Quick Chek Corporation, Phase I Cultural Resource Survey, Quick Chek, East Main Street, Wallkill, Orange County, New York. **Project manager.** 2007

British American, Archaeological Monitoring, 1187-1201 Troy-Schenectady Road Project, Town of Colonie, Albany County, New York. **Project manager.** 2007

Quick Chek Corporation, Phase IA/IB Archaeology Survey, Quick Chek, 751-761 NYSH Route 211 East, Town of Wallkill, Orange County, New York. **Project manager.** 2007

Cultural Resource Screening, Rutland Area Trail, Rutland County, Vermont. **Project manager.** 2007

BBL Construction Phase IA/IB Archaeological Survey, Lia Toyota, 2116 Central Avenue, Town of Colonie, Albany County, New York. **Project manager.** 2007

Columbia Development Companies, Phase IA and Phase IB Archaeological Survey, 455-555 Patroon Creek Boulevard, Albany, County of Albany, New York. **Project manager.** 2007

Hershberg & Hershberg, Phase IA Archaeological Survey, 26 Main Street/20 North Street, Albany, Albany County, New York. **Project manager.** 2007

Public Archaeology Laboratory, Inc., Phase I Archaeological Survey, Steckman Ridge Project, Bedford County, Pennsylvania. **Project manager.** 2007

BBL Development Group, LLC, Pre-Reconnaissance Survey, Proposed Hotel Project, Verona, Oneida County, New York. **Project manager.** 2007

Office of Coastal Zone Management's Wetlands Restoration Program, Archaeological Reconnaissance Survey, Chequessett Yacht & Country Club Golf Course Redevelopment, Town of Wellfleet, Barnstable County, Massachusetts. **Project manager.** 2007

Forum Industries, Phase IA Archaeological Survey, Proposed Cottage Hill Landings, Rensselaer County, New York. **Project manager.** 2007

United Jewish Federation, Phase IA Archaeological Survey, Proposed United Jewish Federation Campus Center, Albany County, New York. **Project manager.** 2007

Harris A. Sanders, Architects PC, Phase I Archaeological Survey, Stephen Myers Affordable Housing Project, Albany, Albany County, New York. **Project manager.** 2006

Fitzgerald & Halliday, Inc., Archaeological Assessment Survey, Route 8 and Associated Local Roadway Improvements, Towns of Derby and Ansonia, New Haven County, Connecticut. **Project manager.** 2006

Peter Moore Associates, Phase IA Archaeological Survey, 250 Bowery, Borough of Manhattan, New York County, New York. **Project manager.** 2006

Albany Soma Project, LLC, Phase IA Archaeological Survey, Quackenbush Square Development City of Albany, Albany County, New York. **Project manager.** 2006

BBL Construction Services, LLC, Phase I Archaeological Survey, Hilton Garden Hotel, New Scotland Avenue and Holland Avenue, Albany, Albany County, New York. **Project manager.** 2006

Chazen Engineering & Land Surveying Co., PC, and the Kingston Regional Health Care System, Phase IA and IB Archaeological Survey, Woodland Pond at New Paltz, Village of New Paltz, Ulster County, New York. **Project manager.** 2005-2006

Dufresne-Henry, Saratoga Springs, Phase IA/IB Archaeological Survey, Floyd Bennett Memorial Airport, Queensbury, Warren County, New York. **Project manager.** 2004-2006

Kagyu Thubten Chöling Monastery, Sensitivity Assessment and Phase IA Archaeological Survey, Proposed Prayer Facility, Kagyu Thubten Chöling Monastery, Wappingers Falls, Dutchess County, New York. **Project manager/principal investigator.** 2005

Ensign-Bickford Realty Company, Reconnaissance Survey, The Powder Forest Remaining Lots, Simsbury, Hartford County, Connecticut. **Project manager/principal investigator.** 2005

Rhode Island Airport Corporation, Cultural Resource Services, Phase I Archaeological Survey, Eligibility and Effects Assessment, Block Island Airport Environmental Assessment, Washington County, Rhode Island. **Project manager/principal investigator.** 2005

Chazen Engineering & Land Surveying Co., PC, and Warren County, Phase IA and IB Archaeological Survey, Queensbury Industrial Park Subdivision, Warren County, New York. **Project manager/principal investigator.** 2005

Acquest Development Company, Phase IA and IB Archaeological Surveys, Grand Island Project Area, Bedell Road and Route 324, Grand Island, Erie County, New York. **Project manager/principal investigator.** 2005

Norstar Development USA, LP, Cultural Resource Assessment and Phase IB Survey, Arbor Hill IIIB, Albany, New York. **Project manager/principal investigator.** 2005

Ensign-Bickford Company, Phase I Archaeological Survey (Reconnaissance Survey), The Powder Forest Active Adult Community, Simsbury, Hartford County, Connecticut. **Project manager/principal investigator.** 2005

Fitzgerald & Halliday, Inc., Phase IA Archaeological Survey and Soils Investigation, DPH/DVA, Rocky Hill, Connecticut. **Project manager/principal investigator.** 2005

Chazen Companies, Phase IA/IB Archaeological Survey, Wappinger Central School District, Town of Wappinger, Dutchess County, New York. **Project manager/principal investigator.** 2005

Norstar Development USA, LP, Phase IA and IB Archaeological Survey, 733 Broadway, Albany, New York. **Project manager/principal investigator.** 2004

Sun Up Enterprises, Inc., Cultural Resource Consultation, The Woods at Cliffdale, Town of Poughkeepsie, Dutchess County, New York. **Project manager/principal investigator.** 2004

Millennium Partners, Archaeological/Historical Exhibit, Georgetown Incinerator Site, District of Columbia. Public education/outreach. Designed exhibit on findings of the historical and archaeological work at the Georgetown Incinerator Site. 2003

Norstar Development USA, LP, Phase IA/IB Archaeological Survey of Eleven Locations and Phase II Site Evaluation for Location 1, Arbor Hill Neighborhood Plan, Albany, New York. **Project manager/principal investigator.** 2003

Delaware Engineering, Additional Phase IB Archaeological Survey, Village of Fleischmanns, Alignment Shifts, Proposed Wastewater Treatment Facilities, Town of Middletown, Delaware County, New York. **Project manager/principal investigator.** 2003

Norstar Development USA, LP, Phase IA Archaeological Survey, Arbor Hill Neighborhood, Eleven Locations, Albany, New York. **Project manager/principal investigator.** 2002

Acquest Development Company, Phase II Archaeological Survey, Proposed Niagara Center, Buffalo, New York. **Project manager/principal investigator.** 2002

Columbia Development Companies, Phase II Archaeological Survey/Phase III Data Recovery, Proposed Albany Family Courts, Albany, New York. **Project manager/principal investigator.** 2002

Columbia Development Companies, Phase II Archaeological Survey, Proposed 677 Broadway Office Building Site, Albany, New York. **Project manager/principal investigator.** 2002

Rettew Engineering and Surveying PC, Phase IA and IB Archaeological Survey, Village of Fleischmanns, Proposed Wastewater Treatment Facilities, Town of Middletown, Delaware County, New York. **Project manager/principal investigator.** 2002

Westage Corporation and the Chazen Companies, Phase IA and IB Archaeological Survey, Westage Medical Development, Orange County, New York. **Project manager/principal investigator.** 2001

Transportation

National Cooperative Highway Research Program (NCHRP) 25-25 Task 79, Successful Practices for Effective Tribal Consultation. Project manager. Research study completed for the NCHRP and the American Association of State Highway and Transportation Officials Standing Committee on the Environment (SCOE). Research showcases findings regarding the most successful tribal consultation programs. The selected programs were analyzed to identify the guiding principles and practices most responsible for their success. The analysis identifies the common elements in working assumptions and activities that seem to make the greatest difference and highlights other elements for programs to consider adopting. The broad comparative discussion provides specific guidance for creating, establishing, and maintaining effective and successful consultation with Indian tribes in the context of surface transportation planning and project delivery.

Connecticut Department of Transportation (CTDOT), Cultural Resource Services. Contract manager. Three-year contract (2011-2014) to provide cultural resource services for project-specific studies for all phases of archaeological investigations and architectural resource surveys. Project examples include the following.

> Phase I Archaeological Reconnaissance Survey, Safety Improvements on Route 127 at Evers Street, State Project No. 15-335, Fairfield County, Connecticut. Phase I archaeological survey conducted in association with proposed roadway improvements to Route 127. 2013

Vermont Agency of Transportation (VTrans), Statewide Archaeological Consultant for the State of Vermont. **Contract manager.** Three-year contract (beginning 2009), which was renewed for an additional three years, to assist the VTrans Archaeology Officer in complying with Section 106 by performing archaeological background investigation, field studies, associated lab work, report write-up, and developing and implementing any necessary public outreach components. To date, 11 task orders have been received and are completed or presently underway. 2009-2015. Examples of completed projects include the following.

> Phase IB Archaeological Survey, Lunenburg NH CULV (27), US 2 Bridge No. 126, Over Hudson Brook, Town of Lunenburg, Essex County, Vermont.

> Phase I Archaeological Survey, Jericho Center Multimodal Connection, Jericho STP EH 12(10), Town of Jericho, Chittenden County, Vermont.

> Phase I Archaeological Survey, Proposed Pittsford-Brandon NH 019-3(494), Stormwater Pond, Towns of Pittsford and Brandon, Rutland County, Vermont.

Field Inspection, Proposed Pittsford-Brandon NH 019-3(494) Stormwater Pond, Towns of Pittsford and Brandon, Rutland County, Vermont.

New York State Education Department (NYSED)/New York State Department of Transportation (DOT), Cultural Resource Services. Contract manager. Two consecutive five-year contracts (2007-2012; 2012-2017) to provide cultural resource services primarily associated with NYS DOT Regions 8-11, but may also include other state agency undertakings. Task orders have been project-specific studies for all phases of archaeological investigations and architectural resource surveys. For the first contract (2007-2012) 28 task orders, including cultural resource reconnaissance surveys (archaeological and architectural), site examinations, data recovery plans, data recovery excavations, and architectural documentation were completed.

Cultural Resource Reconnaissance Survey, Site Examination, Data Recovery Plan, and Data Recovery Excavation, Shaker/Powell Hotel Site, Route 155 and Old Niskayuna Road Intersection Improvements, PIN 1132.15.101, Town of Colonie, Albany County, New York. Project manager and principal investigator.

Archaeological and Architectural Reconnaissance Survey, Gorham Street Bridge and Approach Removal, PIN 3805.50.101, Village of Waterloo, Seneca County, New York. Project manager and principal investigator.

Reconnaissance (Phase I) Survey, Republic Airport Development Aircraft Hangar, PIN 0903.55.101, Town of Babylon, Suffolk County, New York. Project manager and principal investigator.

Cultural Resource Reconnaissance Survey, Jericho Turnpike, PIN 0042.27.121, Towns of Huntington and Smithtown, Suffolk County, New York. Project manager and principal investigator. 2007-2012

New York State Thruway Authority/New York State Canal Corporation, Phase IB Archaeological Survey, Phase II Site Evaluation, Phase III Data Recovery Chuctanunda Terrace Site (A05740.000467), Amsterdam Pedestrian Bridge, Montgomery County, New York. Project manager/principal investigator. Conducted full range of archaeological investigations on a multi-component prehistoric and early to mid-nineteenth-century site along the Mohawk River in Amsterdam, New York. Assisted with the environmental assessment and other permitting documents for the project. 2010-2013

USACE New England, Review of Cultural Resource Investigations for Third-party Environmental Impact Statement and Preparation of Programmatic Agreement, South Coast Rail Project, Southeast Massachusetts. Cultural resource task manager. 2009-2013

Peninsula Corridor Joint Powers Board, Dumbarton Rail Corridor NEPA EIS/CEQA EIR, San Mateo and Alameda Counties, California. Cultural resources task manager. Prepared the cultural resource section for the joint NEPA/CEQA document and the DEIS/DEIR on a proposed 20-mile commuter rail extension across the southern portion of the San Francisco Bay. Also provided QA/QC review for the preparation of the cultural resource reports that formed the basis for the document sections referenced above. 2011-2012

Rhode Island Airport Corporation, Archaeological Survey, North Central State Airport, Town of Smithfield, Providence County, Rhode Island. **Project manager.** 2011

Rhode Island Airport Corporation, Phase I Reconnaissance Survey, Newport State Airport, Town of Middleton, Newport County, Rhode Island. **Project manager.** 2009

Massachusetts Bay Transportation Authority, Reconnaissance Level Cultural Resource Survey, Bridges, MBTA Contract No. B92PS09, Norfolk and Suffolk Counties, Massachusetts. **Project manager/principal investigator.** 2009-2013

A-N Consulting Engineers for the Connecticut DOT, Phase I Cultural Resource Survey, I-84 Intersection Improvements, New Haven County, Connecticut. **Project manager/principal investigator.** 2008

Fitzgerald & Halliday, Inc., for the Connecticut DOT, Archaeological Monitoring/Auger Testing Along Route 7 and Laurel Hill Cemetery, Fairfield County, Connecticut. **Project manager/principal investigator.** 2008

Berger, Lehman Associates PC, and the Connecticut DOT, Project No. 151-273, Reconstruction of I-84 Waterbury, New Haven County, Connecticut. **Project manager/principal investigator.** 2007

Gannett Fleming, Inc., and the Pennsylvania Department of Transportation (PennDOT), Engineering District 3-0, State Route 6015 Relocation and Improvements, Tioga County, Pennsylvania. **Contract manager/project manager and principal investigator.** Projects included the performance of background and site file research; site-specific historical research; Phase I, II, and III archaeological investigations; public outreach programming; geomorphological assessments; historic structure assessments; determinations of eligibility and effects; and a memorandum of agreement.. 1996-2004

PennDOT, *A Bridge to the Past: The Archaeology of the Mansfield Bridge Site* (with Robert D. Wall). **Public education/outreach.** Third volume in Byways to the Past Series. 2003

Gannett Fleming, Inc., and PennDOT, District 3-0, Merit Badge in Archaeology: Boy Scout Troop 21, Mansfield, Pennsylvania. **Principal investigator.** Served as Merit Badge Counselor and designed the merit badge program for Troop 21. Public outreach and education component of the Phase III Investigation of Site 36Ti116 associated with the State Route 6015 Relocation and Improvements, Tioga County, Pennsylvania. 2000

New Jersey DOT, The History & Technology of the Edison & Driscoll Bridge over the Raritan River, New Jersey. Public education/outreach. 1999

PennDOT, Engineering District 4-0, Phase I Survey, Phase II Evaluation, and Phase III Workplan, Wyalusing Creek Bridge Replacement, SR 0706, Rush Township, Susquehanna County, Pennsylvania. **Principal investigator.** 1994-1999

PennDOT, Statewide Open-End Contract for Cultural Resource Investigations, Harrisburg, Pennsylvania. **Principal investigator.** A sample of completed projects includes Ice Dam Bridge Replacement, SR 0029, Section 50S, Charlestown Township, Chester County, Pennsylvania; Determination of Eligibility, Proposed Stabilization, Stone Retaining Wall Along SR 611, Delaware Water Gap National Recreation Area, Monroe County; Proposed Bridge Replacement, SR 0030, Section B05, Independence Township, Beaver County; SR 0191, Section 670, Mill Creek Bridge at Haag's Mill, Dreher Township, Wayne County; Two Temporary Construction Areas, New Bethlehem Bridge Replacement, SR 0028, Section 150, Borough of New Bethlehem, Clarion County. 1994-1999

Vermont Agency of Transportation, Agreement for Statewide Archaeological Services. **Principal investigator.** Completed projects include Phase I survey/Phase II evaluation of Site VT-WD-167, Halifax BRZ 1442(18), Town of Halifax, Windham County; Phase I survey historical research for the Bethel F-022-1(18) and BRF-022-1(14), Town of Bethel, Windsor County; Phase I survey historical research for the Royalton BRS 0147(5), Town of Royalton, Windsor County. 1994-1999

Delaware DOT, Digging for Old Delaware: The Archaeology of Life in the 1700s. **Public education/outreach.** Designed the popular history. 1997

Delaware DOT, Thomas Dawson Site Public Outreach. **Public education/outreach.** Designed and created a brochure and two presentation boards on the history and archaeology of the Thomas Dawson Site located near

Dover, Delaware, as a component of a public outreach program associated with a Phase III data recovery project. 1997

Federal Highway Administration and New Jersey DOT, A Synthesis of the Trenton Archaeological Site Complex: The Abbott Farm Prehistoric Sites, Mercer County, Trenton, New Jersey. **Public education/outreach.** Assisted in the preparation of the Trenton Complex Archaeology Series volume. 1997

Federal Highway Administration and the New Jersey DOT, Stratified Sequence in the Lower Delaware Valley, Site 28ME1-D, Mercer County, Trenton, New Jersey. **Public education/outreach.** Assisted in the preparation of the Trenton Complex Archaeology Series volume prepared. 1997

Federal Highway Administration and New Jersey DOT, Historic Sites, Trenton Complex Archaeology: Report 12. **Project manager/principal investigator.** Prepared this volume of Trenton Complex Series using existing reports and incorporating new material based on additional research. 1997

New Jersey DOT, Raritan River Crossings Historic Context. **Principal investigator.** Preparation of the revised report in response to comments for the historic documentation of Raritan River crossings between Raritan Bay and New Brunswick. 1997

PennDOT, Engineering District 6-0, Proposed Wetland Replacement Plan, SR 6030, Section B03/B04, Associated with the Exton Bypass, Chester County, Pennsylvania, ER No. 83-1113-029. **Principal investigator.** 1994-1997

Federal Highway Administration and the New Jersey DOT, Middle and Late Woodland Occupations in the Delaware River Floodplain Site 28ME114 at Sturgeon Pond, State Route 29. **Public education/outreach.** Assisted in the preparation of the Trenton Complex Archaeology Series volume prepared. 1996

Consolidated Rail Corporation, Pennsylvania Clearance Improvement Project for Double-Stack Container Traffic, ER No. 93-4041-042. **Co-principal investigator.** 1994-1995

Additional Experience

City Archaeologist, Historic Preservation Management Division, City Planning and Development Department, Kansas City, Missouri. 1993-1994

Curator/Director, Archaeology Laboratory and Museum, Muhlenberg College, Allentown, Pennsylvania. 1981-1993

Principal Investigator/Archaeologist, Richard Grubb and Associates, Inc. 1990-1992

Advisory Board, Masters Program in Applied Archaeology, Indiana University of Pennsylvania. 2009-present

Adjunct Faculty, Rensselaer Polytechnic Institute, Troy, New York. Graduate-level course *Historical and Industrial Archaeology*, Master of Science program in Building Conservation. 2007

Adjunct Instructor of Anthropology, School of Science, Marist College, Poughkeepsie, New York. Required courses for the Anthropology minor both in a traditional classroom setting and online. 2003-2007

Adjunct Instructor, Behavioral and Social Sciences, Hudson Valley Community College, Troy, New York. Introduction to Anthropology course. 2003

Assistant Professor of Anthropology, Department of Anthropology, Dickinson College, Carlisle, Pennsylvania. Teaching the Introduction to Cultural Anthropology, World Prehistory, Prehistoric Cultures of North America, Archaeology, and Field Archaeology courses as well as supervising students engaged in Independent Research projects. 1992-1993

Lecturer in Anthropology, The Pennsylvania State University, Allentown, Pennsylvania. Teaching the Introduction to Cultural Anthropology course. 1991-1993

Lecturer in Anthropology, Department of Sociology and Anthropology, Muhlenberg College, Allentown, Pennsylvania. Teaching the Archaeology, Field Archaeology, Physical Anthropology, Language and Culture, and Anthropological Theory courses, as well as supervising students engaged in Independent Study and/or Independent Research projects. 1981-1993

Adjunct Faculty in Anthropology, Department of Sociology and Anthropology, Moravian College, Bethlehem, Pennsylvania. Teaching the Field Archaeology and Historical Archaeology courses. 1989- 1992

Instructor in Anthropology, Department of Anthropology, Bryn Mawr College, Bryn Mawr, Pennsylvania. Teaching the Senior Seminar in Archaeology and advising students preparing senior theses. 1990

Representative Publications

Transportation and Historic Preservation: Progress and Research (with Antony F. Opperman, Emily Pettis and Stephanie Stoermer). *TR News* 262:25-29. May-June 2009.

Approaching Relevance: Public Outreach and Education in CRM. *Northeast Anthropology* 72:33-41. Spring 2007 (published 2009).

Iroquois Pipeline Site 230-3-1: Lessons from a Hudson Valley Late Woodland Occupation (with H. Holt). *Bulletin of the Archaeological Society of Connecticut* 69:59-76. 2007.

Transportation Planning and Historic Preservation (with Charles H. LeeDecker). Natural Resources and Environment 17(2):80-82,114-116. 2002.

Scouting for Lessons: The Merit Badge Program at Site 36Ti116. *1st and 2nd Annual Conferences Byways to the Past: Proceedings*. Indiana University of Pennsylvania Archaeological Services. 2002.

Four Thousand Years of Tioga County Prehistory: The Mansfield Bridge Site Excavations (with Robert D. Wall). *1st and 2nd Annual Conferences Byways to the Past: Proceedings*. Indiana University of Pennsylvania Archaeological Services. 2002.

Earning a Merit Badge in Archaeology. *The SAA Archaeological Record* 1(1):28-29. 2001.

The Archaeology of the Village of Nain. *The James Burnside Bulletin of Research* 4(1 and 2):78-100. 1991.

The 1988-89 Archaeological Investigations of the 1841 Barn at Burnside Plantation: Artifact Analysis. *The James Burnside Bulletin of Research* 3(2):51-67. 1991.

Moravian Industry: The History and Archaeology of the Henry Tradition of Gunsmithing. Ph.D. dissertation, Department of Anthropology, Bryn Mawr College, Pennsylvania. 1991.

Lock, Stock and Barrel: The Henry Gunsmiths of Pennsylvania. *Bulletin of the American Society of Arms Collectors* 62:24-31. 1990.

The Fur Trade and the Boulton Gun Works: A Case Study of the Demand for Craft Technology. Master's thesis, Department of Anthropology, Bryn Mawr. 1988.

Papers and Presentations

Considering the Possibilities: Cultural Resource Management's Role in Heritage Education. Paper to be presented in the "Getting Back to Saving the Past for the Future: Heritage Education at a Professional Crossroads" symposium (organizer/moderator) at the 2014 Society for American Archaeology 79th Annual Meeting, Austin, Texas. April 2014.

Considering the Possibilities: Cultural Resource Management's Conversations with the Public. Poster to be presented in the session sponsored by the Committee on Historic and Archaeological Preservation in Transportation (ADC50) of the Transportation Research Board, held in Washington, DC. January 2014.

Social Media & Websites – What's Your Strategy? Session Moderator. American Cultural Resource Association Annual Meeting, Washington, DC. October 2013.

Making the Static Dynamic: Using Everyday Technology to Engage the Public (organizer/moderator).Transportation Research Board ADC50 Mid-Year Meeting), Sacramento, California. July 21-23, 2013.

Making the Static Dynamic: Using Everyday Technology to Engage the Public. Poster presented in the session sponsored by the Committee on Historic and Archaeological Preservation in Transportation (ADC50) of the Transportation Research Board, held in Washington, DC. January 2013

Powering the Past: Energy Development and Section 106 (organizer/moderator), Preservation Combination conference (Byways to the Past XIII, Heritage Partnership Conference XXXIV, and Transportation Research Board ADC50 Mid-Year Meeting), Lancaster, Pennsylvania. July 15-19, 2012

Archaeological Investigations at the Crossroads of Ancient and Historic Travel Corridors: The Amsterdam Pedestrian Bridge Project in New York State. Poster, co-created with Senior Field Supervisor Delland Gould and Field Supervisor/Draftsperson Rebecca Brodeur, presented in the session sponsored by the Committee on Historic and Archaeological Preservation in Transportation (ADC50) of the Transportation Research Board, held in Washington, DC. January 2011.

Using Archaeological and Geophysical Survey to Assist Transportation Improvement Planning: The East Haven Bridge Replacement Project in Essex County, Vermont. Poster, co-created with Senior Field Supervisor Delland Gould and Field Supervisor/Draftsperson Rebecca Brodeur, presented in the session sponsored by the Committee on Historic and Archaeological Preservation in Transportation (ADC50) of the Transportation Research Board, held in Washington, DC. January 2011.

The Who, wot, Where, When & hw: Considering the Possibilities 4 Public Outreach in CRM. Paper presented in the "Beyond the Brochure 2.0: Public Outreach in Cultural Resource Management" symposium (organizer/moderator) at the 2010 Society for American Archaeology 75th Annual Meeting, St. Louis, Missouri. April 2010.

At the Intersection of History: Revelations of a Touring Population at the Shaker/Powell Hotel Site. Poster, co-created with Senior Field Supervisor Delland Gould and Field Supervisor/Draftsperson Rebecca Brodeur, presented in the session sponsored by the Committee on Historic and Archaeological Preservation in Transportation (ADC50) of the Transportation Research Board, held in Washington, DC. January 2010.

Lessons from the Field: A Cultural Resource Primer for Utility Siting. Paper presented at the Edison Electric Institute Siting Conference in Burlington, Vermont. October 2009.

Alternative Mitigation Strategies. Symposium Organizer and Moderator. American Cultural Resource Association Annual Meeting, Providence, Rhode Island. September 2009.

Tourism on a Nineteenth-Century Byway: The Shaker/Powell Hotel site. Poster, co-created with Senior Field Supervisor Delland Gould and field Supervisor/Draftsperson Rebecca Brodeur, presented at the summer meeting of the Committee on Historic and Archaeological Preservation in Transportation (ADC50) of the Transportation Research Board, Sheridan, Wyoming. July 2009.

Cultural Resource Compliance: A Regional Perspective. Lecture presented for the Associated Industries of Vermont Meeting, Montpelier, Vermont. July 2009.

Cultural Resource Challenges with Transmission Line Siting, Permitting and Construction. Paper co-presented with Brian Connaughton of the Vermont Electric Power Company, Inc., at the Edison Electric Institute Siting Conference in Minneapolis, Minnesota. October 7, 2008.

Approaching Relevance: Public Outreach and Education in CRM. Paper presented in the "Public Archaeology and Education in Northeast Research and Compliance Projects" symposium at the 2007 Society for American Archaeology Annual Meeting, Austin, Texas. April 2007.

The Kingston Armory Site: Lessons of the Hudson Valley Archaic. Paper presented in the "Mission Possible! Cultural Resource Preservation Across the Army National Guard: Papers in Honor of Alan Wormser" symposium at the 2006 Society for American Archaeology Annual Meeting, San Juan, Puerto Rico. April 2006.

Historic, Architectural, Archaeological, and Cultural. Presentation at the "NEPA Back to Basics Training Course," Airports Consultants Council, San Antonio, Texas. May 2004, June 2003.

Forging Ahead: Building an Archaeological Education Initiative. Poster presented in the "Innovative Approaches to Public Outreach" poster session (served as session organizer) at the 2003 Society for American Archaeology Annual Meeting, Milwaukee, Wisconsin. April 2003.

Approaching Relevance in CRM: The Mansfield Bridge Site (with Robert Wall). Individually volunteered poster presentation in the "Archaeological Research Posters" session of the 2002 American Anthropological Association Annual Meeting, New Orleans. November 2002.

Lessons from the Field: A Public Outreach Primer. Invited paper presented in the "Archaeology and Public Involvement" session sponsored by the Committee on Historic and Archaeological Preservation in Transportation (A1F05), held in Kansas City, Missouri. July 2002.

Defining Activity Areas Using High-Resolution Data Recovery (with Robert Wall). Poster presentation in the "Cultural Resource Mitigation: New Ways of Looking at Old Things" session sponsored by the Committee on Historic and Archaeological Preservation in Transportation (A1F05), held in Washington, DC. January 2002.

Earning a Merit Badge in Archaeology: PennDOT and Troop 21. Poster presentation in the "Cultural Resources and Transportation: Outreach, Preservation, and Alternatives to Destruction" session sponsored by the Committee on Historic and Archaeological Preservation in Transportation (A1F05), held in Washington, DC. January 2001.

Archaeology and the Internet. "Armchair Archaeology: The Sequel." Invited Speaker. Bucks County Free Library, Doylestown, Pennsylvania. 1999.

Archaeologists do more than dig! "Armchair Archaeology." Invited Speaker. Bucks County Free Library, Doylestown, Pennsylvania. 1999.

A is for Archaeology: Public Outreach and Education in CRM. Invited paper presented in the session "Public Outreach in CRM" at the Middle Atlantic Archaeology Conference, Harrisburg, Pennsylvania. 1999.

The Eighteenth-Century Moravian Church Mission in Pennsylvania: The Village of Nain. Paper presented in the session "Public Archaeology in Pennsylvania" at the National Council on Public History Conference. 1993.

The Village of Nain. Workshop presented at the Eighth Annual *Workshops in Archaeology* at The State Museum of Pennsylvania, Harrisburg, Pennsylvania. 1992.

The Village of Nain. Paper presented at the 63rd Annual Meeting of the Society of Pennsylvania Archaeology, State College, Pennsylvania. 1992.

The Village of Nain: Moravians and Native Americans in 18th-Century Bethlehem, Pennsylvania. Paper presented at the Society for Historical Archaeology Annual Meeting, Kingston, Jamaica. 1992.

The Henry Gunsmiths of Pennsylvania. Paper presented at the American Society of Arms Collectors Meeting, Prescott, Arizona. May 1990.

Ideology and Industry: Moravianism and Small-Arms Production in 19th-Century Pennsylvania. Paper presented at the Society for Industrial Archaeology Annual Meeting, Quebec, Canada. 1989.

The Anthropology of Guns: Archaeology and Ethnohistory of a 19th-Century Pennsylvania Community. Paper presented at the Society for Historical Archaeology Annual Meeting, Reno, Nevada. 1988.

THE STATE OF NEW HAMPSHIRE
BEFORE THE
SITE EVALUATION COMMITTEE

DOCKET NO. 2010-

APPLICATION OF ATLANTIC WIND, LLC
FOR A CERTIFICATE OF SITE AND FACILITY

PREFILED DIRECT TESTIMONY OF ROBERT D. O'NEAL
ON BEHALF OF
ATLANTIC WIND, LLC

December 2, 2013

Qualifications

Q. Please state your name, position and business address.

A. My name is Robert O'Neal, INCE, CCM. I am a Principal at Epsilon Associates, Inc. ("Epsilon"). My business address is 3 Clock Tower Place, Maynard, Massachusetts.

Q. On whose behalf are you testifying?

A. I am testifying on behalf of Atlantic Wind, LLC ("Wild Meadows Wind" or "the Applicant").

Q. Please summarize your professional and educational background and experience.

A. I received a Bachelor of Arts degree in Engineering Science from Dartmouth College in 1983. I earned a Masters Degree in Atmospheric Science from Colorado State University in 1987. I am a Certified Consulting Meteorologist, and have over twenty-five years of experience in the areas of community noise impacts, meteorological data collection and analyses, and air quality modeling. My noise impact evaluation experience includes the design and implementation of sound level measurement programs, modeling of future impacts, conceptual mitigation analyses, and compliance testing. I am a member of the Institute of Noise Control Engineers (INCE), the Acoustical Society of America, the American Meteorological Society, and the Air & Waste Management Association.

From 1987 until 1997, I was employed by Tech Environmental, Inc. where I was a Project Manager responsible for noise impact assessments and air quality modeling studies. In 1997, I joined Earth Tech, Inc. as a Program Director. In that capacity, I was responsible for community noise studies for electric generating stations, as well as meteorological analyses, and air quality modeling. In 2000, I joined Epsilon Associates, Inc. as a Senior Consultant. In 2004, I became a Principal of the firm. My practice at Epsilon continues to focus on community noise impact assessments and meteorological analyses for power generation facilities in the Northeast, Mid-Atlantic region, the Midwest, and the Southwestern United States. Since 2004, my noise impact assessment work has focused on wind energy generation facilities. A copy of my resume is provided as Attachment A to this prefiled testimony.

Q. Please identify any regulatory proceedings in which you have testified.

A. I have testified in NH as an expert witness before the NH Site Evaluation Committee regarding noise issues for the 48 MW Groton Wind project and the 30 MW Antrim Wind project. I have testified in Massachusetts as an expert witness before the Energy Facilities Siting Board regarding noise issues for the NSTAR 345-kV 18-mile underground electric transmission line and substation project in the Boston metropolitan area, the 350 MW Billerica Energy Center, and the 350 MW Brockton Clean Energy Center. I have testified in Ontario Canada before the Environmental Review Tribunal regarding noise issues for the K2 Wind Ontario and Dufferin Wind projects. In addition, I have testified as an expert witness regarding: (1) a 735 MW wind turbine farm in the 42nd District Court of Texas; (2) a cogeneration power plant, hard rock quarry, and two sand and gravel excavation sites before the New York Department of Environmental Conservation; (3) solid waste transfer stations in Lowell, Marshfield, Oxford, and Holliston, MA; (4) a proposed sand and gravel pit, an existing concrete batch plant, and a proposed cross-dock distribution center before the Massachusetts Land Court; (5) several ski areas and a proposed sand and gravel excavation site before the Act 250 Commission in Vermont; and (6) construction of an asphalt plant before the Massachusetts Department of Environmental Protection.

Q. What is your involvement and responsibility with respect to the proposed Wild Meadows Wind Project?

A. As one of the environmental consultants for the Project, I have responsibility for evaluating and assessing the noise impacts associated with the operation of the proposed Wild Meadows Project.

<u>Purpose of Testimony</u>

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to address the potential noise impacts related to the Wild Meadows Wind Project and to convey the results of Epsilon's sound level assessment technical report which is contained in Appendix 50 to Wild Meadows Wind's Site Evaluation Committee ("SEC") Application. In addition, I performed a review of peer-reviewed and state empaneled studies of potential health effects of wind turbines as they relate to acoustics. A summary report is included as Attachment B.

Q. Are you familiar with the site of the proposed Wild Meadows Wind facility?

A. Yes. I have reviewed the site plans and discussed the Project with the developer. In addition, I visited the site to note potentially sensitive receptors in all directions around the wind farm that could be impacted by Project noise emissions. For general residential locations, we relied on a map prepared by Iberdrola Renewables which identified all residences within at least one mile of each wind turbine in every direction.

Q. Have you or persons under your supervision conducted any ambient sound studies in the vicinity of the Wild Meadows Wind Project?

A. Yes. Epsilon measured existing (ambient) sound levels at eight locations at representative locations around the Project site over a 2-week period in the summer of 2012 to establish background sound levels prior to operation of the proposed wind farm. Epsilon also measured existing sound levels at six locations around the Project site over a 3-week period in the winter of 2012-13. This was done in order to document existing sound levels in the community. The selection of the sound monitoring locations was intended to be representative of nearby residences in various directions from the wind farm. Figure 5-1 of Appendix 50 to the Application shows the proposed wind turbine locations overlaid upon an aerial photograph of the surrounding area, as well as the actual measurement locations, and the residences within one mile.

Concurrent sound level data, ground-level wind speed, upper level wind speed, and meteorological conditions were measured throughout the site area using ANSI S1.4-1983 Type 1 sound level instrumentation. The results of the ambient sound level program for summer and winter are summarized in Table 1. Area-wide equivalent sound levels (Leq) ranged from 32 to 38 dBA in the summer, and 30 to 41 dBA in the winter. Area-wide L90 sound levels ranged from 24 to 32 dBA in the summer, and 26 to 40 dBA in the winter.

Table 1 Summary of Ambient Sound Levels (July and December 2012)

Monitoring Location	Median L_{eq} (dBA)	Median L_{eq} (dBA)	Median L_{90} (dBA)	Median L_{90} (dBA)
	Summer	Winter	Summer	Winter
L1	32	30	25	26
L2	38	N/A	29	N/A
L3	33	33	25	31
L4	34	35	26	31
L5	32	32	25	27
L6	37	41	32	40
L8	36	N/A	29	N/A
L9	33	32	24	30

Q. Please describe the future sound level modeling analysis conducted for this Project.

A. Using software specifically designed for sound level modeling (Cadna/A), worst-case future sound levels from operation of the entire wind farm were calculated at all residences within at least one mile of every wind turbine. This software, which implements the ISO 9613-2 international standard for sound propagation (Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation), offers a refined set of computations accounting for local topography, ground attenuation, drop-off with distance, barrier shielding, and atmospheric absorption of sound from multiple sound sources. The ISO standard states:

> "This part of the ISO 9613 specifies an engineering method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources. The method predicts the equivalent continuous A-weighted sound pressure level…under meteorological conditions favorable to propagation from sources of known sound emission. These conditions are for downwind propagation…or, equivalently, propagation under a well-developed moderate ground-based temperature inversion, such as commonly occurs at night."

The ISO 9613 standard, as implemented through the Cadna/A software, is an internationally accepted standard used by acoustical professionals in the United States and abroad. This model has been accepted for sound level prediction of wind farms, and other sources, by State regulators in New Hampshire, Vermont, and Maine among nearby states. In fact, several jurisdictions explicitly require the use of the ISO 9613 standard in calculating future expected sound levels from wind turbines. Examples are the Ministry of the Environment, Ontario, Canada,[1] and Mason County, Michigan.[2]

Sound level modeling was done for a Vestas V112-3.3 wind turbine with a rated electrical output of 3.3 MW. Based on specifications provided by the manufacturer Vestas, the maximum sound power level from this wind turbine is 106.5 dBA at a wind speed of 7 m/s (or higher) at 10 meters above ground level (AGL) which corresponds to a wind speed of 10 m/s at hub height (94 meters AGL. Vestas notes that an uncertainty of 1 to 2 decibels (plus or minus) applies to each wind turbine. Therefore, each wind turbine at Wild Meadows was modeled at a worst-case sound emission level of 108.5 dBA (106.5 + 2). This is the sound level guaranteed by Vestas.

Q. Please summarize the results of your findings with respect to the Wild Meadows Wind Project.

A. Epsilon's findings and assessment are contained in a report entitled "Sound Level Assessment Report" dated November 20, 2013 and submitted with the Application as Appendix 50. The predicted worst-case sound levels from the Wild Meadows Wind Project will be at or below 40 dBA at all occupied residential structures. A review of Figure 6-1 shows that the closest structure within the site is a summer cottage owned by a participating landowner approximately 620 m (2035 feet) northwest of turbine C8 at the end of Golden Valley Road (receptor ID 53). Predicted sound levels at this location will be 45 dBA. There is a hunting cabin used occasionally by a participating landowner approximately 620 m (2035 feet) northeast of turbine G1

[1] "Noise Guidelines for Wind Farms", Ministry of the Environment, Ontario, Canada, October 2008.
[2] Mason County, MI Planning Commission, Section 17 70 "Noise Levels."

(receptor ID 204). Predicted sound levels here are 44 dBA. There are two abandoned structures on participating landowner property included in the model with sound levels between 41 and 42 dBA (receptor IDs 55 and 54). These are just west of receptor ID 53 and are not noise sensitive.

The closest non-participating residence is located approximately 810 m (2,650 feet) southwest of turbine C9 (receptor ID 178). Worst-case sound levels at this location are predicted to be 39 dBA. There is a structure at the end of Braley Road (receptor ID 63) approximately 1,164 meters (3,820 feet) northwest of turbine E8. Since much of Braley Road is posted "private" it was not possible to verify whether this structure was a residence. Therefore, to be safe, it was assumed to be a residence. Worst-case sound levels at this location are predicted to be 40 dBA. This is a perfect example of how conservative the ISO 9613 standard is since it includes simultaneous contributions from turbines in the "E" string (southeast wind), "G" string (southwest wind), and "N" string (northwest wind). This is physically impossible and thus the sound level at this location is overstated by several decibels. All other residences will be 39 dBA or less under worst-case operating conditions.

Q. Please describe the noise evaluation criteria and standards for the Project.

A. Typical noise evaluation criteria or guidelines relate to how much the Project changes sound levels over existing background (relative change), or by comparison to an absolute standard. There are no formal State of New Hampshire noise regulations applicable to a wind farm. However, in its certification of the Lempster Wind

Project, the NH SEC imposed several noise conditions set forth in the Project's Agreement with the Town of Lempster:

1. Audible sound from the project shall not exceed 55 dBA measured at 300 feet from any existing occupied building, or at the property line if the property line is less than 300 feet from an existing occupied building for non-participating landowners.
2. Sound pressure levels shall not be exceeded for more than 3 minutes in any hour of the day, for non-participating landowners.
3. If the existing ambient sound pressure level exceeds 55 dBA, the standard shall be ambient dBA plus 5 dBA.
4. Sound from the project immediately outside any residence of a non-participating homeowner shall be limited to the greater of 45 dBA or 5 dBA above the ambient sound level, for non-participating landowners.
5. These thresholds implemented via the Town of Lempster were modified by the NH SEC to a level of 45 dBA.

In addition, the NH SEC imposed noise conditions in its approval of the Groton Wind project:

1. Sound levels generated by the Project at the outside facades of homes should not exceed 55 dBA or 5 dBA greater than ambient, whichever is greater, in daytime and 45 dBA or 5 dBA greater than ambient, whichever is greater, at night.

2. Sound levels generated by the Project shall not exceed 40 dBA or 5 dBA greater than ambient, whichever is greater as measured within current boundaries of the Baker River Campground.
3. Any landowner may waive the noise restriction set forth in the SEC Certificate by signing a waiver of their rights, or by signing an agreement that contains provisions providing for a waiver of their rights.

Two other useful guidelines for putting sound levels into perspective are described below. One is the "Guideline for Community Noise" (World Health Organization, Geneva, 1999). This document states that daytime and evening outdoor living area sound levels at a residence should not exceed an L_{eq} of 55 dBA to prevent serious annoyance and an L_{eq} of 50 dBA to prevent moderate annoyance from a steady, continuous noise. At night, sound levels at the outside facades of the living spaces should not exceed an L_{eq} of 45 dBA, so that people may sleep with bedroom windows open.

The second useful guideline for comparing sound levels is the "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety" (U.S. Environmental Protection Agency, Office of Noise Abatement and Control, Washington, DC, 550/9-74-004, March 1974). This document, often referred to as the "Levels" document, identifies an L_{dn} of 55 dBA outdoors in residential areas as the maximum level below which no effects on public health and welfare occur due to interference with speech or other activities. This level includes a 10 dBA "penalty" for sound levels at night (10 p.m. to 7 a.m.). This level will permit normal speech communication, and would also protect against sleep interference inside a home with the windows open. A constant sound level of 48.6 dBA 24 hours per day would be equal to an L_{dn} of 55 dBA.

Sound levels due to wind turbine operation are expected to be equal to or less than 40 dBA at all year-round residences. These sound levels are expected to meet previously approved noise conditions from the NH SEC (limit of 45 dBA), the World Health Organization's 45-dBA nighttime guideline for residential locations, and the US EPA guideline of 48.6 dBA which is equal to an L_{dn} of 55 dBA. Therefore, the Wild Meadows Wind Project would easily meet the NH SEC noise criteria applied to the Lempster, NH and Groton, NH wind projects, as well as the referenced EPA and WHO guidelines.

Q. In your opinion, will the Wild Meadows Wind Project have an unreasonable adverse effect on public health and safety, specifically as the result of noise?

A. No. For additional discussion of this topic, please see Attachment B at the end of this testimony.

Does this conclude your testimony?

A. Yes, it does.

Attachment B

Summary of Health Impact Studies Related to Wind Turbine Acoustics

Q. Will the Wild Meadows Wind Project have an unreasonable adverse effect on public health and safety, specifically as the result of noise?

A. No. To reach this conclusion, I have reviewed many reports and/or studies conducted over the past several years. Conclusions from seven of these reports or findings are summarized below.

A Wind Turbine Health Impact Study was commissioned by the Massachusetts Department of Environmental Protection and the Massachusetts Department of Public Health (MA DEP & MA DPH, 2012). Among some of the findings were:

- There is insufficient evidence that the noise from wind turbines is directly (i.e., independent from an effect on annoyance or sleep) causing health problems or disease.
- Whether annoyance from wind turbines leads to sleep issues or stress has not been sufficiently quantified.
- Claims that infrasound from wind turbines directly impacts the vestibular system have not been demonstrated scientifically. Available evidence shows that the infrasound levels near wind turbines cannot impact the vestibular system.
- There is no evidence for a set of health effects, from exposure to wind turbines that could be characterized as a "Wind Turbine Syndrome."

A review of wind turbine noise and possible health effects was conducted by the head of the Maine Center for Disease Control (CDC) within the Department of Health and Human Services (DHHS), Dr. Dora Anne Mills (Maine CDC/DHHS, 2009). Dr. Mills concluded that there was "no evidence in peer-reviewed medical and public health literature of adverse health effects from the kinds of noise and vibrations heard by wind turbines other than occasional reports of annoyances, and these are mitigated or disappear with proper placement of the turbines from nearby residences."

A report was prepared by the Chief Medical Officer of Health (CMOH) of Ontario, Canada to examine this topic (CMOH, 2010). The CMOH concluded "…while some people living near wind turbines report symptoms such as dizziness, headaches, and sleep disturbance, the scientific evidence available to date does not demonstrate a direct causal link between wind turbine noise and adverse health effects. The sound level from wind turbines at common residential setbacks is not sufficient to cause hearing impairment or other direct health effects, although some people may find it annoying."

Another review of the literature was published by Knopper and Ollson in *Environmental Health* (Knopper, L.D. and C. A. Ollson, 2011). Their review looked for reported health effects from wind turbines, specifically in terms of both audible and subaudible sound, in both peer reviewed literature as well as the popular literature. They found that in peer reviewed studies "wind turbine annoyance has been statistically associated with wind turbine noise, but found to be more strongly related to visual impact, attitude to wind turbines and sensitivity to noise. To date, no peer reviewed articles demonstrate a direct casual link between people living in proximity to modern wind turbines, the noise they emit, and resulting physiological health effects….In the popular literature, self-reported health outcomes are related to distance from turbines and the claim is made that infrasound is the causative factor for the reported effects, even though sound pressure levels are not measured."

A comprehensive study was commissioned by the American Wind Energy Association (AWEA) and the Canadian Wind Energy Association (CanWEA) entitled "Wind Turbine Sound and Health Effects – An Expert Panel Review" (Colby et al, 2009). The three fundamental conclusions of the review were:

- There is no evidence that the audible or sub-audible sounds emitted by wind turbines have any direct adverse physiological effects.
- The ground-borne vibrations from wind turbines are too weak to be detected by, or to affect, humans.
- The sounds emitted by wind turbines are not unique. There is no reason to believe, based on the levels and the frequencies of the sounds and the panel's experience with sound exposures in occupational settings, that the sounds from wind turbines could plausibly have direct adverse health consequences.

A review of wind turbine noise and possible health effects was conducted by the head of the Maine Center for Disease Control (CDC) within the Department of Health and Human Services (DHHS), Dr. Dora Anne Mills (Maine CDC/DHHS, 2009). Dr. Mills concluded that there was "no evidence in peer-reviewed medical and public health literature of adverse health effects from the kinds of noise and vibrations heard by wind turbines other than occasional reports of annoyances, and these are mitigated or disappear with proper placement of the turbines from nearby residences."

The State of Oregon conducted a health impact assessment from wind energy development in Oregon, including effects from wind turbine noise (Oregon Health Authority, 2013). They examined many aspects besides noise, however, their key findings on noise-related health impacts were as follows:

- The perception of sound as noise is a subjective response that is influenced by factors related to the noise, the person, and the social/environmental setting. These factors result in considerable variability in how people perceive and respond to noise at the individual and community level
- A small number of epidemiological studies have linked wind turbine noise to increased annoyance, feelings of stress and irritation, sleep disturbance, and decreased quality of life. These studies have not identified positive associations between wind turbine noise and hypertension, cardiovascular disease, or other diseases
- Factors unrelated to noise may explain some of the annoyance reported in the few epidemiological studies of wind turbine noise. These factors include being able to see wind turbines from home, having a negative opinion about turbines, and self-reported sensitivity to noise.
- Wind turbine-generated infrasound (frequencies below 20 Hz) is below levels that can be perceived by humans.

The State Government in Victoria Australia recently compiled technical information on wind farms, sound and health (Department of Health, 2013). They concluded that "infrasound is audible when the sound levels are high enough…Infrasound from wind farms is at levels well below the hearing threshold and is therefore inaudible to neighboring residents. There is no evidence that sound which is at inaudible levels can have a physiological effect on the human body. This is the case for sound at any frequency, including infrasound."

References

1. CMOH, 2010. The Potential Health Impacts of Wind Turbines. Chief Medical Officer of Health (CMOH) Report, Ontario, Canada. May 2010.
2. Colby et al, 2009. Colby, David, M.D., Dobie, Robert, MD., Leventhall, Geoff, PhD., Lipscomb, David M. PhD.,McCunney, Robert J., M.D., Seilo, Michael T., PhD., Sondergaard, Bo, M.Sc. Wind Turbine Sound and Health Effects – An Expert Panel Review. December 2009.
3. Department of Health, 2013. Wind farms, sound and health – Technical Information. Department of Health, Victoria, Australia, April 2013.
4. Knopper, L.D. and C. A. Ollson, 2011. Health effects and wind turbines: A review of the literature. Environmental Health 2011, **10**:78.
5. MA DEP & MA DPH, 2012. Wind Turbine Health Impact Study: Report of Independent Expert Panel. Prepared for Massachusetts Department of Environmental Protection and Massachusetts Department of Public Health, January 2012.
6. Maine CDC/DHHS, 2009. Wind Turbine Neuro-Acoustical Issues. Dora Anne Mills, MD, MPH, Maine CDC/DHHS, June 2009.

7. Oregon Health Authority, 2013. Strategic Health Impact Assessment on Wind Energy Development in Oregon – Final Report. Public Health Division, Oregon Health Authority, March 2013.

ROBERT D. O'NEAL, CCM, INCE

PRINCIPAL

Epsilon ASSOCIATES INC.

EDUCATION

M.S., Atmospheric Science, Colorado State University, 1987
B.A., Engineering Science, Dartmouth College, 1983

REGISTRATIONS

Certified Consulting Meteorologist, #578

PROFESSIONAL SUMMARY

A Principal of the firm, Mr. O'Neal is a Certified Consulting Meteorologist with over 25 years experience in the areas of community noise impact assessments, meteorological data collection and analyses, and air quality modeling. Mr. O'Neal's noise impact evaluation experience includes design and implementation of sound level measurement programs, modeling of future impacts, conceptual mitigation analyses, and compliance testing. Rob has performed noise measurement and modeling assessments for wind energy and fossil-fuel power generation facilities in the Northeast, the Mid-Atlantic region, the Midwest, and the Southwestern U.S. Other industries served include hard rock quarries, aggregate handling, asphalt and concrete plants, C&D processing facilities, landfills, real estate development, and mobile sources. He has also provided expert witness testimony on noise impact studies and air pollution modeling in front of local boards, courts of law, and adjudicatory hearings. His air quality background involves applying air quality dispersion models for regulatory permitting applications, as well as for general air quality impact evaluations. He has experience with the CALMET/CALPUFF modeling system used to evaluate visibility and acid deposition impacts in Class I areas.

PROFESSIONAL EXPERIENCE

Wind Energy Projects

- *Iberdrola Renewables – Groton Wind, Groton, NH.* Developed an extensive sound level measurement and modeling program for a proposed 48 MW wind farm near Plymouth, NH. Concurrent sound level data and meteorological data were collected and analyzed. The results were presented as expert witness testimony at community open houses and during the Site Evaluation Committee public hearings.

- *Massachusetts Clean Energy Center – Research Study on Wind Turbine Acoustics.* The study includes measuring sound emissions from a variety of operating wind turbines in the Commonwealth of Massachusetts. Fieldwork includes measuring both the level and quality of sound emissions from operating wind turbines under various wind regimes and topography. To better understand how wind speed and wind direction vary over the turbine height, meteorological data are collected using on-site meteorological towers and LiDAR systems. Acoustical data are measured at various distances from the wind turbines and include broadband, one-third octave band, low frequency and infrasound, and interior/exterior sound levels.

- *Eolian Renewable Energy -- Antrim Wind, Antrim, NH*. Developed an extensive sound level measurement and modeling program for a proposed 30 MW wind farm in Antrim, NH. Concurrent sound level data and meteorological data were collected and analyzed. The results were presented as expert witness testimony at community open houses and during the NH Site Evaluation Committee public hearings.

- *FPL Energy – Horse Hollow Wind Energy Center, Taylor County, TX*. Developed and executed an extensive sound level measurement program for a 735 MW wind farm in Taylor County, TX. Concurrent sound level data, meteorological data, and wind turbine power output data were collected and analyzed. The results were used in legal proceedings as part of expert witness testimony in the case.

- *Pioneer Green Energy – Great Bay Wind, Somerset County, MD*. Developed an extensive sound level measurement and modeling program for a proposed 99 MW wind farm on the eastern shore of Maryland. Concurrent sound level data and meteorological data were collected and analyzed. The results were used in the state-level permit applications.

- *FPL Energy – Wolf Ridge Wind Farm, Cooke County, TX*. Developed and executed an extensive sound level measurement and modeling program for a proposed wind farm in Cooke County, TX. Concurrent sound level data and meteorological data were collected and analyzed. The results were used in legal proceedings as part of expert witness testimony in the case.

- *John Deere Renewables –Michigan Thumb I Wind Farm, Huron County, MI*. Developed and executed a long-term sound level measurement program for an existing 69 MW wind farm in Michigan to determine compliance with the local noise ordinance. Concurrent sound level data and meteorological data were collected and analyzed.

- *NextEra Energy Resources (formerly FPL Energy) – Low Frequency & Infrasound Study, TX*. Developed and executed a sound level measurement program as part of a scientific study to determine low frequency and infrasound levels from two types of wind turbines. Both interior and exterior data were compared to independent impact criteria for audibility, vibration, rattle, and annoyance. The study results were published in the peer-reviewed Noise Control Engineering Journal.

- *NextEra Energy Resources (formerly FPL Energy) – Ashtabula Wind Farm, Barnes County, ND*. Developed and executed a sound level measurement program for an existing wind farm in

North Dakota in response to noise complaints. Concurrent sound level data and meteorological data were collected and analyzed.

- *Gamesa Energy – Barton Chapel Wind Farm, Jack County, TX*. Developed an extensive sound level measurement and modeling program for a proposed 120 MW wind farm in Jack County, TX. Concurrent sound level data and meteorological data were collected and analyzed. The results were used in legal proceedings as part of expert witness testimony in the case.

- *TCI Renewables – Crown City Wind Farm, Cortland County, NY*. Developed an extensive sound level measurement and modeling program for a proposed 80 MW wind farm in central NY. Concurrent sound level data and meteorological data were collected and analyzed. The results were used in the state-level permit applications.

- *Babcock & Brown – Allegheny Ridge Wind Farm, Portage, PA*. Developed and executed a sound level measurement program for an 80 MW wind farm in Cambria and Blair Counties, PA. Concurrent sound level data, meteorological data, and wind turbine power output data were collected and analyzed. The results were used to demonstrate compliance with the noise standard of the Development Agreement with the local Township.

- *FPL Energy – Waymart Wind Farm L.P., Waymart, PA*. Managed the post-construction community noise study for a 65 MW wind turbine facility utilizing 43 GE 1.5 MW turbines. A compliance demonstration with the local noise ordinance was done utilizing the pre-construction ambient sound level data and the on-site meteorological data.

- *State of New Hampshire, Office of the Attorney General -- Lempster Mountain Wind Power Project, Lempster, NH*. Performed an independent review of a proposed 24 MW wind turbine farm. The applicant's noise impact analysis was evaluated and comments provided to the State of NH.

Independent Power Projects

- *Braintree Electric Light Department – Thomas A. Watson Generating Station, Braintree, MA*. Conducted long-term continuous ambient sound level measurement program for a proposed 105 MW natural gas and oil-fired simple-cycle electric power generation facility. Acoustical modeling, including several rounds of mitigation, was performed to demonstrate compliance with the State noise policy.

- *Montgomery Energy Billerica Power Partners -- Billerica Energy Center, Billerica, MA*. Worked on noise aspects for a proposed 350 MW natural gas and oil-fired simple-cycle electric power generation facility. Acoustical modeling, including several rounds of mitigation, was performed to demonstrate compliance with the State noise policy. Expert testimony on noise issues was presented to the Energy Facilities Siting Board.

- *Advanced Power Services – Brockton Power, Brockton, MA*. Conducted a 168-hour continuous ambient sound level measurement program at multiple sites for a proposed 350 MW natural gas-fired combined-cycle electric power generation facility. Acoustical modeling, including mitigation, was performed to demonstrate compliance with the State noise policy. Expert testimony on noise issues was presented to the Energy Facilities Siting Board.

- *Besicorp-Empire Development Company – Rensselaer, NY*. Prepared interrogatory responses, and testimony for the Noise section of the Article X application for this proposed 505 MW combined-cycle gas-fired electric power generation facility, recycled newsprint manufacturing plant, and waste water treatment plant. Additional testimony was provided for Technical Conference hearings before a NYS DEC Administrative Law Judge.

- *Cornell University, Ithaca, NY*. Prepared a sound level impact assessment report for the NY SEQRA process and Article VII natural gas pipeline application for this proposed 30 MW combined heat and power generation facility.

- *Milford Power Co., LLC – Milford, CT*. Conducted post-construction ambient sound level measurements for a 544 MW combined-cycle gas-fired electric generating facility. The project utilizes two Alstom GT-24 combustion turbines, one steam turbine, and an 8-cell wet mechanical cooling tower. High-pressure steam blows and transformer noise were also measured during construction and assessed for community impacts.

- *FPL Energy – Jamaica Bay Peaking Facility, Far Rockaway, NY*. Managed the noise impact study as part of an Environmental Assessment for a 50 MW natural gas-fired peaking plant utilizing two P&W combustion turbines. A compliance demonstration with the local noise ordinance was done utilizing the ambient background data and acoustical modeling. Follow-up noise monitoring was done to evaluate vendor performance specifications.

- *FPL Energy – Bayswater Peaking Facility, Far Rockaway, NY*. Managed the noise impact study as part of an Environmental Assessment for a 55 MW natural gas-fired peaking plant utilizing two P&W combustion turbines. A compliance demonstration with the local noise ordinance was done utilizing the ambient background data and acoustical modeling.

Linear Siting and Transmission Projects

- *NSTAR 345 kV Transmission Reliability Project, Stoughton, Canton, Milton, Boston, MA*: Responsible for noise impact assessment for this proposed 18 mile multi-circuit underground 345 kV project. Construction noise impacts along the route and operational noise from substations in Hyde Park and South Boston were analyzed. Expert testimony before the EFSB was provided.

- *Weaver's Cove Energy, Fall River, MA*. Managed the implementation of an extensive existing condition sound level measurement program. Long-term continuous and short-term measurements were taken at multiple locations around a proposed liquefied natural gas (LNG) import terminal. Expected future sound level impacts from operation of the LNG import terminal were calculated. In addition, community sound level impacts from an associated 2.5 million yd^3 dredging project in the adjacent channel were evaluated. The FERC Resource Report 9 section on noise impacts was prepared.

Industrial/Commercial Projects

- *General Electric Company, Hudson River PCBs Superfund Site, Hudson River, NY*. Prepared the Noise Impact Assessment for dredging, processing, and construction activities associated with Phase 1 of the Final Design Report. Source-specific sound level measurements of key sources were also made. Sound level monitoring was done during Phase 1 dredging and processing of the sediment to determine compliance with the Quality of Life Performance Standards.

- *Former Coal Tar Gasification Facility, Island End River, Everett, MA*. Managed an extensive sound level measurement program prior to and during a dredging operation. An existing condition measurement program over multiple seasons was conducted for one-week intensive periods. A measurement program during a 10-day pilot study was carried out to determine key sources of dredge noise within the community. Sound level monitoring was also conducted throughout the remediation work program itself. This work was coordinated with the land-based and water-based parties on the remediation team.

- *Environmental Soil Management, Inc., Loudon, NH*. An extensive sound level measurement program was conducted for a thermal soil treatment plant in response to community noise complaints. Simultaneous overnight measurements were made at multiple locations with and without the plant operating to identify the possible sources of area noise. Digital audio tape recordings were collected and presented at the local zoning board meeting to demonstrate the low noise levels. Follow-up measurements were made to satisfy decibel limits imposed by the board in order to allow 24-hour per day operations.

- *Gordon Food Service, Brighton, MI*. Noise impacts from loading dock activity, truck traffic, yard dogs, and rooftop mechanical equipment were analyzed as part of the local approval process for a 170,000 square foot regional distribution center in Michigan. Detailed existing condition sound level measurements were made and future operational impacts modeled.

- *Eastman Gelatine Corp., Peabody, MA*. A detailed sound level measurement program was performed to identify sources of community noise concerns around an existing manufacturing facility. Long-term continuous broadband and short-term narrow band sound level measurements were collected around the site. The narrow-band measurements allowed the annoying sources of noise to be identified and a mitigation program to be established.

- *The Home Depot, Sutton, MA*. Ambient sound level measurements, noise modeling, and air quality modeling were conducted to evaluate the potential noise impacts from the operation of a new 24-hour per day 200-dock regional distribution center. The primary sources included the delivery trucks and yard dogs. Expert testimony on air quality and noise impacts were presented in Massachusetts Land Court.

- *The Stop & Shop Supermarket Company, Freetown, MA*. Noise impacts from loading dock activity, truck traffic, and rooftop mechanical equipment were analyzed as part of the local approval process for a 1,500,000 square foot regional distribution center in Freetown. The results of the study were presented to the neighborhood in a series of meetings.

Rock Quarries

- *A. Colarusso & Son., Inc., Hudson, NY*. A sound level impact analysis was performed for a proposed rock quarry expansion at a site in Columbia County in support of the NYS DEC Mined Land Reclamation Permit and SEQRA process. Ambient background sound level measurements were collected around the site. Project-specific impacts of the excavation and haul equipment were measured at an existing excavation site and were used to calculate future sound level impacts.

- *Aggregate Industries, Peabody, MA*. A Noise Management Plan was developed as part of the Special Permit requirements at this site. A method of correlating noise complaints with meteorological conditions were set-up. In addition, a series of Best Management Practices for noise reduction were implemented. An extensive community sound level monitoring program was developed and implemented. Mitigation measures to reduce noise from the quarry were designed and presented to city officials and the neighborhood.

- *Paquette Pit, Center Harbor, NH*. A sound level impact analysis on rock-crushing and processing equipment, and electrical generators was conducted for a proposed quarry. The results were submitted to the Planning Board.

- *A.A. Wills Materials, Inc., Freetown, MA*. Ambient sound level measurements were conducted at residential locations around an existing 105-acre hard rock quarry along Route 140. Four days of continuous measurements were made with and without the quarry operating to determine the impact of the operations on ambient sound levels in the neighborhood.

Sand & Gravel Operations

- *Okemo Mountain Resort, Ludlow, VT*. A sound level impact analysis was performed for a proposed sand and gravel excavation site in Ludlow. Ambient background sound level measurements were collected around the site. Project-specific impacts of the excavation and haul equipment were used to model future sound levels from operation of gravel extraction. Expert testimony on noise impacts was presented before the Act 250 District Environmental Commission and the local review board.

- *Dalrymple Gravel & Contracting Co., Inc., Erwin, NY*. A sound level impact analysis was performed for a proposed sand and gravel excavation site ("Scudder Mine") at a site in Steuben County in support of the NYS DEC Mined Land Reclamation Permit and SEQRA process. Ambient background sound level measurements were collected around the site. Project-specific impacts of the excavation and haul equipment were measured at an existing excavation site and were used to calculate future sound level impacts. Expert testimony on noise impacts was presented before a NYS Administrative Law Judge.

- *Palumbo Block Co., Inc., Ancram, NY*. A sound level impact analysis was performed for a proposed sand and gravel excavation site ("Neer Mine") in Columbia County in support of the NYS DEC Mined Land Reclamation Permit process. Ambient background sound level measurements were collected around the site. Project-specific impacts of the excavation and haul equipment were measured at existing excavation sites and used to calculate future sound level impacts. Expert testimony on noise impacts was presented before a NYS Administrative Law Judge.

- *Newport Sand & Gravel, Goshen, NH*. A sound level impact analysis was performed for a proposed 68-acre sand and gravel excavation site along Route 10 in Goshen. Ambient background sound level measurements were collected around the site. Project-specific impacts of the excavation and haul equipment were measured at existing excavation sites and used to calculate future sound level impacts. The results of this work were presented to the local Zoning Board of Appeals.

- *Morse Sand & Gravel, Lakeville, MA*. A sound level impact analysis was performed for an existing concrete batch plant. Ambient background and operational sound level measurements were collected around the site. A mitigation program was designed and the effectiveness of various noise control options were tested. The results of this work were presented as expert witness testimony in Massachusetts Land Court in Boston.

- *Ambrose Brothers, Inc., Sandwich, NH*. A sound level measurement program was performed for an existing sand and gravel excavation site in Sandwich. A future sound level measurement program will be conducted upon the opening of a new phase of the operation to determine the sound level change due to equipment relocation.

- *Granite State Concrete, Inc., Lyndeborough/New Boston/Mont Vernon, NH*. A sound level impact analysis was performed for a proposed 39-acre expansion of an existing sand and gravel excavation site in Lyndeborough. Ambient background sound level measurements were collected around the site. Project-specific impacts of the excavation and haul equipment were measured at the existing excavation site and used to calculate future sound level impacts. The results of this work were presented to the local Zoning Board of Appeals.

Asphalt Plants

- *Massachusetts Broken Stone Company, Berlin, MA*. Performed an ambient hydrogen sulfide (H_2S) and meteorological monitoring program at an existing hot mix asphalt plant. Continuous measurements were made of H_2S, wind speed, and wind direction to determine if the facility may be a source of odor in the area.

- *Tilcon Capaldi, Inc., Watertown and Weymouth, MA*. Air quality impacts from two asphalt-batching plants were evaluated based on best management practices and dispersion modeling. Both fugitive sources from materials handling and ducted combustion sources were reviewed and mitigation measures were recommended. Expert testimony was provided on matters before the MA DEP and abutters of the plants.

Transfer Stations/Landfills

- *Confidential Client, ME.* Project manager for an ambient air quality monitoring plan submitted to ME DEP for two existing landfills as part of the landfill gas and odor management system. CALMET meteorological modeling and CALPUFF dispersion modeling were used to specify the continuous hydrogen sulfide (H_2S) monitoring locations and appropriate H_2S Action Levels.

- *Wood Recycling, Inc., Southbridge, MA*. Prepared an ambient air quality monitoring plan for the existing Southbridge Landfill as part of the landfill gas and odor management requirements. MA DEP approval was obtained for the sampling locations and equipment specifications of three fixed hydrogen sulfide (H_2S) monitoring systems and an on-site meteorological station. Dispersion modeling was used to specify the appropriate detection limits for the H_2S equipment.

- *Pine Tree Waste, Inc., Westbrook, ME*. Prepared a noise impact assessment for a proposed construction & demolition transfer station and processing facility. This project involved calculation of expected operational noise impacts from the processing equipment, a compliance evaluation with State and local noise regulations, and testimony before the local Planning Board.

- *Holliston Transfer Station, Holliston, MA*. Prepared a noise impact assessment for an existing C&D and MSW transfer station in Holliston, MA. This project involved ambient background noise monitoring at sensitive receptors around the site, a compliance evaluation with State and local noise regulations, and expert testimony before the Board of Health during the site assignment hearings.

- *Resource Recovery of Cape Cod, Sandwich, MA*. Prepared a noise impact and mitigation assessment for an existing 600-ton/day construction & demolition transfer station on Cape Cod. This project involved extensive ambient background noise monitoring at sensitive receptors around the site, calculation of expected operational noise impacts from the processing equipment, a compliance evaluation with State noise regulations, and mitigation calculations.

- *Valley Mill Corp., Pittsfield, MA*. Prepared a noise impact assessment for a proposed 250-ton/day C&D transfer station in Pittsfield. This project involved ambient background noise monitoring at sensitive receptors around the site, calculation of expected operational noise impacts from the processing equipment, and a compliance evaluation with State noise regulations.

- *WSI, Oxford, MA*. Prepared a noise impact assessment for a proposed 750-ton/day C&D and MSW transfer station in Oxford, MA. This project involved ambient background noise monitoring at sensitive receptors around the site, calculation of expected operational noise impacts from the processing equipment, a compliance evaluation with State noise regulations, and expert testimony before the Board of Health during the site assignment hearings.

EXPERT TESTIMONY EXPERIENCE

Expert witness before the Environmental Review Tribunal, Ontario, Canada on noise issues for Dufferin Wind Power [Case ERT 13-070 to 13-075, Bovaird v. Director, Ministry of the Environment].

Expert witness before the Environmental Review Tribunal, Ontario, Canada on noise issues for K2 Wind Ontario, Inc. [Case ERT 13-097 to 13-098, Drennan v. Director, Ministry of the Environment].

Expert witness before the NH Site Evaluation Committee on noise issues for the 30 MW Antrim Wind Project (2012); 48 MW Groton Wind project (2010).

Expert witness before the MA Energy Facilities Siting Board on noise issues for: 18-mile underground electric transmission line and substation project in the Boston Metropolitan area (2004-2005); Billerica Energy Center power plant (2007); Brockton Clean Energy (2008-2009).

Expert witness in Vermont Act 250 Land Use proceedings on noise issues for a proposed sand and gravel excavation site at Okemo Mountain (2007).

Expert witness in the 42nd District Court of Texas on noise issues for a 735 MW wind turbine farm (2006).

Expert witness before NY DEC Administrative Law Judge on noise issues for a hard rock quarry facility (1997), two sand and gravel excavation sites (2001; 2003), and a cogeneration power plant (2003).

Expert witness for site assignment hearings on noise issues from solid waste transfer stations in Lowell, MA (1998); Marshfield, MA (1999); Holliston, MA (2004); Oxford, MA (2006).

Expert witness in Massachusetts Land Court on noise issues for a proposed sand and gravel pit (1991), a proposed cross-dock distribution center (2002), and an existing concrete batch plant (2005).

Expert witness in Vermont Act 250 Land Use process for air quality impacts at ski areas (1991; 1992; 1997).

Expert witness before MA DEP Administrative Law Judge for an asphalt plant in Boston (1996).

Expert witness before municipal boards on issues of air pollution and noise impacts from local industries (many years).

Invited specialty speaker on noise impact assessments for Boston University's Masters of Urban Planning degree program (1994; 1996).

PROFESSIONAL ORGANIZATIONS

American Meteorological Society - Certified Consulting Meteorologist #578
Air and Waste Management Association
Institute of Noise Control Engineers (INCE)
Acoustical Society of America

PUBLICATIONS

O'Neal, R.D., Hellweg, Jr., R.D. and R. M. Lampeter, 2011. Low frequency sound and infrasound from wind turbines. Noise Control Engineering Journal, **59** (2), 135-157.

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O'Neal, R.D., 1991: Predicting potential sound levels: A case study in an urban area. Journal of the Air & Waste Management Association, **41**, 1355-1359.

McKee, T.B. and R.D. O'Neal, 1989: The role of valley geometry and energy budget in the formation of nocturnal valley winds. Journal of Applied Meteorology, **28**, 445-456.

CONFERENCE PRESENTATIONS

O'Neal, R.D. Lampeter, R.M., Emil, C.B. and B.A. Gallant. Evaluating and controlling noise from a metal shredder system. Presented at INTER-NOISE 2012, NY, NY, August 19-22, 2012.

O'Neal, R.D., 2011. Wind Turbine sound Levels: The Michigan I, Huron County, MI Study. Presented at Great Lakes Wind Collaborative 4th Annual Meeting, Ypsilanti, MI.

O'Neal, R.D., Hellweg, Jr., R.D. and R. M. Lampeter, 2011. Low frequency sound and infrasound from wind turbines. Presented at WINDPOWER 2011, Anaheim, CA.

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O'Neal, R.D., and R.M. Lampeter, 2009: Sound from Wind Turbines: A Key Factor in Siting a Wind Farm. 12th Annual Energy & Environment Conference – EUEC 2009, Phoenix, AZ, February 2, 2009.

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Hendrick, E.M., and R.D. O'Neal, 2001: A Case Study of Class I Impacts Using CALPUFF Screen. Proceedings of the Air & Waste Management Association Guideline On Air Quality Models: A New Beginning, Newport, RI, April 2001.

O'Neal, R.D., 1994: Indoor air sampling techniques used to meet workplace and ambient air toxic detection requirements. Proceedings of the Air & Waste Management Association 87th Annual Meeting and Exhibition, Cincinnati, OH, June 19-24.

O'Neal, R.D., 1992: Estimating future noise levels from industrial noise sources. Acoustical Society of America 124th Meeting, New Orleans, LA, October 31 - November 4.

O'Neal, R.D., 1991: Temporal traffic fluctuations and their impact on modeled peak eight-hour carbon monoxide concentrations. Proceedings of the Air & Waste Management Association 84th Annual Meeting and Exhibition, Vancouver, B.C., June 16-21.

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THE STATE OF NEW HAMPSHIRE
BEFORE THE
NEW HAMPSHIRE
SITE EVALUATION COMMITTEE

DOCKET NO. 2013-__

APPLICATION OF ATLANTIC WIND, LLC
FOR A CERTIFICATE OF SITE AND FACILITY

PREFILED DIRECT TESTIMONY OF NEIL B. NIMAN
ON BEHALF OF
ATLANTIC WIND, LLC

December, 2013

Qualifications

Q. Please state your name and business address.

A. My name is Neil B. Niman, Department of Economics, Peter T. Paul College, University of New Hampshire, 10 Garrison Ave. Durham, NH 03824

Q. Who is your current employer and what position do you hold?

A. I am currently the Chair of the Department of Economics at the University of New Hampshire.

Q. What are your background and qualifications?

A. I have been a member of the faculty in the Department of Economics since 1985. I was awarded a Bachelor's Degree in Economics from the University of California, Santa Cruz in 1978. I earned a Master's Degree in Economics from the University of California, Riverside in 1980. I was awarded a Ph.D. in Economics from the University of Texas at Austin in 1985.

Prior to my retirement from public service in 2011, I was a member of the Durham Town Council for 9 years having served as Council Chair for 4 years, Chair Pro Tem for 2 years and as a regular member for 3 years. During my time on the Durham Town Council I was part of a master plan process, the rewriting of the town's zoning ordinances and was involved in a number of issues dealing with economic development and the preservation of natural resources.

Since leaving public service, I have served as a consultant to the Town of Exeter in their effort to arrive at an agreement with the Town of Stratham with respect to the pricing of water and wastewater, the NH Realtors Association in their efforts to understand the effect of state budget cuts on real estate prices, Sora Development and their efforts to undertake a $63 million dollar mixed use real estate development in partnership with UNH and the Town of Durham. Most recently, I submitted an amicus brief to the U.S. Supreme Court in support of a writ of certiorari the case of Overstock.com and Amazon.com vs. the New York State Department of Taxation and Finance.

<u>Purpose of Testimony and Overview of the Project</u>

Q What is the purpose of your testimony?

A. I have been retained by Iberdrola Renewables to study and quantify the estimated economic impact of the Wild Meadows Wind Farm. Using IMPLAN multipliers, the JEDI spreadsheet tool, proprietary data provided by the company, and the extensive experience gleaned from two previous projects here in the State of NH.

Q What are the results of your study?

A. The study estimates the expected economic impact of the Wild Meadows Project. Looking at the construction phase, the project is likely to create 404 full time equivalent jobs, $21.7 million dollars in earnings and $42.35 million dollars of increased economic activity. During the operational phase of the project (the twenty years covering the life of the project) annual impacts are likely to be the equivalent of 13 full time jobs, $770,000 in annual earnings, and $2.31 million dollars of increased economic activity.

In addition to the benefits to the local region and the entire State of New Hampshire, the benefits to the host communities Alexandria and Danbury are substantial. Both are small rural communities with little commercial development and as a result, a high property tax burden for residential property owners. The Wild Meadows project will help to expand the commercial tax base for these host communities without requiring any significant increase in the provision of municipal services. It will make possible a reduction in local property taxes or an increase in municipal services that will, in all likelihood, increase the attractiveness of these communities.

In summary, the Wild Meadows project will create high paying jobs in the State of NH. It will bring capital into the state and stimulate economic activity. It is taking land that would otherwise most likely not be used for commercial development and generate a stream of payments that could be used to offset the high property taxes in the host communities.

Q Can you describe the methodologies and models used in your analysis?

A. A common methodology that is generally used to evaluate the regional economic impact of a project is to develop an input-output model. Spending that enters a local economy will lead to additional spending as purchases made it one business lead to further purchasing activity at another. In this way it is said that the initial spending is multiplied within the economy. As a result, the total impact of a project in terms of spending, income generation and economic activity is often greater than the level of initial expenditures. Input-output models track and calculate these various effects. Within the model, multipliers are used to create a measure of the likely increases in spending that will take place in the local economy for each dollar spent on a project.

To evaluate the economic impacts of the proposed Wild Meadows Project, I used modeling software and data available from the IMPLAN group. To better track the specific expenditures associated with a wind energy project, I used the JEDI (Jobs and Economic Development Impact) Spreadsheet Tool provided by the National Renewable Energy Laboratory (NREL). NREL provides a number of different tools that can be used to evaluate the economic impact of different types of renewable energy sources.

Based on the data associated with a number of wind energy projects, NREL constructed the tool and populated it with default values that are consistent with a generic wind project. While the JEDI Tool contains a series of values that can create a fairly reasonable approximation of the values associated with the economic impact of a generic wind project, I was able to use proprietary data provided by Iberdrola. This enabled me to generate a more robust result that takes into account the special characteristics of the project and the State of NH. The numbers in the internal cost models provided by

Iberdrola showed significantly lower turbine costs while incorporating substantially higher construction and labor costs, than what exists in the default settings associated with a generic project. Part of this can be attributed to the higher prevailing wages that exists in NH and part can be attributed to the fact that the project is being sited on a ridgeline as opposed to flat land found on a plains. Thus the multiplier effects generated after customizing the values were substantially higher than indicated by the default model.

A number of projects throughout the United States have used the JEDI spreadsheet tool to estimate economic impacts with good results. Moreover, when used appropriately, the Environmental Protection Agency of the U.S. Government has recommended its use. That being said, tools such as JEDI are only as effective as the underlying multipliers that are used in conjunction with the data that is entered into any model. The IMPLAN multipliers have been used in a wide variety of studies both here in NH and across the U.S. Studies have revealed that the IMPLAN multipliers are as effective in estimating economic activity as other regional multiplier approaches and econometric models.

Q What effect might the Wild Meadows project have on housing prices?

A. With respect to the impact on housing prices, the most recent study (August 2013) tracking over 50,000 real estate transactions reaffirmed previous studies that showed no statistically significant impact of wind facilities on housing values. While much anecdotal evidence suggests that fear of potential negative impacts during the announcement and pre-construction phase of a project has a negative impact on real estate prices, hedonic studies where a large number of post-construction transactions exist, indicate that there is no negative impact on real estate values. That being said, what all of these studies fail to take into account is the fact that when development takes place on private land, those owners have rights to develop their land. Hence when looking at the potential impact of development, the appropriate comparison is not development versus virgin untouched land, but rather, the proposed project relative to the next best permitted use of the land. Unless a parcel of land is own by the State or Federal government, or its development rights have been purchased and the land has been placed in conservation, the owner holds certain rights that can be exercised within the parameters set by local zoning ordinances. Hence it may be possible to envision an alternate development project that may have significant negative impacts, particularly when compared to a wind project.

Q. Does this conclude your testimony?

A. Yes.

Neil B. Niman
Curriculum Vitae

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Education:

Ph.D. University of Texas at Austin, *Economics*, 1985
B.A. University of California, Santa Cruz, *Economics and Modern Society and Social Thought*, 1978

Dissertation Title: *The Economics of Technological Advances in the Transactions Mechanism*

Employment:

2010 -	Chair, Department of Economics
2006-2010	Chair, Durham Town Council
2003-2012	Councilor, Durham Town Council
1993	Resident Director, Programme Nouvelle-Angleterre, Ecole Superieure Des Affaires, *University of Grenoble*, France
1991 -	Associate Professor of Economics *University of New Hampshire*
1985-1991	Assistant Professor of Economics *University of New Hampshire*
1981-1985	Assistant Instructor *University of Texas at Austin*

University Awards:

2012 UNH Award for Excellence in Public Service
1988 University Award for Teaching Excellence

Honors, Awards and Grants:

2011 Schalkenbach Foundation Grant
2009 Schalkenbach Foundation Grant
2008 UNH Outreach Scholars Academy
2006 MBAA Distinguished Paper Award
2001 NOAA/UNH Joint Hydrographic Survey
1999 UNH Graduate School Summer Faculty Fellowship

1997 Hilton Foundation
1996 Microsoft Internet Innovator Award
1996 Rockefeller Foundation
1995 WSBE Associates Summer Research Award
1995 UNH Undesignated Gifts
1992 United States Small Business Administration
1990 Outstanding Faculty Member of the Year *(voted by UNH Greek System)*
1990 WSBE Associates Summer Research Award
1989 WSBE Associates Summer Research Award
1986 UNH Summer Research Fellowship

WORK IN PROGRESS

- EconJourney: A New Approach to Teaching Economics
- Using Big Data to Support Multiple Principles Sections with a 1000+ Students

WORK UNDER SUBMISSION

- The Hero's Journey: Using Story to Teach Economic Principles

BOOKS

- The Gamification of Higher Education: *Using Game Design to Avert the Growing Crisis Facing Universities Today.* Palgrave Macmillan. July 2014.

JOURNAL ARTICLES

- Giving, Taking and Punishment in a Public Goods Environment (with B. Kench), *Journal of Applied Business and Economics*, Forthcoming.
- The Allure of Games: Toward an Updated Theory of the Leisure Class, *Games and Culture*, January 2013.
- Henry George and the Intellectual Foundations of Open Source, *American Journal of Economics and Sociology*, 2011.
- Henry George and the Development of Thorstein Veblen's Theory of Capital**,** *Journal of the History of Economic Thought*, 2010.
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- The Influence of Psychological Type and Interpersonal Needs in Social Dilemmas: a Public Goods Experiment with Punishment (with B. Kench, R. Beekman and G. Wynn), *Journal of Psychological Type*, January 2010.
- Charles Babbage's Influence on the Development of Alfred Marshall's Theory of the Firm, *Journal of the History of Economic Thought*, December 2008.
- Strong Altruism & Moral Sentiments: Toward a Greater Understanding of Group Behavior, *Journal of Economic Development and Business Policy*, 2008 (with B. Kench and P. Zhang).
- Moral Attributes in a Dictator Game, *Journal of Diversity Management*, 2007 (with B. Kench, R. Beekman and W. Chaves).
- Sexual Selection and Economic Positioning, *Journal of Bioeconomics*, 2005.
- The Evolutionary Firm and Cournot's Dilemma, *Cambridge Journal of Economics*, March 2004.
- Platform Externalities and the Antitrust Case Against Microsoft, *Antitrust Bulletin*, Winter, 2002.

- Competition and Economic Progress, *Journal of Bioeconomics*, 2:(3), 2000.
- Picking Winners and Losers in the Global Technology Race, *Contemporary Economic Policy*, July 1995.
- Information Technology: Management Effectiveness and Service Quality, *Hospitality Research Journal*, 1993 (with J. Durocher).
- Modeling Coordination in Markets and Organizations, *Management Science*, December 1992.
- Biological Analogies in Marshall's Work, *Journal of the History of Economic Thought*, Spring 1991.
- The Entrepreneurial Function in the Theory of the Firm, *Scottish Journal of Political Economy*, May 1991.
- Automated Guest Relations that Generate Hotel Reservations, *Information Strategy*, Spring 1991 (with J. Durocher).
- Deficit Reduction and Healthcare Expenditures: A Macroeconomic Perspective, *Journal of Nursing Administration*, June 1991 (with L. Nichol).
- Technology: Antidote to the Shakeout, *The Cornell Hotel and Restaurant Administration Quarterly*, May 1990 (with J. Durocher).
- Keynes and the Invisible Hand Theorem, *Journal of Post Keynesian Economics*, Fall 1987.

CONTRIBUTIONS TO EDITED VOLUMES
- Marshall, Veblen and the Search for an Evolutionary Economics, in Rutherford, M. (ed.) *Economic Mind in America*, Routledge, 1998.
- The Computer Industry, in Adams, W. (ed.), *The Structure of American Industry, Ninth Edition*, Prentice Hall 1995 (with M. Irwin).
- Biological Analogies in the Theory of the Firm, in Mirowski, P. (ed.), *Natural Images in Economics: Markets Read in Tooth and Claw*, Cambridge University Press, 1994.
- The Corporate Telecommunications Network: Market Transparency and State Accountability, in Garnham, N. (ed.), *European Telecommunications Policy Research*, IOS, 1988 (with M. Irwin).

REPRINTED ARTICLES
- Biological Analogies in Marshall's Work, reprinted in Hodgson, G. (ed.) *Economics and Biology*, Edward Elgar, 1995
- Keynes and the Invisible Hand Theorem, reprinted in Blaug, M. (ed.) *Pioneers in Economics*, Edward Elgar, 1991.

BOOK REVIEWS
- Schabas, Margaret. <u>The Natural Origins of Economics</u>, *Victorian Studies*, 2007
- Andersen, E. <u>Evolutionary Economics: Post-Schumpetarian Contributions</u>, *Journal of Economic Behavior and Organization*, 1997
- Reisman, D., <u>Alfred Marshall's Mission</u>, *Southern Economic Journal*, 1991

PUBLISHED CONFERENCE PROCEEDINGS

- "Moral Attributes in a Dictator Game" (with Robert Beekman, Wanda Chaves, and Brian Kench), *Academy of Business Economics Proceedings*, at the Midwest Business Administration Association International, Annual Meetings, Chicago Illinois, March 29, 2007.
- "Leadership Models and Observations from Public Goods Experiments" (with R. Beekman, G. Wynn, and B. Kench), *Academy of Business Disciplines Proceedings*, Fort Myers, FL, 2006.
- "Strong Altruism & Moral Sentiments: Toward a Greater Understanding of Group Behavior." (with Brian Kench and Ping Zhang), the *5th Global Conference on Business & Economics Proceedings*, (paper # 197), Cambridge University, Cambridge, UK, 2006.
- "Strong Altruism: An Element in the Emergence of Public Institutions?" (with Brian Kench and Ping Zhang), *Academy of Business Economics Proceedings*, at the Midwest Business Administration Association International annual meetings, Chicago, IL, 2006.
- "Open Source and the Pharmaceutical Industry," (with Brian Kench), *Midwest Business Economics Association Proceedings*, March, 2003, pp. 123-132.

PAPER PRESENTATIONS

- The Hero's Journal: Using Story to Teach Economic Principles, Third Annual AEA Conference on Teaching Economics, 2013
- The Allure of Alternate Reality (and other) Games: Toward an Updated Theory of the Leisure Class, History of Economics Society Annual Meeting 2011.
- Animal Spirits and the Future of the Macroeconomy: Lessons from the Past, History of Economics Society Annual Meeting 2010.
- Of Altruist & Thieves, Society for the Advancement of Behavioral Economics Annual Meetings, 2009.
- Henry George and the Intellectual Foundations of Open Source, History of Economics Society Annual Meeting, 2009.
- Taking in a Public Goods Environment, Economic Science Association, 2008.
- Strong Altruism & Moral Sentiments: Toward a Greater Understanding of Group Behavior, 5th Global Conference on Business & Economics, Cambridge University, 2006
- Leadership Models and Observations from Public Goods Experiments, Economic Science Association, 2006
- Strong Altruism: An Element in the Emergence of Public Institutions? Midwest Business Administration Association Annual Meeting, 2006
- Strong Altruism: An Element in the Emergence of Public Institutions? Southern Economic Association Annual Meeting, 2005
- The Continuity of Science in Marshall's Work, History of Economics Society Annual Meeting, 2005.
- Open Source and the Future of the Pharmaceutical Industry, Southern Economic Association Annual Meeting, 2004.
- Why Economics has not Become an Evolutionary Science, Summer Institute, George Mason University, 2004.
- Conjectural History vs. Historical Fact: Uncovering the Process of Vertical Integration, Eastern Economic Association Meetings, 2002.

- Enterprise in a Whirlpool of Speculation: Veblen and the Post-Keynesians, ASSA Meetings, 2000.
- Social Policy in Marshall's Work, History of Economics Society, 1998.
- Marshall, Veblen and the Search for an Evolutionary Economics", History of Economics Society, 1996.
- Picking Winners and Losers in the Global Technology Race, Western Economics Association, 1994.
- A.C. Pigou: A Tragic Figure in the History of Economic Thought, Kress Society Seminar, 1992.
- The Role of Biological Analogies in the Theory of the Firm, Natural Images in Economics Conference, University of Notre Dame, 1991.
- Biological Analogies in Marshall's Work, Western Economic Association, 1990.
- Biological Analogies in Marshall's Work, Kress Society Seminar, 1990
- The Entrepreneurial Function in the Theory of the Firm, Bentley College Economics Seminar, 1990.
- The Non-Dichotomization of Market and Hierarchical Theories of the Firm, Western Economic Association, 1989.
- Keynes and the Invisible Hand Theorem", Eastern Economic Association, 1987
- Technology and the Evolving Nature of a Monetary Economy, Association for Evolutionary Economics, 1987.

COURSES TAUGHT

MBA Economics, An Introduction to Behavioral Economics, Government Regulation of Business, The Economics of Electronic Commerce, Organizational Economics and Architecture, History of Economic Thought, Principles of Macroeconomics, Intermediate Macroeconomic Analysis, Intermediate Microeconomic Analysis, Online Principles of Microeconomics, and Online MBA Economics.

UNIVERSITY SERVICE

- AAUP Executive Committee
- Chair, Department of Economics
- Chair, WSBE Structural Review Committee
- Chair, WSBE Graduate Curriculum and Assessment Committee
- University Ecosystem Task Force
- Presidential Strategic Planning Steering Committee
- Co-Chair Strategic Planning Workgroup on External Relationships
- Faculty Senate
- Faculty Senate Library Advisory Committee
- DCE Advisory Committee
- University Computing Advisory Committee
- University Technology Center
- McKerley Chair Search Committee
- WSBE Graduate Curriculum and Assurance of Learning Committee

- WSBE Policy and Procedures Committee
- WSBE Restructure and Mission Committee
- WSBE P&T Committee
- WSBE Computer Committee
- Economics P&T Committee
- Economics Graduate Admissions and Financial Aid Committee
- Department of Economics Graduate Program Review

COMMUNITY SERVICE

- Councilor, Durham Town Council
- Commissioner, Strafford Regional Planning Commission
- Commissioner, Seacoast Metropolitan Planning Organization
- Chair, Durham Economic Development Committee
- Apportionment Formula Study Committee – Oyster River Cooperative School District

PROFESSIONAL SERVICE

1999 – present	Treasurer - History of Economics Society
1999 – present	Executive Committee - History of Economics Society
2003 – present	Investments Committee – History of Economics Society
2005 – present	Webmaster – History of Economics Society

Referee Cambridge Journal of Economics, Journal of the History of Economic Thought, Management Science, Contemporary Economic Policy, Journal of Bioeconomics, Scottish Journal of Political Economy, Review of Political Economy, Palgrave Macmillan, and Eastern Economic Journal, History of Political Economy.

THE STATE OF NEW HAMPSHIRE
BEFORE THE
SITE EVALUATION COMMITTEE

<u>DOCKET NO. 2013-</u>

APPLICATION OF ATLANTIC WIND, LLC
FOR A CERTIFICATE OF SITE AND FACILITY

PREFILED DIRECT TESTIMONY OF MATTHEW MAGNUSSON ON BEHALF OF ATLANTIC WIND, LLC

December, 2013

<u>Qualifications of Matthew Magnusson</u>

Q. Please state your name and business address.

A. My name is Matthew Magnusson and my business address is PO Box 302, Hampton Falls, NH 03844.

Q. Who is your current employer and what position do you hold?

A. I am owner of KPItrac, LLC doing business as Seacoast Economics. Seacoast Economics provides project-based economic consulting services.

Q. What are your background and qualifications?

A. I am a graduate of the University of New Hampshire's Whittemore School of Business and Economics with a Masters of Business Administration and currently am earning my Ph.D. in Natural Resources and Environmental Studies at the University. My formal educational training has included courses in economics, statistics, and environmental valuation. I have provided analysis for and contributed authorship to several studies of the economic impacts of energy policies in New Hampshire including: 1) the New Hampshire Renewable Portfolio Standard legislation; 2) New Hampshire's participation in the Regional Greenhouse Gas Initiative ("RGGI"); 3) New Hampshire's Greenhouse Emissions Gas Reduction Fund; and the New Hampshire Better Buildings energy efficiency program.

Specifically, I have provided economic evaluation of NH wind farms for studies that have been requested by Noble Environmental Power, Iberdrola Renewables and Antrim Wind Energy, LLC. The wind farms analyzed consist of: the Lempster Wind Farm, the Granite Reliable Wind Farm, the Groton Wind Farm, and the proposed 30 MW wind farm by Antrim Wind Energy, LLC. I was primary author of the study "Impact of the Lempster Wind Power Project on Local Residential Property Values" which investigated the impact of the Lempster Wind Farm on local property values. My resume is attached to this testimony.

Q. Have you previously testified before this Committee and/or any other state permitting agencies?

A. Yes, I testified before this Committee on the economic and property value effects in regards to the 30 MW wind farm proposed by Antrim Wind Energy, LLC in 2012.

<u>Purpose of Testimony</u>

Q. What is the purpose of your testimony?

A. The purpose of this testimony is to provide information on the anticipated real estate market property value effects of the proposed Wild Meadows Wind Farm ("the Wind Farm") upon the region in which the Wind Farm is proposed to be located.

Q. Are you familiar with the Wind Farm that is the subject of this docket?

A. Yes. Iberdrola Renewables, LLC ("Iberdrola") contracted with my company to independently study the potential impact of Iberdrola's proposed 75.9 megawatt ("MW") wind farm on the local area economy in Grafton and Merrimack counties. During the course of this engagement, I have been provided with information about the Wind Farm by Iberdrola, I visited the communities around the existing and proposed turbine locations, and I have independently collected and reviewed information on the Wind Farm from public sources, therefore I am familiar with it.

Property Values

Q. Please describe the study you performed for the purpose of assessing the Wild Meadows Wind Farm's anticipated effects on local area property values.

A. This study was undertaken to assess whether there would be any real estate value effects around the Wild Meadows Wind Farm as a result of the project. Given the similarity of Iberdrola's two other wind farms in NH— the Lempster Wind Farm and the Groton Wind Farm—in terms of general location in the state, the local topography and demographics—the economic activity of the real estate markets in these regions provides important and highly relevant information about the potential effect that the Wild Meadows Wind Farm may have on the local surrounding real estate market.

The study approached this in four ways: (1) performance of a literature review of relevant regional, national, or international studies, (2) analysis of all post-construction arms-length single family home transactions in the immediate communities surrounding the Lempster Wind Project from November 2008 through July 2013, (3) analysis of all post-construction arms-length single family home transactions in the immediate communities surrounding the Groton Wind Farm in Grafton county, NH from December 2012 through July 2013, and (4) analysis of Grafton and Sullivan counties property assessment data.

This study reviewed 135 post-construction property transactions around the Lempster Wind Farm and the Groton Wind Farm. This study utilized analysis of variance (ANOVA) as the primary statistical test. The statistical test family (ANOVAs) was selected for this analysis because it a well-established type of statistical analysis that specifically looks for differences among the averages of groups. ANOVA tests are robust statistical tests that have been used in numerous other studies to evaluate factors that may have an impact on property values.

This study follows the approach of utilizing assessed value as the “expected” value to compare to sales price. Assessors would be viewed as local market experts with in-depth knowledge of the unique characteristics and dynamics of the properties in the communities they assess and the expectation is that assessed value should show a strong relationship to fair market value.

This study took a three step approach in evaluating property value transactions around the Lempster Wind Farm and the Groton Wind Farm. The first step was to determine if pre-sale assessed values showed a relationship to sales prices using the statistical technique called linear regression for all arm's-length sales around the wind farms from January 2008 through July 2013. The second step was to conduct a single factor ANOVA test on assessed values for sales occurring during this time period when grouped by year. The third step was to calculate the sales price to pre-sale assessed value ratio for each property transaction and conduct a single factor ANOVA test on post-construction property transactions for both wind farms combined based on distance.

Q. Please summarize your findings from your literature review

A. Three studies were reviewed which had large number of property transactions 1) a study performed by the Lawerence Berkley National Laboratory ("LBNL") in 2009 consisting of approximately 7,500 property transactions around wind farms, 2) a study performed by LBNL in 2013 of approximately 50,000 property transactions around wind farms, and 3) a study performed by Martin D. Heintzelman, Ph.D. and Carrie Tuttle, Ph.D. in 2012 of approximately 11,000 property transactions around wind farms. The two studies by LBNL show no statistically significant change in property values and the study by Heintzelman and Tuttle showed mixed effects with both statistically significant positive and negative effects on property values.

The 2013 study by LBNL is the most significant study to-date as it assembled a national data set of over 50,000 property transactions within 10 miles of a wind turbine with 1,200 sales having occurred within 1-mile of a turbine, features a robust analysis methodology, and originates from a highly credible source of information. The LBNL is a member of the national laboratory system supported by the U.S. Department of Energy through its Office of Science, has thirteen Nobel prizes associated with it, and fifty-seven LBNL scientists are members of the National Academy of Sciences.

The 2013 LBNL study reported no statistically significant difference in the sales price for transactions at any distance, including within bands of 0.5-miles and 1-mile of a wind turbine. The 2013 LBNL study was of a sufficient data transaction size to provide strong statistical evidence that there was no relationship between wind farms and real estate property values. The study's statistical modeling approach showed a "good fit" for property data collected—explaining 67% of the variation observed in property transactions—which supports the reliability of their findings.

The 2009 LBNL study is noteworthy in its work with regards to view impact, an area the 2013 LBNL study does not specifically address. Statistical modeling was employed to investigate whether the sales prices of homes were impacted with varying wind turbine views, based on a data set of just under 5,000 property transactions (730 transactions with views of turbines)—it was found that there was no statistically significant difference in selling prices between homes with minor, moderate, substantial, or extreme views of wind turbines. The study's statistical modeling approach showed a "good fit" for property data collected—explaining 77% of the variation observed in property transactions—which supports the reliability of their findings.

The Heintzelman and Tuttle study has significant issues which makes its findings questionable. In the 2013 LBNL study, it was discussed that the Heintzelman and Tuttle study had a low number of transactions within 1-mile (35 transactions) and very few to none in areas of estimates (1/10 and ¼ mile), and that their model also uses the inverse of continuous distance. This is problematic as it causes the model to estimate effects at the average distance, which in the case of their model is greater than 10 miles from the turbines. This approach weakens the ability of the model to quantify effects near the turbines where they would be expected to be stronger if present.

The issues with this study show in there statistical model which explained only 33% of the variation observed in property transactions; this was far lower than those observed in the LBNL studies These flaws show in their results which were inconsistent and showed both statistically significant positive and negative impact on property values from wind farms. In other words, they are saying that sometimes wind farms decrease property values, but in other instances wind farms actually increase property values. This does not make sense and the inconsistent results support the position that there were issues in the study design.

Q. Please summarize the results of your property values study.

A. A complete report of the study is contained in Appendix 54 of the Wild Meadows Wind Farm Application. Since the completion of the Lempster Wind Farm and Groton Wind Farm in New Hampshire, there have been 132 arms-length single family home property transactions at a value of $22.5 million in the immediate communities surrounding the wind farms. For these property transactions, there was no statistically significant difference found between the sales price and pre-sale assessed value for NH homes within 0-1 mile of a turbine, 1-3 miles of a turbine, and 3-10 miles to a turbine. There also was no statistically significant change observed in the assessed values of properties sold in these regions from 2008 through 2013.

Since the completion of construction of the two wind farms, there have been 14 arms-length transactions totaling $6.1 million for waterfront residential properties located on bodies of water that are within 10 miles of a turbine and that feature visibility of a turbine from areas on the body of water and areas of the shoreline. In general, these properties have sold at assessed value; this is especially noteworthy given that the overall trend in Grafton and Sullivan counties has been for properties to sell on average slightly below assessed value. This study did not find any evidence to suggest that waterfront properties (ranging from 2.2 to 6.4 miles from the nearest turbine) were impacted by the presence of the wind farms.

A separate supporting analysis of real estate market value based on the NHDRA median ratio and assessed residential values did not indicate that the real estate market activity of the communities surrounding the Lempster Wind Farm or the Groton Wind Farm was different from that experienced throughout the communities in Grafton or Sullivan counties from 2008 through 2012.

Based on the similarities in topography, demographics, and regional location, it is highly likely that the property value experience at the proposed Wild Meadows Wind Farm would be the same as the property value experience observed at the Lempster Wind Farm or the Groton Wind Farm. Given the findings of the 2013 LBNL study, supported by the property transactions observed around the two wind farms reviewed, it is highly likely there will be no consistent differences in the sales prices relative to assessed values for post-construction property transactions around the Wild Meadows Wind Farm including those properties in close proximity to the turbines or properties with significant views of the turbines.

Q. Do you wish to provide any additional details on your findings?

A. Yes, this study did not find any consistent or statistically significant differences in property transactions in close proximity to the Lempster Wind Farm or the Groton Wind Farm as determined by the ratio between sales price and pre-sale assessed value. While this is a relatively small sample size (135 post-construction property transactions),which can limit the magnitude of difference that can be detected, the finding of no relationship between wind farms and local property values is consistent with previously published research on this topic which has tended to indicate that wind farms produce little or no effect on home values.

Conclusion

Q. In your opinion, from a real estate market perspective, will the Wild Meadows Wind Farm unduly interfere with the orderly development of the region?

A. No. In my opinion, for the reasons set forth above and in my report in Appendix 54, I believe that the Wild Meadows Wind Farm will not adversely affect residential property values. Therefore, from a real estate market perspective, the Wind Farm will not unduly interfere with the orderly development of the region.

Q. Does this conclude your testimony?

A. Yes.

Matthew Magnusson

PO Box 302
Hampton Falls, NH 03844
603- 285-5735
mmagnusson@ccsnh.edu

Experience:

2012 - Present **KPItrac, LLC, Hampton Falls, NH**
Owner
Provide data collection, analysis, presentations and report authoring on project-based energyand economic research.

- **2013 – An Evaluation of the NH BetterBuildings Program**
  Sponsor: NH Community Finance Development Authority

- **2012– Climate Impacts on the Winter Tourism Economy in the United States**
  Sponsor: Natural Resources Defense Council, Protect Our Winters

- **2012 – The Economic Impact of the Piscataqua River and the Ports of Portsmouth and Newington**
  Sponsor: Piscataqua River Economic Development Committee

- **2012 - Economic Impact of the Proposed Antrim 30 MW Wind Power Project in Antrim, New Hampshire**
  Sponsor: Antrim Wind Energy, LLC

- **2012 - Impact of the Lempster Wind Power Project on Local Residential Property Values**
  Sponsor: Antrim Wind Energy, LLC

2012 – Present **Community College System of New Hampshire, Concord, NH**
Grant Researcher & Analyst
Responsible for establishing reporting systems, ensuring compliance with U.S. Dept. of Labor performance reporting, and evaluating grant performance across 8 different consortium campuses for $19.1 million Trade Adjustment Assistance Community College and Career Training Grant awarded to NH Community College System.

2005–2013 **University of New Hampshire, Durham, NH**
Research Associate (Most recent official position: Project Director II)
Provide data collection, analysis, presentations and report authoring on project-based grant-funded research.

Summary of Research

- **2013– New Hampshire Medicaid Program Enrollment Forecast**
  Sponsor: New Hampshire Department of Health & Human Services

- **2012 – Energy & Economic Impacts of the NH Greenhouse Gas Emissions Reduction Fund**
  Sponsor: New Hampshire Public Utility Commission

- **2010 – The Economic Impact of the Local Sea Food Industry in New Hampshire – Opportunity for Sustainability**
  Sponsor: University of New Hampshire Cooperative Extension

- **2010 – New Hampshire Medicaid Program Enrollment Forecast SFY 2011-2013 Update**
  Sponsor: New Hampshire Department of Health & Human Services

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- **2010 – The Economic Impact of Local Food Systems in New Hampshire - Current Status and Prospects for Growth**
  Sponsor: University Office of Sustainability, NH Charitable Foundation

- **2010 – Economic Impact of the Proposed Groton Wind 50 MW Wind Power Project in Groton, New Hampshire**
  Sponsor: Groton Wind LLC

- **2009 – Economic Impact of Granite Reliable Power Wind Power Project in Coos County, New Hampshire**
  Sponsor: Granite Reliable Power LLC

- **2009– Economic & Greenhouse Gas Impacts of the New 2009 Fuel Economy (CAFE) Standards in New England**
  Sponsor: Carbon Solutions New England

- **2009– New Hampshire's Green Economy and Industries: *Current employment and future opportunities***
  Sponsor: Rockingham Economic Development Committee (REDC), U.S. Dept. of Commerce-Economic Development Administration

- **2009 – Economic Analysis of Policies Proposed by the NH Climate Change Policy Task Force for the Governor's NH Climate Change Action Plan**
  Sponsor: New Hampshire Charitable Foundation

- **2008 - Economic Impacts of Regional Greenhouse Gas Initiative on New Hampshire**
  Sponsor: New Hampshire Department of Environmental Services, The Energy Foundation

- **2007- Economic Impacts of a State Renewable Portfolio Standard in New Hampshire**
  *Sponso*r: New Hampshire Department of Environmental Services

- ***2006*- Economic Modeling of Low Sulfur Heating Oil in the Northeast**
  Sponsor: Northeast States for Coordinated Air Use Management (NESCAUM)

- ***2006* - Fiscal Impact of Lower Ignition Strength Cigarettes in New Hampshire**
  Sponsor: New Hampshire Office of State Fire Marshal

Summary of Other Work

2012– "The Sustainable Business Case Book", co-author with Professor Ross Gittell and Professor Michael Merenda textbook published by Flat World Knowledge

August 2009 – "Sustainability and Business" Chapter in "Exploring Business" textbook published by Flat World Knowledge

2012 **University of New Hampshire, Durham, NH**
Adjunct Lecturer
Taught senior-level undergraduate Sustainable Business Models course. Instruction included grading, and course development.

2005–2012 **University of New Hampshire, Durham, NH**

Matthew Magnusson

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Lead Recitation Instructor
Lead classroom instruction for the Introduction to Business course. Instruction included grading, leading classroom discussion and course development.

Fall 2004 **Maine Green Power Connection, Brunswick, ME**
Internship
Presented on the electricity options available to Maine businesses. Consulted with businesses on energy certification for their product lines. Evaluated the effectiveness of the Clean Power Maine marketing campaign and developed a system to track inquiries.

2000–2008 **University of New Hampshire, Durham, NH**
Information Technologist III
Project manager for UNH Information Technology projects including management reporting and ERP system. Responsible for employee training of new IT related systems. Web application and database development of in-house applications for undergraduate student admissions.

Education:

2012(in-progress) **University of New Hampshire, Durham, NH**
PhD in Natural Resources & Earth Sciences

2005 **Whittemore School of Business and Economics, University of New Hampshire, Durham, NH**
Masters Degree in Business Administration

1997 **University of New Hampshire, Durham, NH**
Bachelor of Science Degree in Kinesiology

Technical Skills:

- Data extraction, manipulation, integration, query development and reporting of complex data sets from government and proprietary sources

- Application and programming experience includes: IMPLAN 3.0, SQL Server, JavaScript, HTML 5.0, C#, Ruby on Rails, Dreamweaver, Fireworks, Windows Azure, Amazon EC2

THE STATE OF NEW HAMPSHIRE
BEFORE THE
SITE EVALUATION COMMITTEE

DOCKET NO. 2013_-__

APPLICATION OF ATLANTIC WIND, LLC
FOR A CERTIFICATE OF SITE AND FACILITY

PREFILED DIRECT TESTIMONY OF CHUCK BRAXTON
ON BEHALF OF
ATLANTIC WIND, LLC

December, 2013

Qualifications

Q. Please state your name and business address.

A. My name is Chuck Braxton. My business address is 97 Daniel Webster Hwy, Meredith NH 03253.

Q. Who is your current employer and what position do you hold?

A. I am a licensed New Hampshire REALTOR® employed by Roche Realty Group, Inc.

Q. What are your background and qualifications?

A. Over the past nine years, my real estate practice has centered on the Lakes & Mountains Region of New Hampshire. Roche Realty Group is one of the leading independent agencies in the state. Since 2009 I have ranked in the top five among the 50 agents in our two offices. My experience centers on the towns in Belknap, Merrimack and Grafton Counties that might be within view of various wind projects including New

Hampton and Meredith in Belknap Co., Danbury, Hill and Wilmot in Merrimack Co.; and Alexandria, Bridgewater, Bristol, Campton, Groton, Grafton, Hebron, Holderness, and Plymouth in Grafton Co.

Prior to my real estate career I held executive management positions in the energy and gas utility industries and in high technology firms including medical devices and precision manufacturing for the electronics and telecommunications applications. I earned a BSEng. in Aerospace & Mechanical Sciences with honors from Princeton University and an MBA from Harvard Business School in finance and industrial marketing.

Purpose of Testimony and Overview of the Project

Q What is the purpose of your testimony?

A. I was asked to review the nationally published and recently completed local studies of the impact of wind energy development on property values and to compare the results and conclusions with my experience and knowledge of the real estate market in and around the proposed Wild Meadows project.

Q. Are you familiar with the Project that is the subject of this Application?

A. Yes.

Q. Based on your experience, has the presence or potential presence of a wind farm had an effect on the property values in the respective project areas of the existing Groton Wind Farm or the proposed Wild Meadows Wind Farm?

A. No. Among properties that I have knowledge of that are within view of existing or proposed projects, my experience is that either the appropriateness of the asking price relative to market clearing value or other property characteristics such as location, proximity to busy roads, accessibility, condition and upgrades and other elements of the view are the dominant factors in buyers' decisions.

Active public awareness opposition campaigns during the post-project announcement phase may deter some buyers. However, once made aware of the proposed project, no successful buyers that I know of have changed course, deferred a purchase decision or sought a price concession from a seller based on the announced project.

Q. Do you have any examples of sales or transactions within the project areas which demonstrate this?

Yes. Whittemore Shores is a condominium community of more than 50 stand-alone residential units in Bridgewater on the eastern shore of Newfound Lake. Many units at Whittemore Shores have lake and mountain views that might encompass the Wild Meadow project site. Since announcement of the project, selling prices have reached new post-2008 highs at Whittemore Shores.

Q. Does this complete your testimony?

A. Yes.

CHUCK BRAXTON
97 Daniel Webster Hwy
Meredith, NH 03253

Experience:

2004 - Present Roche Realty Group, Inc., Licensed New Hampshire REALTOR®

Prior Experience:

Former Leader, Coach and Volunteer, Camp Dudley, Westport, NY (#9009)
Former CEO, EN-TAG® - Energy Technology Assurance Group, Inc.
Former VP & General Manager, 11-state northeast region, DukeSolutions, Inc.
Former Chief Marketing/Sales Officer for NMGas™, a $600 million unit of Niagara Mohawk.
Former Executive VP and CFO, Rocky Mountain Instrument Co., Inc.

Education:

Master of Business Administration, Harvard Business School, Finance and Industrial Marketing
B.S. in Engineering (with Honors), Princeton University, Aerospace & Mechanical Sciences

Background, Memberships, and Affiliations

- Viet Nam Era Veteran. Directly commissioned U.S. Army Medical R&D Command Project officer. Advanced to rank of Captain, honorably discharged.
- Member, Lakes Region Board of Realtors, New Hampshire and National Assn. of Realtors®
- Graduate of the Realtor Institute (2008)
- Director, New Hampshire Electric Cooperative, Inc. (2003 to present)
- Vice-Chairman of the Board, New Hampshire Electric Cooperative, Inc. (2005-2007)
- Secretary of the Board, New Hampshire Electric Cooperative, Inc. (2011 to 2013)
- National Rural Electric Cooperative Assn. Board Leadership Certificate (2008)
- National Rural Electric Cooperative Assn. Credentialed Cooperative Director (2005)
- Sustaining Fellow, Massachusetts Institute of Technology,
- Founder of the Winston B. Braxton Memorial Scholarship that has funded undergraduate studies
- President and Director, Windy Waters Conservancy trade name of the Waukewan Shore-Owners Association, (2011 to present)
- Trustee, NHEC Foundation (2008 to present)
- Vice Chairman, NHEC Foundation (2008-2013)
- Region Leader, Appalachian Mountain Club (2005 to present)
- Received AMC Stewardship Society Pychowska Award (2010-2011)
- Member, Society for Protection of New Hampshire Forests
- Member, The Nature Conservancy
- Director, White Mountain Gateway Economic Development Council (2006 to present)
- Member, New Hampshire Preservation Alliance
- Member and Trails Volunteer, Squam Lakes Association

THE STATE OF NEW HAMPSHIRE
BEFORE THE
SITE EVALUATION COMMITTEE

DOCKET NO. 2013-
APPLICATION OF ATLANTIC WIND, LLC
FOR A CERTIFICATE OF SITE AND FACILITY

PREFILED DIRECT TESTIMONY OF BRIAN GOTTLOB
ON BEHALF OF
ATLANTIC WIND, LLC
DECEMBER, 2013

Background and Qualifications

Q. Please state your name, business address and qualifications.

A. My name is Brian Gottlob. My business address is 51 Atkinson St. Dover, NH 03820. I have more than 20 years' experience completing regional economic and labor market analyses, economic impact studies, as well as public policy research, evaluation, and analysis. A description of my background and experience is contained in the attached curriculum vitae.

Q. Who is your current employer and what position do you hold?

A. I am employed by PolEcon Research, an economic consulting firm which I founded and for which I am the only employee.

Purpose of Testimony

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to discuss the findings of a study that I completed, at the request of Atlantic Wind, LLC, on the impact of existing wind farms on tourism in New Hampshire. I will also discuss my analysis and conclusions in regards to the potential impacts of the proposed Wild Meadows Wind Farm on tourism in the vicinity of the project and on the larger Grafton County, and Merrimack County towns of Danbury, Hill, and Wilmot tourism economy.

Q. Are you familiar with the Project that is the subject of this application?

A. Yes I am. This fall I was provided with information about the scope and location of the project, information that was necessary for me to complete a regional economic analysis and to develop models and estimates of the project's potential impact on tourism in the region.

Tourism Impacts

Q. Please describe the methods you used to evaluate the impact of wind farms on tourism in New Hampshire.

A. I first conducted a review of the national and international research literature on wind farm impacts on tourism. A majority of those studies conclude that wind farms have little if any negative or positive impact on tourists' attitudes regarding the attractiveness of a region or on tourism visits or expenditures. To date, most studies of wind farm impacts on tourism have drawn their conclusions based on stated preference surveys of visitors to regions where wind farms are present. Although there is a general consensus among studies using visitor surveys that wind farms have little or no impact on tourism, examining direct evidence, where possible, can provide an additional level of empiricism to support or question that consensus. My research took advantage of a natural experiment that allowed me to examine key indicators of the tourism economy in a region both before and after the introduction of a wind farm in Lempster, New Hampshire, and to compare trends in that region with tourism trends in regions of the state that that did not experience the introduction of a wind farm. I examined meals and rooms (accommodations and food services) sales trends, weekend traffic volumes, and changes in tourism related employment to assess the impact that wind farms may have had on the tourism economy in the region where Lempster Wind is located, and to compare trends in that region to tourism trends in other regions of the state. Each of the measures I examined is tracked at the state level and reported in "*Travel Barometers,*" a publication that reports on tourism trends in New Hampshire and is produced by the Institute for New Hampshire Studies at Plymouth State University for the State of New Hampshire Division of Travel and Tourism Development. In addition, I examined trends in state parks visits and revenues in the region and compared them to statewide trends.

Q. What did your analysis conclude about the impact of the Lempster wind farm on tourism in that region?

A. For each of the direct tourism measures I examined - meals and rooms sales data, employment in tourism-related industries, state parks revenues, and weekend traffic counts, the data showed that the Lempster region was not adversely impacted by the introduction of a wind farm in the region. I analyzed data for a time period that began the year prior to the commissioning of the Lempster wind farm (2007) and ended with the most recent data available (2012 for most data but 2013 data for meals and rooms sales). All regions in New Hampshire were affected by a recession that began in 2008 and that resulted in employment declines and reductions in consumer expenditures, including those related to tourism activities. If the Lempster wind farm had the effect of discouraging visits to the region and tourism expenditures, then the tourism metrics I analyzed would have shown that the Lempster region performed more poorly relative to other regions of the state over the time period that began prior to the location of the wind farm and ending with the latest date for which data is available. Instead, the data show that, in fact, the Lempster region performed better than some other regions that did not experience the location of a wind farm during the time period studied, and worse than some others. These findings are especially significant because the Lempster wind farm is located in a region that has, for some time, demonstrated weaker economic growth than most other regions of the state. Overall, the region performed about in the middle of the pack on key tourism metrics since the introduction of the Lempster wind farm. This is consistent with the findings of most research that wind farms have little or no effect on tourism. The notable exception from my analysis was state park revenues where state parks closest to the Lempster wind farm increased by a much larger percentage than did state parks overall in New Hampshire during the time period studied. This is significant and an indication that visitors seeking natural and recreational amenities in the region did not avoid state parks in the region in response to the presence of Lempster wind farm.

Q. What are your conclusions about the impacts of wind farms on tourism in New Hampshire?

A. My primary conclusion is that there is no evidence of a discernible negative effect from wind farms on tourism in New Hampshire. There have been no measurable impacts on key tourism metrics. Based on the performance of the Lempster region, the evidence shows no adverse effects on tourism. Negative rhetoric surrounding the effects of wind farms on tourism is not supported by the evidence of actual impacts. It appears that individual assessments of the aesthetic value of wind farms, rather that empirical evidence, may be the primary source of beliefs that wind farms have a detrimental impact on tourism.

Q. Did you also investigate the impact of wind farms in Groton and Dixville for impacts on tourism?

A. Each of those wind farms was commissioned in 2012, in the case of Groton Wind, late 2012. The most recent data available for most of the tourism metrics used in my study are for 2012, thus there is not sufficient post-commissioning economic data to conduct the same time series analysis as was performed for the Lempster wind farm region. Meals and rooms sales data is available for the first half of 2013 and does not suggest negative impacts but without more data conclusions cannot be drawn.

<u>Implications for Wild Meadows</u>

Q. Did you examine the potential for Wild Meadows Wind Energy to impact tourism?

A. Yes I did. I examined the regional economy to assess the volume of tourism activity in the Wild Meadows region. In addition to analyzing industry and employment data, I examined publicly available files from the New Hampshire Department of Revenue, of entities in the region currently subject to New Hampshire's meals and rentals tax revenue. These data allowed me to estimate the volume of tourism-dependent expenditures in the Wild Meadows region and as a percentage of the larger Grafton County region. This analysis established the baseline volume of tourism activity that Wild Meadows Wind Energy could impact.

Q. What are your conclusions about the potential impacts of Wild Meadows Wind Energy on tourism?

A. My overall conclusion is that the project will not have a measurable adverse impact on tourism. To the extent that there are any measurable effects, negative or positive, they will be extremely small. The basis for this conclusion is that evidence of effects from existing wind farms in New Hampshire does not demonstrate adverse impacts on tourism.

Q. Does that conclude your testimony?

A. Yes it does.

BRIAN GOTTLOB

PROFESSIONAL EXPERIENCE

POLECON RESEARCH
Dover, NH,
Founder and Principal, 2001-Present

Provide economic and public policy analysis and forecasting, fiscal and economic impact analysis, regional economic analysis and economic development strategy, demographic and labor market analysis, cost/benefit analysis, industry and market analysis services to for-profit clients in the energy, financial service, real estate, retail trade, and legal industries, and not-for-profits including, government agencies, economic development organizations, charitable and human service organizations, trade associations, foundations, national advocacy organizations, "think tanks", chambers of commerce, and higher education institutions.

MILTON & ROSE D. FRIEDMAN FOUNDATION
Indianapolis, IN
Senior Research Fellow, January 2004 – Present

Prepare fiscal and economic analyses for the Foundation's work in various states on issues related to school choice and state and local education finance. Support national, local and regional partners of the Foundation with research and analysis of school choice and school finance issues.

WHITTEMORE SCHOOL OF BUSINESS AND ECONOMICS, UNIVERSITY OF NH
Durham, NH
Instructor, 2001-2003

Taught introductory course for primarily non-business majors.

BUSINESS AND INDUSTRY ASSOCIATION OF NEW HAMPSHIRE
Concord, NH
Vice President for Fiscal and Economic Policy, 1989-2000

Developed and implemented BIA's economic, fiscal, and telecommunications policy initiatives (and from 1989 to 1993 its environmental policies). Created in-house economic research capabilities. Conducted policy research, including surveys and econometric modeling of fiscal, economic, and industry impacts of changes in public policies. Represented organization's members in the NH legislature by providing information and testimony on policy proposals of interest to the business community. Frequent speaker at conferences, seminars, forums, and in the media on topics related to public policy and the New Hampshire economy.

RKG ASSOCIATES
Durham, N.H.
Associate Economist, 1987-1988

EDUCATION

M.P.A., University of NH, Concentrations in Policy Analysis, Public Finance and Economics
MBA Coursework, Whittemore School of Business and Economics, University of NH
B.A. Economics, State University of New York

PROFESSONAL AFFILIATIONS

National Association for Business Economics
Advisory Board, New England Economic Partnership 2000-2006
Industrial Advisory Council, College of Engineering and Physical Sciences, University of NH 1996-2004

(SAMPLE) REPORTS AND PRESENTATIONS

INVITED CONGRESSIONAL TESTIMONY

U.S. House of Representatives, Committee on Ways and Means, Subcommittee on Income Security and Family Support, "Characteristics and Causes of the Uninsured Population in the U.S.". 2007.

LEGISLATIVE TESTIMONY

Regularly appear before New Hampshire House and Senate Committees to present research and analysis that addresses key public policy issues.

SAMPLE PROFESSIONAL REPORTS

"How Public Policies are Changing the Competitive Market for Banking Services in New Hampshire," New Hampshire Bankers Association, Forthcoming.

"Why is Student Debt so High in New Hampshire?" New Hampshire Higher Education Assistance Foundation, October, 2013.

"The Economic and Fiscal Impacts of the Construction and Operation of the Oregon Clean Energy Center," Oregon Clean Energy LLC, January 2013.

"The High Cost of Excessive Alcohol Consumption in New Hampshire," New Futures, Inc., January 2013.

"The Fiscal Impacts of Expanded Spirits Retailing in New Hampshire," New Futures, Inc., February, 2012.

"Job Impacts in New Hampshire From Construction of the Proposed Northern Pass High-Voltage Transmission Line," New England Power Generators Association, January, 2012.

"The Economic and Fiscal Impacts of the Construction and Operation of the Texas Clean Energy Project in Ector County, TX," Summit Texas Clean Energy LLC, June, 2011.

“Funding Economic Recovery: Trends in Small Business Lending in Massachusetts,” Massachusetts Bankers Association, April, 2011.

“The Fiscal and Economic Impacts of Decreasing the Cigarette Tax in New Hampshire,” The American Cancer Society, March, 2011.

“The Retail Industry in New Hampshire: Myths, Realities And The Impacts of New Hampshire’s Sales Tax Advantage,” Retail Merchants Association of New Hampshire, February, 2011.

“School Passports: A proposal for Salvaging Educational Reform and Durable Fiscal Relief for States,” The Foundation for Educational Choice, December, 2010.

“Credit Where Credit is Due: Trends in the Small Business Lending in New Hampshire,” New Hampshire Bankers Association, January, 2010.

“Understanding the Stimulus: A Primer for NH Citizens on the American Recovery and Reinvestment Act of 2009,” S.T.W.E.W.A.R.D. of Propserity. 2009.

“Understanding the Stimulus: A primer for NH Citizens on the American Recovery and Reinvestment Act of 2009,” The Yankee Institute, 2009.

“The Economic and Fiscal Impacts of the Construction and Operation of the Longview Power Generating Facility in Monongalia County, WV,” GenPower Corp, 2009.

“The Impact on Belknap County and it’s Communities From Changes in Medicaid Cost Sharing Between The State of NH and its Counties,” Belknap County Commission, June, 2009.

“What is Causing the Rise of Foreclosures in New Hampshire and How High Will they Climb?” The New Hampshire Bankers Association, August, 2007.

“State Education Finance Reforms: Fiscal Lessons For NH from Other States”, The Committee for Sensible School Funding, 2007.

SAMPLE PRESENTATIONS AND SPEAKING ENGAGEMENTS

New Hampshire Municipal Association, “Where is the NH Economy Headed: Implications for Local Government Revenues and Expenditures.” November, 2013

NH Manufactured and Modular Housing Association, “Trends in NH’s Economy and Housing Market.” November 2013.

Greater Manchester Chamber of Commerce, Annual Economic Forecast Luncheon (With Dennis Delay and Chancellor Ross Gittell), September, 2013.

Measured Wealth Private Client Group, “Key Forces Affecting the U.S. and New Hampshire Economies,” June, 2013

State of NH General Court, Committee on Ways and Means, "The NH Economic Outlook and Implications for State Government Revenues," January, 2013.

Pentucket Bank Economic Forum, Haverhill MA, "Waiting for Clarity: An Economy on Hold Until After the November Election," October, 2012.

Greater Manchester Chamber of Commerce, Annual Economic Forecast Luncheon (With Dennis Delay and Prof. Ross Gittell), September, 2012.

Greater Dover Chamber of Commerce, "Key Population and Demographic Trends in Dover: Implications for the Community and the Local Economy," March, 2011.

Greater Concord Chamber of Commerce Economic Forum, "Is There a "New Normal" for the NH Economy?," December, 2011.

Greater Portsmouth Chamber of Commerce, Bank of America Forum Series, "Trends and Directions in the New Hampshire Economy," June, 2011

New Hampshire Bankers Association and Vermont Bankers Association CEO/Senior Management Conference, "The Impact of High Energy prices on the Northern New England Economy," May, 2011.

Massachusetts Bankers Association Annual CEO Seminar, "Trends in Small Business Lending in Massachusetts," January, 2011.

NH Municipal Association Annual Conference, "NH's Economic Outlook and Implications for Local Revenues: Between a Rock, A Boulder, and a Very Hard Place," November, 2010.

CIVIC ACTIVITIES

Cocheco Waterfront Development Committee, City of Dover, N.H.
Dover, NH Business and Industrial Development Authority, Board of Directors.
Main Street Program, Dover, NH
    Volunteer, Prepared Downtown Dover Market Analysis for Submission To National Main Street Program.
School Board, Dover, NH, 1993-1998
    Chair, Finance Committee, 1993-1998
    Chair of the Board, 1998
Youth Sports, Dover NH, 1994-2006
    Soccer, Basketball, and Baseball Coach
Strafford County Stars AAU Girls Basketball Club, 2002-2007
    Board Member and Coach
Passenger Rail Transportation Committee, Dover NH, 1994-1996

PERSONAL

Married (Karin), three children

**THE STATE OF NEW HAMPSHIRE
BEFORE THE
SITE EVALUATION COMMITTEE**

DOCKET NO. 2013_-__

**APPLICATION OF ATLANTIC WIND, LLC
FOR A CERTIFICATE OF SITE AND FACILITY**

**PREFILED DIRECT TESTIMONY OF TYLER PHILLIPS
ON BEHALF OF
ATLANTIC WIND, LLC**

December, 2013

Qualifications

Q. Please state your name and business address.

A. My name is Tyler Phillips. My business address is 34 School Street, Littleton, New Hampshire, 03561.

Q. Who is your current employer and what position do you hold?

A. I am employed by Horizons Engineering, Inc. (“Horizons”).In my present position I am a Senior Project Manager for the company.

Q What is the purpose of your testimony?

A. The purpose of my testimony is to discuss the design of the Wild Meadows Wind Project’s specifically as it relates to impacts on water quality and the efforts taken to minimize, avoid, and where appropriate mitigate those impacts.

Q. What are your background and qualifications?

A. I have more than 15 years of experience in water quality and erosion and sediment control design and implementation. I have been employed at Horizons since its founding in 2004, and am a Certified Professional in Erosion and Sediment Control and Licensed Subsurface Designer. I hold a Bachelor of Science in Land Use Planning and Sciences from the University of New Hampshire. Prior to joining Horizons, I worked for the engineering firm Provan and Lorber and prior to that I was with Comprehensive Environmental Inc. where much of my work involved protecting large drinking water supplies from the effects of stormwater. In addition to my qualifications as a Certified Professional in Erosion and Sediment Control, I have thousands of hours of field experience monitoring construction project compliance with permits and water quality standards, including over one thousand hours on wind projects. I have been contracted to provide training to other engineers, scientists, regulators, and contractors on National Pollution Discharge Elimination System (NPDES) stormwater compliance and proper use of sediment and erosion control BMPs. I have worked on and directed numerous watershed and stormwater studies and developed and carried out complex chemical, and biological sampling designs and program Other pertinent experience includes completion of a number of river stabilization and restoration projects including NH's largest river restoration project in Woodstock, NH using natural channel design principles and numerous drainage and stormwater management designs for ski areas where many of the higher elevation and steep terrain challenges are similar or greater than those of ridge top wind projects.

Q. Are you familiar with the Project that is the subject of this Application?

A. Yes, I am. In my role as the Senior Project Manager for the design and implementation of Best Management Practices (BMPs), erosion and sediment control measures, and overall analysis of water quality impacts for the Project, I have been involved in the site planning from the beginning of the Project and have conducted field reviews of the site. The Project has been designed by civil engineers at Horizons, but I take responsibility for much of the stormwater management system design and water quality analysis. My engineering team and I have been involved in almost all aspects of the Project, including survey, civil design and permitting of the access roads, lay-down areas, operation and maintenance area and switchyard area, the electrical interconnect corridor, wind turbine sites and stormwater management. I have also participated in a number of consultation meetings with the NH Department of Environmental Services (NH DES), U.S. Army Corps of Engineers (USACE), and U.S. Environmental Protection Agency (USEPA) regarding the Project.

Water Quality Impacts

Q. Please describe the consideration that the Project has given to water quality issues.

A. The Project will require permits including, among others, a NHDES Alteration of Terrain Permit (AoT), a NHDES Wetlands Bureau Dredge & Fill Permit, a USACE Section 404 Permit, and an USEPA NPDES Construction General Permit. In addition, as part of the USACE permits process, the Project may require a Section 401

Water Quality Certification issued by NHDES. Information supporting the NHDES permits and certification is contained in Appendices 1, 2, and 3 to the Application. These permitting processes require the development of comprehensive plans which address potential construction-related impacts as well as an evaluation of the effects of the Project after construction. These plans detail the Project's proposed construction techniques and materials and explain the approach for first preventing erosion or other sources of potential water quality impacts and then mechanisms and infrastructure used to address potential sources of water quality impacts that cannot be fully prevented. We have found that the best approach to prevent and address water quality issues is to maintain dispersed drainage patterns.

Although the techniques used to maintain dispersed drainage patterns are described in greater detail in the AoT and 401 applications and below, the benefits of maintaining dispersed drainage patterns include:

- preventing the generation of erosive forces on roads and in ditches which can lead to the detachment of soil particles; and
- minimizing the diversion of shallow groundwater away from downgradient wetlands and streams; and
- allowing for more numerous and more distributed sediment trapping controls that can be designed to continue to work more efficiently throughout a wider range of storm intensities than when compared to more centralized measures; and

- allowing the site's stormwater to be spread over a larger surface area and have most contact time with the adjacent forest soils and boita that have a natural ability to polish the stormwater and assimilate nutrients and fine particles.

Q. Have you studied the water quality impact this Project will have?

A. Yes. The Project site is the location of an active timber harvesting operation with continuing logging operations that includes a large network of logging roads and timber processing areas. This Project does not involve any new point source discharge, and the civil engineering design involves the development of stormwater runoff analysis and plans to handle both the quantity and quality of non-point source stormwater runoff. In particular, the new access roads are designed to be stable, but will not be paved. This avoids the creation of new highly-impervious surfaces, which along with other unique elements of wind project road construction, will substantially limit the potential for water quality effects. Additionally, the drainage design has been very carefully engineered to maintain existing drainage patterns as much as possible to minimize potential changes to streams and hydrology on the site. Stream crossings have been avoided through thoughtful engineering design and where stream crossings cannot be avoided they have been sited to avoid any crossing of perennial streams and the crossings of intermittent streams have been designed to meet or exceed NH DES Stream Crossing Rules.

This Project differs from typical land development projects in that the intensity of use after construction is expected to be quite low. The wind turbines are designed to be efficient and reliable and can be remotely monitored for performance. Access to the turbines after construction will generally only be required for inspection, maintenance and repairs. There are expected to be impacts during construction for upgrades of the portions of private access roads located on private land, for new access roads to the ridge lines, turbine pad sites, storage and staging areas, substation and the operations and maintenance area. Post-construction impacts are expected to be minimal as a result of the low intensity of use and stormwater management elements that have been proposed and proven at least at one other wind project in NH. With proper operation and maintenance this wind facility should not increase in the amount of TSS, or Phosphorus exported from the site. Depending on one's level of thermal measurement resolution, even potential thermal increases area likely to be minimal or absent and only improve over time as vegetation matures and increases shading.

Q. What steps will the Applicant take to address the water quality impact of the Project?

A. The Applicant will take a number of steps to reduce and mitigate water quality impacts associated with the Project. . The access roadway widths will be the minimum required to provide safe and adequate access during the construction phase and portions of the wider crane access roads will be re-vegetated after construction to reduce the post-construction roadway widths. The Applicant will employ erosion prevention techniques to minimize erosion including the use of erosion control matting, rock stabilized slopes, rock check dams, seeding, and may include the use of soil tackifiers. Sediment controls used during construction include the use of various erosion control barriers, pervious berms consisting of shredded bark and/or stump grindings, sediment traps and sediment basins. Erosion and sedimentation control measures are presented in detail on the Plans provided in the Alteration of Terrain Permit application found in Appendix 2 of the Atlantic Wind's application. The Applicant will monitor the effectiveness of construction related erosion and sediment controls and make timely recommendations of adjustments to the site work contractor where needed. These measures have been discussed through consultations with the NHDES, however the project will obtain coverage under EPA's National Pollution Discharge Elimination System Construction General Permit (CGP) as the project will disturb over one acre of earth. A detailed strategy for managing construction related stormwater will be developed in a Stormwater Pollution Prevention Plan (SWPPP) consistent with EPA's 2012 CGP. Through extensive design efforts the project has been refined to avoid many of the wetlands and streams found onsite. Where feasible, buffers between disturbance areas and important resources have been provided to further protect the functions and values of these resources during construction.

The Alteration of Terrain Rules are intended to not only protect wetlands and surface waters from potential impacts during construction, but also from non-point source pollutants that may emanate from a development project once the facility has been constructed and is operational. Unlike most development projects that require AoT permits, wind projects involve different construction techniques, materials, and operational usage that inherently minimizes many of the post construction related concerns that the AoT rules are intended to address. Specifically, roads and wind turbine pads are constructed with coarse materials that provide less impedance of precipitation and natural water and stormwater runoff flow paths. Unlike typical development projects, the roadway infrastructure of wind facilities receive relatively little traffic once the facility is operational. Because the intensity of vehicular traffic is positively correlated with the concentration of many non-point source pollutants found in runoff from roadways, wind facilities can be anticipated to generate lower concentrations and fewer types of most potential non-point source pollutants. The types of pollutants of concern are more akin to those that might be expected to occur from logging activities (i.e.: total suspended solids and associated adsorbed phosphorus, and temperature). This project has been designed to first prevent the generation of such pollutants so that their entrainment in stormwater runoff is minimized. Because it is recognized that prevention will not entirely prevent the mobilization of these pollutants (for instance TSS) during more intense storms, the project has included many dispersed treatment measures to capture and treat such pollutants close to the point of runoff generation. The following design features have been incorporated into this project to meet the above-referenced objectives:

1. tree cutting needed to construct roadways and other wind facility infrastructure has been minimized by proposing a narrower roadway and pad footprint, thereby maximizing the amount of shading and minimizing the area subject to potential thermal increases;
2. the areal extent of cut and fills have been minimized by allowing for steeper rock cuts, thereby lessening the surface area of soil that needs to be disturbed;

3. areas of earth disturbance outside of the permanent 16' wide roadways and crane pad/access areas will be stabilized using grass or stone to prevent the mobilization of soils by rainfall and runoff, and in the case of grass, increase the shading and lessen the albedo of ground surfaces to minimize increases in the temperature of stormwater that travels over these surfaces in larger storm events;
4. roadways have been limited to grades of 15% or less to minimize runoff velocities;
5. roadway crowns will limit the distance that water travels down the gravel roadways thereby minimizing runoff concentration and erosive forces;
6. grassed vegetative buffers will be established adjacent to 16 foot wide permanent roadways and crane pad/access areas (once the facility construction is complete) to receive and disperse runoff from roadways and trap sediments that do become entrained in larger storm events;
7. grass and stone stabilized ditches will collect runoff that may be generated during larger storm events and convey the runoff in a stable channel, thus retarding the erosive forces of concentrated flow that may develop in larger storms;
8. porous rock conveyances (termed "rock sandwiches") will be used in certain select locations where roadways cross non-riverine wetlands and are intended to convey shallow groundwater flow in a dispersed manner to the downslope

side of the roadway where flows can re-enter the ground, thereby minimizing disruptions of shallow groundwater flow regimes;

9. culverts have been spaced at frequent intervals to allow for the dispersion of concentrated flows that may occur in ditches;
10. sediment traps will be located at many of the culvert or ditch outlets and will serve to settle entrained sediment particles, return a portion of the stormwater flow back into the shallow groundwater, and disperse onto the adjacent forest floor that portion of the flow volume that is not attenuated in the sediment traps during larger storms; and,
11. treatment swales have been located in areas where flatter grades exist and will receive and settle sediments entrained in stormwater.

This approach of preventing erosion and thermal increases, minimizing disruption of flow regimes, and capturing sediments in areas where concentrated flows might develop, has been used successfully at wind facilities in New Hampshire including those at higher elevations and with project features that have a greater proximity to wetlands and surface waters and we feel confident that this project incorporates highly functional mechanisms that are protective of the aquatic environment. In pre-application meetings NH DES has indicated that they concur with this dispersed drainage approach and the type of stormwater measures that can be employed on sites such as these to protect water quality.

The substation and operation and maintenance facilities are located in flatter terrain that allows for the use of more traditional post-development stormwater controls and, therefore, these facilities will utilize sand filters, micropool extended detention, and treatment swales to minimize the generation of stormwater pollutants and treat those pollutants that may become conveyed in stormwater in treatment devices suited to the use of these facilities.

Q. Did you evaluate watershed wide effects on the Smith River and Newfound Lake watersheds?

A. Yes. As part of the development of drainage and stormwater management design, and in response to water quality concerns of watershed stakeholders we reviewed many of the Newfound Lake Regions Association's (NLRA) documents as well as the NH DES Stormwater Manual (Volume 1, 2 & 3) and the 2010 and 2012 watershed report cards. NRLA has recently completed a watershed master plan and feel that if we are able to address many of the concerns in the Newfound Lake watershed then many similar benefits will likely be realized in the Smith River Watershed. Many of the concerns expressed in these documents are not applicable to the project either because we have designed our project to avoid impacting certain features (for example stream crossings have been avoided and reduced to include no perennial stream crossings and the few crossings that exist are for intermittent channels where the crossing designs meet or exceed DES stream crossing Rules) or because the project owners have set very high environmental standards that have not yet been widely adopted in the watershed . For instance, herbicides will not be used, fertilizers (if used at all) will be applied once at the beginning of construction at applied at agronomic rates, and salt will not be used on any of the roads. From review of this master plan and supporting documents it appears that phosphorus (and specifically particulate forms of phosphorus) is identified as the primary form of chemical threat to Newfound Lake. However, phosphorus is a nutrient that cannot be entirely prevented from mobilizing off of one's property. The master plan identifies many possible existing sources of phosphorus inputs to the Lake, however the phosphorus in stormwater runoff that reaches the lake from watershed tributaries is frequently cited as the largest phosphorus contributor to the lake. While this project is not located alongside the lake where runoff from impervious surfaces can have very direct phosphorus contributions, it does partially lie within the Newfound Lake watershed and therefore tributaries that are within the project can provide a potential means of conveying phosphorus (entrained in stormwater) from the project site. With proper construction and operation however phosphorus mobilization will be minimized and much of the remaining phosphorus that does become mobile will be trapped in the various treatment features and adjacent forest floor. Given this and foregoing discussion we do not anticipate that phosphorus loads to the lake will increase over those that exist today, prior to the project's construction.

Q. In your opinion will this Project have an unreasonable adverse effect on the natural environment, more particularly water quality?

A. The Project has been designed to minimize and mitigate adverse water quality impacts and is based upon coordination with DES staff and other wind project experience. With proper implementation of temporary and permanent erosion control measures, sufficient construction monitoring, and proper implementation of remedial actions as may be required, the Project, in my opinion, will not have an unreasonable adverse effect on water quality.

Q. Does this complete your testimony?

A. Yes.

TYLER PHILLIPS, CPESC

Senior Project Manager

EXPERIENCE

With extensive design and permitting experience, Tyler has helped clients all over New England find successful and often innovative solutions to their problems. With a focus on water resources, public and private clients have found Tyler's insights to be valuable in avoiding costly and time consuming permitting delays by anticipating project challenges and working with clients and agencies to achieve project goals in a timely and cost-effective manner that is protective of the environment.

With his currency in the field of stormwater management he has been appointed to a number of state panels and commissions and is a lecturer at workshops for engineers, scientists, regulators and contractors on the subject, providing them with Continuing Education Credits and recommendations on how to comply with local, NH, VT, MA, ME and EPA regulations related to stormwater and erosion control. Tyler has completed over 100 Storm Water Pollution Prevention Plans for construction sites and has performed thousands of hours of erosion control inspections.

Some of Tyler's recent work has involved:

- Preparation of 401 Water Quality Certification, and ACOE/NH DES permitting compliance for construction of 12 miles of new high elevation roadway ((up to 3,400' elev.), and upgrades to 20 miles of existing roadway involving 13.5 acres of wetland impact and over 200 acres of earth moving for a wind farm in Coos County. Aided contractor in meeting environmental obligations enabling project to be constructed and operational in less than one year. (*Dummer, NH*)

- Stormwater treatment designs, permitting, and monitoring at various high elevation (between 1,500 and 4,000' elev.) projects. (*Lincoln, Livermore, Carroll, Crawford's Purchase, Harts Location, Bethlehem, Franconia, Waterville Valley, Jackson, NH and Burke , VT*)

- Directing a fish passage study evaluating over 100 potential barriers (bridges and culverts) along the Ammonoosuc River, and development of NH's first Eastern Brook Trout fish passage assessment protocol. (*Woodsville-Carroll, NH*)

- Developing sampling designs, bio-monitoring plans, pollutant and sediment transport studies, and providing environmental monitoring services for various private companies, NGO's, Town, and State (NH DES, NH DOT) agencies. (*Statewide*)

- NPDES permitting and blast monitoring plans for construction and industrial sand and gravel facilities and quarries. (*Statewide*)
- Monitoring the creation of a 13 acre ACOE wetland mitigation site for NH DOT. (*Albany, NH*)
- Preparation of various construction dewatering and wetland restoration plans including EPA required mitigation/restoration of ephemeral and perennial stream channel (*Woodstock, Carroll, Londonderry, NH*)
- HEC RAS modeling, and federal, state and local permitting, construction stakeout and construction oversite for channel modifications involving 36 acres of wetland disturbance to a large high-gradient river and NH's largest river restoration project using natural channel design principles (*Pemigewasset River -Woodstock, NH*)

PROFESSIONAL ASSOCIATIONS

Certified Professional in Erosion and Sediment Control
NH Licensed Subsurface Designer

EDUCATION

Bachelor of Science in Land Use Sciences, University of New Hampshire, 1995
Wastewater Treatment Plant Operation I- California State Univ., Sacramento, CA, 1996
Wastewater Treatment Plant Operation II- California State Univ., Sacramento, CA 1998
Advanced Turbidity Control, NC State Chappell Hill, NC 2010

PATENTS

A limnetic device for the efficient removal of soluble phosphorus from surface waters - *Pending*

OTHER

Chairman- Thornton NH Planning Board
NH DES Ad Hoc Engineers Panel - Regulatory review

THE STATE OF NEW HAMPSHIRE
BEFORE THE
SITE EVALUATION COMMITTEE

DOCKET NO. 2013_-__

APPLICATION OF ATLANTIC WIND, LLC
FOR A CERTIFICATE OF SITE AND FACILITY

PREFILED DIRECT TESTIMONY OF ARTHUR J. COLVIN
ON BEHALF OF
ATLANTIC WIND, LLC

December, 2013

Qualifications

Q. Please state your name and business address.

A. My name is Arthur J. Colvin. My business address is 34 School Street, Littleton, New Hampshire, 03561.

Q What is the purpose of your testimony?

A. The purpose of my testimony is to describe the design of Atlantic Wind, LLC's ("the Applicant") wind power project ("Wild Meadows Wind Farm") in Merrimack and Grafton Counties, NH ("the Project"), including the overall design basis for the Project, the methods and approach for reducing the overall footprint and minimizing wetland impacts and overall disturbance, and the stormwater management systems considered and designed for the Project.

Q. Who is your current employer and what position do you hold?

A. I am employed by Horizons Engineering, Inc. ("Horizons"). In my present position I am a Senior Project Manager / Civil Engineer for the company.

Q. What are your background and qualifications?

A. I have more than 30 years of experience in the civil engineering field. I have been employed at Horizons since November, 2011, and am a Licensed Professional Engineer in the states of Maine and New Hampshire. I hold a Bachelor of Science in Civil Engineering (BSCE) from the New Jersey Institute of Technology. Prior to joining Horizons, I was employed by several Engineering/Surveying Companies as well as being the sole owner of an Engineering/Surveying business for 7 years. In addition to my qualifications as an engineer, I am certified as a Professional Land Surveyor in the State of Maine.

Q. Are you familiar with the Project that is the subject of this Application?

A. Yes, I am. In my role as the Senior Project Manager and Civil Engineer for the engineering design of the Project, I have been involved in the design from the preliminary engineering stages of the Project and have conducted field reviews of the site. The civil engineering plans bear my stamp as a professional engineer. As such, I take professional responsibility for the civil engineering design work including roadway layout and design, and the stormwater management system design. My engineering team and I have been involved in all aspects of the Project, including civil design of the access roads, construction lay-down areas, operation and maintenance area, substation and interconnection areas, the overhead and underground collection lines, crane pads, and all stormwater design features and management. I am responsible for the preparation of the Alteration of Terrain permit application for this project. During the design process we have consulted with the New Hampshire Department of Environmental Services (NHDES) on civil design, stormwater management design and management, culvert design, and other engineering features of the project.

Q. Please describe the design of this Project.

A. The Project consists of the construction of 23 wind turbines, each with a capacity of 3.3 megawatts. The Project, when fully constructed, will have a total footprint of disturbance of approximately 150 acres, and approximately 9 miles of roadway to access the turbines as well as other areas of the project. The Project also will include various stormwater management system features including sediment traps, treatment swales, rock sandwiches, ditches, and level lip spreaders, all of which are described in further detail below.

Q. Please describe the design basis for this project?

A. The Project will have approximately 9 miles of access roads and crane roads. The access roads will be used for component delivery as well as for general access to the site. The access roads will be approximately twenty two (22) feet wide during the construction phase of the project. These will be reduced to sixteen (16) feet post-construction. Crane roads will be approximately forty (40) feet wide during the construction phase of the project. The crane roads are roadways that can accommodate the cranes that will be used to assemble the wind turbine generators (WTGs). The cranes used during construction will be able to "walk" along these roadways between the various crane pads. These crane roads also will be reduced to 16 feet post-construction. Turbine pads are designed to handle storage of some of the wind turbine components as well as for providing a place for the wind turbines to be assembled. The majority of the pad dimensions are one hundred (100) feet by one hundred and sixty (160) feet. Some vary slightly. All but a sixty (60) foot by ninety (90) foot permanent pad area will be reclaimed with a vegetated surface. The roadway embankments will be constructed from common borrow in the fill areas. The common borrow will be generated from areas of the project site requiring cuts to attain design grades. A sixteen (16) foot wide area of gravel will be installed as part of the permanent site access. This gravel will consist of twelve (12) inches of base gravel and six (6) inches of crushed, surface gravel. Roadways created in cut sections will also have the same gravel treatment as in the fill sections. Fill materials that form the roadway embankment must be compacted to a minimum of 95% maximum dry density in accordance with ASTM D-1557. The maximum vertical grade, project wide, will be 15%. The minimum horizontal curve proposed for the project is one hundred and eighty five (185) feet.

Q. Please describe the methods and approach you used to reduce or minimize the project footprint?

A. Project footprint was minimized through a number of iterations of design that we analyzed. Initially, we established the horizontal road alignments so that they "snaked" through and between the mapped wetland areas. Secondly, we used our Civil 3D software to continually tweak the vertical alignments to lessen the amount of wetland impacts by the grading limits associated with the various designs. On normal fill sections of roadway, we used a two (2) feet horizontal to one (1) foot vertical sideslope. In areas where we were adjacent to either wetlands or in intermittent streams, we increased the steepness of the road sideslope to one and a half (1.5) feet to one(1) foot vertical. This reduced the amount that the graded areas would extend into the wetland boundary and as such, reduced overall wetland impacts.

It is more advantageous to use a two (2) feet horizontal to one (1) foot vertical sideslope because soil can be used to form this slope. In areas where we are increasing the steepness to one and a half (1.5) feet to one(1) foot vertical, a rock borrow material will be required to stabilize the embankment. The project footprint was substantially minimized by reducing the number of turbines from an initial 40 down to 23. This reduced the total footprint by 55 acres; the total amount of roads by 5.5 miles; and the total amount of electrical collector system line by 5 miles.

We also were able to balance the cut and fill volumes on the site by analyzing the earthwork volumes from the first cut and changing the vertical grades to keep the cut and fill volumes as close to each other as possible. This will greatly reduce the movement of materials on the site and to/from the site.

Q. Please describe the stormwater management features of this project?

A. The stormwater features for the project are varied and numerous. Our overall approach was to maintain continuity between pre construction drainage areas and post construction areas to the greatest extent possible. This was able to be accomplished by proposing culverts at frequent intervals. This allows for continuity between the pre and post construction watersheds while also providing the added benefit of dispersing the runoff waters. Dispersion of runoff waters results in fewer areas of high runoff rates, less erosion and less sedimentation. Stormwater design features and modeling were refined through consultations with the NHDES.

We were able to attain full compliance with AOT requirements in the flatter portions of the Project site. These are the areas where the Operations and Maintenance Facility (O&M) and Substation and Interconnection Stations are proposed. In these areas we used stormwater BMP's (Best Managements Practices) to both treat and attenuate stormwater flows. Attenuate means manipulating runoff so that the peak rates maintain preconstruction levels. This requirement comes from Rule Env-Wq 1507.06. A Micropool Extended Detention Pond was designed to handle the stormwater from the Interconnection Station. In order to meet Groundwater Recharge Volumes (GRV) we utilized a Surface Sand Filter. This requirement comes from Rule Env-Wq 1507.04. The O&M site utilized a Surface Sand filter to attenuate, treat and infiltrate stormwater. Other stormwater features include:

- Sediment Traps - Sediment Traps will be located at many of the culvert or ditch outlets and will serve to settle entrained sediment particles, return a portion of the stormwater flow back into the shallow groundwater, and disperse onto the adjacent forest floor that portion of the flow volume that is not attenuated in the sediment traps during larger storms;
- Treatment Swales - Treatment Swales have been located in areas where flatter grades exist and will receive and settle sediments entrained in stormwater;

- Rock Sandwiches - Porous rock conveyances (termed “rock sandwiches”) will be used in certain select locations where roadways cross non-riverine wetlands and will serve to convey shallow groundwater flow in a dispersed manner to the downslope side of the roadway where flows can re-enter the ground, thereby minimizing disruptions of shallow groundwater flow regimes ;
- Ditches - Grass and stone stabilized ditches will collect runoff that may be generated during larger storm events and convey the runoff in a stable channel, thus retarding the erosive forces of concentrated flow that may develop in larger storms; and
- Level Lip Spreaders - Level Lip Spreaders have been used in all areas of concentrated flow, where a sediment trap is not specified. These devices allow the runoff to exit the structure in sheet flow. Sheet flow essentially means a more spread out, slower moving, less erosive form of flow.

Q. Does this complete your testimony?

A. Yes.

ARTHUR J. COLVIN, P.E., L.S.

Senior Project Manager

As a civil engineer, Arthur has held a Professional Engineer's license in the State of Maine since 1988 and is also a licensed Professional Land Surveyor. Arthur has worked on a wide variety of civil engineering and surveying projects both as sole owner of his own company as well as an employee of other firms. Art is Horizon's Senior Project Engineer.

As an engineer, Art has been responsible for overall site design and layout of various projects. Included in those aspects were site layout; grading and drainage, and erosion control; completion of wetlands permitting; public and residential sewer and water design; roadway and parking design, and construction supervision.

PROJECT EXPERIENCE

Current Projects

Town of Pittsburg, New Hampshire—Pittsburg Water Project—Created a soil erosion and sediment control plan for a new 50,000 gallon storage tank, treatment facility and water line extension. Completed the Wetlands Dredge and Fill permit application package.

Cottage Hospital, Woodsville, New Hampshire—Cottage Hospital Parking Lot—The hospital's parking lot is being reconfigured for improved utilization. Grading, specifications and sizing of new drainage infrastructure is also being designed.

Owls Nest Associates, Campton, New Hampshire—Owls Nest Resort—Budget items and numbers are currently being compiled for the construction of a 400 unit hotel with indoor/outdoor water park. Considerations are being made for the proposed use of 40 million gallons of water/year. Designs will include an on-site storage tank; water treatment system for the resort, as well as options for sanitary flows for water generated from the backwashing and drainage of pools.

The Balsams Hotel, Dixville , New Hampshire—Site and Water System Improvements—Responsible for site grading of the hotel building area and parking lot, as well as the total redesign for a State roadway re-alignment. Responsible for the complete overhaul of the potable water system for the hotel as well as fire flow requirements. There is a small hydro-station on the hotel grounds. Arthur is involved in the design of a new penstock waterline that feeds the power station. The penstock will also be utilized for fire protection for the hotel. A new 80,000 gallon water tank was designed as part of the overall improvements to the property. A new potable water distribution system was also needed for this project. Arthur was responsible for reviewing the new water system design.

Past Projects

City of Augusta, Maine—Cony Road Design – Preparation of design plan in accordance with City of Augusta road design standards. Designed all aspects of the project. Coordinated with City and prepared bid documents for contractor bidding.

Maine Department of Transportation (MDOT) - Town Farm Road Design— Arthur was responsible for design of the entire reconstruction of Town Farm Road in accordance with MDOT standards. Analyzed horizontal and vertical sight distance requirements, minimum and maximum road grades. Coordinated with MDOT staff to meet various design schedule requirements.

Town of Casco, Maine—Casco Culvert Replacement—As project manager on this project, plans were created to show grading materials and specs for a multi-plate arched culvert replacement project. Assisted the town in the interviewing and selection process for the appropriate contractor for job.

Town of Camden, Maine—Sidewalk Replacement—Aided in the design of a new sidewalk for the downtown area of Camden. We were chosen, by bid, to design and oversee the project. We worked directly for the Town of Camden.

City of Augusta, Maine—Parking Garage Conceptual Design – Worked with the City of Augusta's Economic Development Coordinator and City Engineer to create multiple options for a parking garage in the downtown area of the City of Augusta.

MBNA, Belfast, Maine—Belfast Campus Design – Worked with others for the design of an office campus complex in Belfast, Maine. Arthur was responsible for the design of the access roads to the site. Arthur was also responsible for the design of the sanitary and water distribution systems for the complex.

Oceans East, Portland, Maine—Apartment Complex Design – As project manager, Arthur oversaw a team of designers and was responsible for the site layout, coordination with the client, project Architect, and City officials to get project approval. The project required a Site Location of Development permit. The project involved the design of water and sewer lines, as well as, site grading and drainage plans.

EDUCATION

Bachelors of Science in Civil Engineering,
New Jersey Institute of Technology, 1983

LICENSES AND REGISTRATIONS

Licensed Professional Engineer:
ME # 6065
Licensed Professional Land Surveyor:
ME #2036