

**TOWN OF OAKFIELD
WIND ENERGY REVIEW COMMITTEE
P.O. BOX 10
OAKFIELD, ME 04763**

**2011 REVIEW OF EVERGREEN WIND POWER II, LLC'S
PROPOSED WIND ENERGY FACILITY
IN OAKFIELD, MAINE**

FINAL REPORT

October 19, 2011

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PROLOGUE

Currently, the Town of Oakfield does not have any local zoning or site review ordinances that address wind energy facility developments; however, Oakfield is considering the adoption of a wind energy facility operations ordinance to provide the Town with local regulatory control for large wind projects. With respect to site review standards, the only regulatory review available is by the Maine Department of Environmental Protection [“Maine DEP”] under the Maine Site Location of Development Act and Natural Resource Protection Act.

This report was developed as a supplement to the September 4, 2009 Final Report of the Oakfield Wind Energy Review Committee [the “Oakfield I” review],¹ and was produced in order to (1) identify local concerns related to Evergreen Wind Power II, LLC’s revised 2011 wind energy facility proposed within the Town of Oakfield, Maine, (2) provide information about these local concerns to the Oakfield community, and (3) provide recommendations for how to address these local concerns.

Consistent with its purpose, the Oakfield Wind Energy Review Committee [the “Committee”] decided to conduct a due diligence review process of Evergreen Wind Power II, LLC’s 2011 [“Evergreen II”] proposed wind energy facility (as revised from Evergreen II’s 2009 proposal). The Committee has been charged with collecting information from the public, reviewing Evergreen II’s applications to the Maine DEP, requesting and reviewing information from Evergreen II, and then reporting and making any recommendations to the Board of Selectmen. Specifically, these recommendations would include appropriate actions that would be forwarded to Evergreen II, and the Maine Department of Environmental Protection with requests for their inclusion in Evergreen II’s current applications (as amendments) and any approval orders issued by the Maine Department of Environmental Protection with respect to the 2011 wind project.

In furtherance of its charge, the Committee re-hired the same firms that assisted the Committee in its 2009 review. To address sound and noise issues, the Committee engaged Ken Kaliski, P.E., of Resource Systems Group based out of White River Junction, Vermont. For general engineering issues, the Committee engaged Jonathan Edgerton, P.E., of Wright-Pierce, which is based out of Topsham, Maine. To address any legal issues, the Committee engaged Andrew Hamilton, Esq., and Jonathan Pottle, Esq., of Eaton Peabody based out of Bangor, Maine.

¹ A copy of the Committee’s September 4, 2009 Final Report is available at, <http://oakfieldme.org/vertical/Sites/%7BD2794B8C-60B4-4246-A7A2-B97C2A034DA9%7D/uploads/%7BA4C2873F-C6D4-4193-9916-5FDC78EA6ED9%7D.PDF>.

INTRODUCTION

I. Chronology of Events Before the Oakfield Wind Energy Review Committee's 2011 Review

In the summer of 2009, the Town of Oakfield created the Wind Energy Review Committee to conduct a due diligence review process of Evergreen Wind Power Wind II, LLC's² ["Evergreen II"] proposed wind energy facility. The Committee's 2009 review resulted in a Final Report dated September 4, 2009, which consisted of a series of recommendations that were forwarded to the Board of Selectmen, Evergreen II, and the Maine Department of Environmental Protection ["Maine DEP"]. Several of these recommendations were incorporated into Evergreen II's Site Location of Development application, which was ultimately approved by the Maine DEP and upheld by the Maine Supreme Judicial Court (sitting in its appellate capacity as the Law Court).

In June 2011, Evergreen II submitted an amendment to their previously approved 2009 project to the Maine DEP [the "Revised Project"].³ In general, Evergreen II has proposed to change the project by:

- Erecting 3.0 MW Vestas wind turbines, replacing the previously proposed 1.5 MW General Electric wind turbines
- Increasing the number of wind turbine sites within the Town of Oakfield from 34 to 40
- Adding 10 wind turbine sites in Township 4, Range 3, an unorganized territory that is immediately south of the Town of Oakfield
- Changing the footprint of turbine pad sites, road widths, and some road locations
- Adding temporary and permanent MET towers
- Eliminating the northern substation and adding a new substation location
- Changing the point of electrical interconnection with the grid
- Constructing a transmission corridor (applied for by Maine GenLead, LLC, a subsidiary of First Wind Energy, LLC)

² Evergreen Wind Power II, LLC is a Delaware corporation registered to do business in the State of Maine, and is a subsidiary of First Wind Energy, LLC, a Delaware Corporation with a principal place of business in Boston, Massachusetts.

³ A copy of these amendment materials is available at, <http://www.maine.gov/dep/blwq/docstand/sitelaw/Selected%20developments/oakfield-wind-amendment/index.htm>.

In short, the Revised Project will be larger in terms of the number of wind turbines and the size of those turbines, resulting in a 120 MW wind energy facility within the Town of Oakfield.

In response to Evergreen II’s Revised Project, the Board of Selectmen requested that the Oakfield Wind Energy Review Committee convene and review the proposed changes in Evergreen II’s June 2011 Maine DEP application [the Committee’s “2011 Review”].

II. 2011 Committee Appointments

Table 1 below shows the names, addresses, and occupations of the members chosen by the Selectmen to serve on the Committee for the 2011 Review.

Table 1 – Committee Members.

| Name | Address | Occupation |
|---|--|---------------------------------------|
| Jim Sholler –Selectmen | 257 Thompson Settlement Road Oakfield, ME 04763 | Retired B&A Railroad – Carmen |
| Linwood Hersey – Selectmen | 24 Norman Street Oakfield, ME 04763 | Retired Maine State Trooper |
| Anthony White – Planning Board Member | 69 Ridge Road Oakfield, ME 04763 | Katahdin Forest Products – Manager |
| Robin Crandall – Planning Board Member | 216 Brown Road Oakfield, ME 04763 | Retired Homemaker |
| Kirby Hardy – Planning Board Member | 92 Spaulding Lake Oakfield, ME 04763 | Independent Logging Contractor |
| Cathy Briggs (1st Alternate) | 103 Spaulding Lake Road Oakfield, ME 04763 | Self-employed Contractor |
| Gina Clark (Alternate) | 270 Ridge Road Oakfield, ME 04763 | Self-employed Contractor |

III. The Committee’s Charge

The purpose of the Committee remains unchanged from 2009, which is to review local siting and environmental concerns related to Evergreen II’s commercial wind energy facility in Oakfield and to report and make recommendations to the Selectmen for appropriate actions with respect to these local concerns.

Specifically, the Committee will continue to:

- (1) Receive input from Oakfield residents on project-related siting and environmental concerns;
- (2) Review appropriate portions of Evergreen II's applications to the Maine DEP for permit approvals as they relate to local siting and environmental concerns;
- (3) Request and review Evergreen II's responses to local siting and environmental concerns;
- (4) Consult with any 3rd party review consultant(s) engaged by the Town on specific project-related issues; and
- (5) Report and make recommendations to the Selectmen for appropriate actions.

Consistent with the Committee's charge, it hired the same consultants that assisted the Committee in its 2009 Review, who were Ken Kaliski, P.E., of Resource Systems Group ["RSG"] to address sound and noise issues, Jonathan Edgerton, P.E., of Wright-Pierce to address other issues relating to the siting of wind turbines in Oakfield and Andrew Hamilton, Esq., and Jonathan Pottle, Esq., of Eaton Peabody to address legal matters. Collectively, these consultants provide technical and legal support for the Committee's 2011 due diligence review.

IV. Meeting Schedule

In order to meet the Committee's Charge, a series of meetings were held that collectively make up the Committee's 2011 Review. Below is a summary of these meetings.

| | |
|-----------------|---|
| August 3, 2011 | Initial meeting to convene the Committee for its 2011 Review, select consultants, and review the overall changes to Evergreen II's 2009 Oakfield Wind Project |
| August 8, 2011 | Review of sound and noise issues associated with wind energy projects, discussion of specific changes identified in Evergreen II's 2011 Revised Project, and public hearing on the draft Oakfield Wind Energy Facility Operations Ordinance |
| August 15, 2011 | Update on Evergreen II's responses to the Committee's data requests, discussion of other wind |

projects permitted in Maine, and additional public comments on the draft Oakfield Wind Energy Facility Operations Ordinance

- September 7, 2011 Update on Evergreen II's responses to the Committee's data requests, preliminary recommendations from the Committee's consultants, discussion of draft Final Report
- September 26, 2011 Review Draft Final Report, take public comments, and set final schedule for the Committee's 2011 Review of Evergreen II's Revised Project
- October 19, 2011 Final Action on the Committee's Final Report and the Committee's Recommendation on Whether to Adopt the Oakfield Wind Energy Facility Operations Ordinance

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PROJECT DESCRIPTION

Evergreen II's Revised Project proposes to construct approximately 40 wind turbines within the Town of Oakfield, utilizing Vestas V112-3.0 megawatt ["MW"] wind turbines. Specifically, up to 13 wind turbine locations are proposed on the ridgeline northwest of Sam Drew Mountain (southerly of Spaulding Lake), 3 wind turbines are proposed on Sam Drew Mountain, 9 wind turbines are proposed to the northeast of Red Bridge, 3 wind turbines are proposed to the west of the Brown Road and the Hunt Ridge, 7 wind turbines are proposed along the Hunt Ridge, and 5 wind turbines are proposed to the east of the Hunt Ridge and Morrison Brook. Notably, there are 10 additional wind turbines proposed in Township 4, Range 3, which borders the Town of Oakfield to the south, which brings the total number of wind turbines for the project to 50. *(See Appendix A for a Project Map illustrating the proposed locations for each wind turbine – the "Project Area Map" Appendix A also includes a variation of the Project Area Map that shows distance contours in 500-foot intervals from the proposed wind turbines to dwellings.)* The capacity or potential power output of the proposed project is estimated to be up to approximately 150 MW of electricity, 120 MW of which is proposed within the Town of Oakfield.

Evergreen II's Revised Project also includes the construction of an electrical collector system, up to 5 permanent MET towers, up to 4 temporary MET towers, an electrical substation, an operations and maintenance building, and road construction for erecting wind turbines and for operation and maintenance access (including a combination of new roads, road upgrades, and road maintenance). *(See Appendix A, the Project Area Map, for locations of these structures.)*

Evergreen II anticipates that about 10,932 square feet (or 0.25 acres) of wetlands will be permanently filled, 25,928 square feet (or 0.60 acres) of wetlands will be temporarily filled, 4.01 acres of vegetation will be cleared, and 383 linear feet of stream channel will be culverted. Compensation for these impacts is being proposed through preservation of a 2100 acre parcel of land in Drews Plantation, which is immediately located to the east of Macwahoc, Maine.

Electricity generated in Evergreen II's Revised Project is proposed to be collected at a substation on the South Oakfield Road, which would then be transmitted by a transmission line to the Keene Road Substation in Chester, Maine, where it would tie into the existing Bangor Hydro Electric system. *(See Appendix B for a Project Map illustrating the proposed location of the Transmission Corridor – the "Transmission*

Corridor Map".) Maine GenLead, LLC⁴ has separately applied to the Maine DEP for this transmission corridor from Oakfield to Chester.

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⁴ Maine GenLead, LLC is a Delaware corporation registered to do business in the State of Maine, and is also a subsidiary of First Wind Energy, LLC.

RECOMMENDATIONS ON SPECIFIC ITEMS ADDRESSED BY THE COMMITTEE

The Committee has identified the following specific items to address in its 2011 Review of the Revised Project: (I) Sound and Noise; (II) Wildlife and Natural Resources; (III) Stormwater Management; (IV) Blasting; (V) Shadow Flicker; (VI) Public Safety & Public Access; (VII) Impacts to Town Ways; (VIII) Wind Energy Facility Operation and Maintenance; and (IX) Decommissioning.

The format for the Committee's report is to provide a discussion and the Committee's specific recommendations for each of the above subject areas. The Committee also recommends that the Town ensure that Evergreen II implement all of these recommendations, and that Evergreen II makes provision for any affiliate, successor, or assign of Evergreen II to be committed to these recommendations.

I. Sound and Noise

A. Introduction

The Committee focused on the following sound and noise issues and information when reviewing Evergreen's II's Revised Project, including its noise analysis submitted to the Maine DEP:

- A peer-review of Evergreen II's predictive noise model and Evergreen's compliance with Maine DEP noise standards
- Modeling associated with normal operation and Noise Restrictive Operation ["NRO"] modes of the Revised Project
- Noise reduction and mitigation measures (including NRO)
- Available information with respect to background (or ambient) sound data
- Sound power levels by wind speed and by octave band
- Annual and seasonal wind rose for each MET tower
- Annual and seasonal wind shear and turbulence intensity
- Low frequency noise
- Post-construction monitoring protocols
- Complaint Resolution Protocols and the proposed Oakfield Wind Energy Review Operations Ordinance
- Miscellaneous noise issues relevant to the Revised Project

In addition to the above, the Committee has provided a summary of other projects in Maine that have been permitted and constructed, with the purpose of avoiding future potential issues associated with the Revised Project.

B. Analysis of Evergreen II's Predictive Noise Model and Compliance with Regulations

The applicant retained Bodwell EnviroAcoustics LLC to prepare a sound level study for this project, which is found in Section 5 of the Maine DEP application and is attached as *Appendix C* to this report. As part of this study, sound levels from the proposed project were modeled and compared to the existing Maine DEP Chapter 375.10 regulations. A copy of these regulations is attached as *Appendix D*.⁵

Modeling was conducted assuming the installation of 50 Vestas V112-3.0 MW wind turbines. The maximum rated sound power from the V112 is 106.5 dBA compared with 104 dBA from the previously permitted General Electric [“GE”] 1.5 MW wind turbine. While the overall sound power in the Revised Project has increased, the applicant provided a lower density of wind turbines in critical areas, and selective use of “noise reduced operating modes,” which will be discussed later in this section.

Other than the turbine locations and respective sound power, the noise report uses the same modeling parameters used for the GE 1.5 MW turbines in Oakfield I, the original application. These included:

- Use of the Cadna A computer model, an implementation of the ISO 9613 standard;
- Use of the mean sound power at the wind speed with the highest sound output from the V112 with 5 dBA added to account for turbine and model uncertainty;
- Setting a ground absorption factor for an equal mixture of hard and soft ground ($G=0.5$), except for water bodies which are set as hard ground ($G=0$).

In a separate proceeding, the applicant's sound expert conducted post-construction modeling at Stetson I and II,⁶ and compared the results with the model predictions. They found that, using the same ground absorption factor and 5 dBA addition to turbine sound power levels, the model overpredicted actual turbine sound levels by about 3 dBA or more. The Committee's expert reviewed these results and found this to be good evidence that the model used for Oakfield is likely to be similarly conservative.

⁵ For more information on the Maine DEP noise standards, see pp. 14-21 of the Committee's Final Report dated September 4, 2009, available at <http://oakfieldme.org/vertical/Sites/%7BD2794B8C-60B4-4246-A7A2-B97C2A034DA9%7D/uploads/%7BA4C2873F-C6D4-4193-9916-5FDC78EA6ED9%7D.PDF>.

⁶ Stetson I and II are previously permitted and constructed wind energy projects located in the unorganized territory of Washington County, Maine, near the Town of Danforth.

In the applicant's Maine DEP application for the Revised Project, sound receptors were placed at various representative protected locations. A protected location is generally defined as a location within an adjacent property which includes a residence, place of worship, school, library, hospital, nursing home, or designated park land that is accessible by foot. The daytime standard of 55 dBA is applied at all parts of a protected location, but the nighttime standard of 45 dBA is applied no more than 500 feet from the living and sleeping quarters on the subject land. This means that on large lots, the receptor is placed as much as 500 feet from the residence, but on small lots, the receptor is placed at or near the subject property line, which can be much closer than 500 feet from the residence. The Committee discussed concerns associated with locations on Thompson Settlement Road where the property lines are less than 500 feet from the dwelling. These dwellings are near the northern turbine group where several turbines are proposed to be operated in NRO.

The results of the modeling show that the predicted hourly sound levels at non-participating protected locations can exceed 45 dBA, the Maine DEP nighttime standard. As a result, the applicant has proposed implementing "noise restricted operation" ["NRO"] to reduce the predicted nighttime sound level to 45 dBA or below. With NRO, automatic controls are implemented to change the pitch and rotor speed to lower the sound power of the turbine. The amount of NRO can be adjusted to obtain a 1 dBA to 4 dBA reduction in sound. Five turbines would be in NRO 1, five in NRO 2, and one in NRO 4. With NRO, all regulated protected locations are modeled to be at or below 45 dBA at night.

It should be noted that this does not mean that 45 dBA is achieved at 500 feet from all homes. In particular, at homes along Thompson Settlement Road, those with smaller properties, the predicted sound level exceeds 45 dBA within 500 feet. The Committee understands that non-participating homes along Nelson Road, South Road, Brown Road, Ridge Road, and Spaulding Lake Road have nighttime sound contours (with NRO) that are at or below 45 dBA within 500 feet of the non-participating homes.

The applicant was asked what additional steps could be taken for predicted sound levels to meet 45 dBA at 500 feet from these dwellings on Thompson Settlement Road. The response was that three turbines that are currently at NRO 1 and NRO 2, N13 to N15, if necessary, could be increased to NRO 4, and that no turbines would have to be eliminated. The applicant was asked to consider this as part of an agreement with the Town, but that this additional level of NRO be conducted only under winds from the south or southeast (blowing from the turbines toward these homes). With this in place, the predicted nighttime sound levels at these locations just outside homes is 44 dBA or less, and within 500 feet is 45 dBA or less.

Except for Fox Island Wind in Vinalhaven, NRO has not been used on wind turbines in Maine before. However, several recent applications have proposed NRO, including Spruce⁷ and Highland.⁸ Spruce has obtained a permit from DEP assuming the use of NRO as a valid method to attenuate noise. In addition, the applicant has obtained a guarantee from Vestas on the sound output during NRO modes. (*See Section 5, page 36, of Evergreen II's 2011 Maine DEP Application.*) As a result, the Committee accepts the NRO mitigation proposed by the applicant with the application of possible NRO 4 to those three additional turbines (N13 to N15) under certain wind conditions as needed to meet 45 dBA within 500 feet of the five specified dwellings on Thompson Settlement Road as described above or with substantial evidence (including collected sound data) that demonstrates noise will not exceed 45 dBA within 500 feet of the dwellings on Thompson Settlement Road, regardless of the location of property lines.

The Committee requested additional information on the number of homes where predicted sound levels exceed 55 dBA, 50 dBA, and 45 dBA. The applicant provided a table showing 4 participating camps where predictions exceeded 55 dBA during the day. At night two additional participating camps (not owned by Evergreen II or First Wind) predictions exceeded 50 dBA, and 19 participating dwellings (camps and homes) predictions exceeded 45 dBA. Based on post-construction monitoring at Stetson provided by the applicant, the Committee is comfortable that actual sound levels under full turbine sound output and site conditions favorable to sound propagation will nonetheless be within limits. The Committee has provided this information in *Appendix E* of this report, so that participating landowners can know what to expect if the Project is approved by the Maine DEP, constructed, and operated.

C. Low Frequency Noise

The applicant's noise study in its Maine DEP amendment application did not evaluate low frequency sound or infrasound as part of its standard Maine DEP application. Instead, the application includes a statement that "Independent research and testing have indicated that impacts from infrasound and low frequency sounds from wind turbines are uncommon and not likely to be of concern from a properly sited, designed, and operated wind energy facility." (*See Appendix C, Section 5, page 27, of Evergreen II's Sound Level Study contained in its 2011 Maine DEP Application.*) Although low frequency sound is not specifically regulated by Maine DEP 375.10, the Committee asked the applicant to conduct an evaluation of low frequency noise with respect to other commonly accepted standards.

⁷ The Spruce Mountain Project is a permitted wind energy facility in the Town of Woodstock, which is located in Oxford County, Maine. A copy of the permit is available at, http://www.maine.gov/dep/blwq/docstand/sitelaw/Selected%20developments/Spruce_Mountain/order.pdf

⁸ The Highland Wind Project is a proposed wind energy facility in Highland Plantation, which is located in Somerset County, Maine.

The applicant responded on August 19, 2011 with additional quantitative analysis of low-frequency noise to determine whether there was any potential to create moderately perceptible noise-induced building vibration. The analysis looked at impacts at the 31.5 and 63 Hz octave bands compared to ANSI S12.2-2008, “Criteria for Evaluating Room Noise.” The results showed that at all modeled receiver points, daytime and nighttime low frequency sound level predictions were below the ANSI criteria, even considering that many of these points are up to 500 feet from individual homes of non-participating landowners. These results are attached as *Appendix F*.

The Committee then asked the applicant to provide this same information for project participants. This additional data showed that predicted sound levels at 31.5 Hz exceeded the ANSI criteria at 18 structures located on participating landowners’ properties. Of these, 12 are camps, 2 are unoccupied homes, one is uninhabitable, and the remainder were owned by Evergreen II or First Wind. No occupied year-round dwelling exceeded the ANSI standard. This information is also provided in *Appendix F*.

Based on this information, the Committee does not anticipate low frequency noise to be problem at non-participating dwellings; however, for participating properties, predicted low frequency sound levels will be above guidelines for noise-induced building vibration.

The Committee has provided the above low frequency information, so that landowners, including individual participants in the project, know what to expect if the Revised Project is approved by the Maine DEP, constructed, and operated.

D. Short Duration Repetitive Sounds

The applicant is proposing the Vestas V112 as a replacement to the GE wind turbine used in Oakfield I, the original application. One of the major differences between the two turbines is that the rotor diameter of the V112 is 112 meters (or approximately 367 feet), compared with the GE at 77 meters (or approximately 253 feet). This represents roughly two times the sweep area of the former turbine. In addition, the V112 nacelle sits atop a slightly higher tower for a hub height of 84 meters or approximately 276 feet) compared to the GE (80 meters or approximately 262 feet).

The Committee is concerned that the larger turbine will exhibit more amplitude modulation than previously generated by the GE wind turbines. The rotors will sweep higher in the sky to capture faster winds, but also lower towards the ground which generally has slower winds creating a modulating sound at each blade passage. At high modulation levels, this can lead to “short duration repetitive sounds” [“SDRS”] as defined by Maine DEP 375.10. Testing of the GE turbines at Stetson II under high wind shear and worst case for sound indicated only minimal SDRS events.

The Committee asked the applicant to provide additional information on the potential for SDRS, given the proposal to substitute the Vestas V112 turbines for the GE 1.5 MW turbines. The applicant and the Committee asked Vestas, as well. After a thorough literature search, the applicant's expert, Vestas, and the Town's acoustical consultant could not confirm whether amplitude modulation would increase with the V112. Vestas offered that the pitch of each blade is independently optimized. In this way, when the blade is at the top of the rotation, it is pitched to be optimized at the higher wind speed, but when it is at the bottom of the rotation, it is pitched to be optimized for the lower wind speed.

Since the level of SDRS is unknown for Vestas V112 wind turbines, the Committee recommends that SDRS monitoring be incorporated into the post-construction monitoring program. In addition, the applicant's expert indicated that some research suggests cross-wind directions can be worse for SDRS, and recommended SDRS measurements under cross-wind conditions. As such, the Committee recommends that some data be collected when the wind is approximately perpendicular to the line between the receivers and turbines.

The Committee's other concern regarding SDRS was that winds that run parallel to the ridge could cause turbulence increases due to the wake effects of upwind turbines. This could potentially lead to increased noise and amplitude modulation. The Committee asked for information as to whether turbines will be shut down during these events. The applicant provided the Committee's expert with a sector curtailment plan under a non-disclosure agreement and, at a public meeting, both Vestas and the applicant's expert confirmed that sector curtailment will be used to shut down select turbines under some wind directions and wind speeds.

Other factors have the potential to contribute to higher sound levels and a greater potential for SDRS. These could include wind shear and naturally occurring turbulence. The Committee requested that data from the project MET towers be analyzed to assess whether this site is unusually turbulent or subject to extremely stable atmospheric conditions. Under a non-disclosure agreement, the applicant provided detailed information to the Committee's expert, and presented a summary to the Town. The applicant found that the likelihood of extremes in turbulence intensity and wind shear was similar to that found in Stetson Wind where only minimal SDRS events were found. As a result, the Committee concludes that the likelihood of SDRS and excessive noise from naturally occurring wind shear and turbulence in Oakfield is similarly low.

E. Post-Construction Monitoring

The Maine DEP quiet noise standards will be in place to protect Oakfield residences from undue adverse sound levels during operation of the proposed wind energy facility. However, because the Maine DEP noise standards were not specifically intended to address potential adverse effects from wind energy facilities, and due to inherent uncertainties with predictive sound modeling, there should be a monitoring plan to address the measurement of sound levels as part of assuring compliance with the Maine DEP noise standards. A monitoring plan should:

- Address both standard post-construction monitoring and complaint resolution;
- Address each type of noise regulated by the standard, including overall sound levels, amplitude modulation (SDRS), and tonal sound;
- Collect enough information to evaluate upset or other conditions that could lead to complaints;
- Require testing during times when the turbines are generating their maximum sound power;
- Require testing during meteorological conditions that are favorable to sound propagation or that are conducive to complaints by neighbors;
- Use industry standard practices for equipment sensitivity and accuracy;
- Include simultaneous monitoring of wind speed and wind direction at the turbine hubs and representative of the sound measurement locations;
- Allow for reasonable forecasting of the proper conditions favorable for monitoring;
- Allow for appropriate flexibility within specified constraints;
- Be conducted under repeatable conditions; and
- Allow for appropriate response times in the case of complaints.

The Maine DEP approved the protocol that was agreed to between the Town and First Wind in Oakfield I. The only exception was that the Maine DEP's consultant recommended monitoring at six locations compared to the Town recommending two or more locations chosen in consultation with Maine DEP.

For the Revised Project, the applicant's expert has proposed that a sound testing protocol similar to that agreed to in Oakfield I be implemented. The Committee agrees. However, given the increased size of the project, the Committee requests that the applicant monitor more than two locations. These locations would be chosen in consultation with Maine DEP, and the Town. The locations shall initially include at least one monitoring location on or near the following roads:

- Spaulding Lake Road;
- Brown Road;
- Nelson Road; and
- South Road

At its meeting on September 26, 2011, the Committee also discussed whether more than one monitoring station may be needed on the Thompson Settlement Road, due to the number of non-participating residences and their proximity to proposed wind turbines. The Committee's consultant recommended that two monitoring stations on the Thompson Settlement Road may be needed, which the Committee believes is a reasonable request. Accordingly, the Committee recommends that two monitoring stations on or near the Thompson Settlement Road be required in any post-construction monitoring protocol.

F. Complaint Protocol

The applicant has agreed to use the same Sound Complaint Response and Resolution Protocol negotiated by the Town in Oakfield I. A copy of this protocol is provided in *Appendix G*. This is the same protocol recommended by the Committee as referenced in a proposed Wind Energy Facility Operations Ordinance, which is discussed below in the next section of this report. The purpose of the Oakfield Sound Complaint Response and Resolution Protocol is to:

- (1) Provide a transparent process for reporting sound complaints to Evergreen II/First Wind;
- (2) Provide a consistent approach to documenting complaints and to inform subsequent monitoring efforts;
- (3) Provide a process for informing the Town and the Maine DEP of sound complaints.

Once a complaint is received, Evergreen II will provide a response, which will depend upon the particular set of circumstances contained in the complaint. Responses may include:

- (1) a site visit to the location of the complaint;
- (2) an inspection of the wind turbines operating near the location of the complaint;
- (3) informal sound monitoring and sound evaluation; or
- (4) formal sound monitoring and sound evaluation.

In the event Evergreen II conducts formal sound monitoring at a complaint location, it will notify the Town ahead of time and will provide the results to the Town. If Evergreen II conducts a visit to the complainant, or informal sound monitoring at a complaint location, it will undertake best efforts to notify the Town Manager and the Town Complaint Review Officer and allow him or her to observe. In any event, the results of the response to the sound complaint will be available for the Town's review.

The Maine DEP or Evergreen II may require sound monitoring as part of this protocol as a result of sound complaints. If sound monitoring is undertaken to determine if the Oakfield wind energy facility meets the quiet level noise standards, Evergreen II will first provide an appropriate test protocol to both the Town and the Maine DEP for review and comment and then report the testing results of the approved protocol. If the results indicate that the Oakfield wind energy facility is not in compliance, Evergreen II must submit a revised wind energy facility operation protocol to the Maine DEP that will demonstrate compliance with the Maine DEP noise standards.

The Committee has concluded that the Oakfield Wind Project Sound Complaint Response and Resolution Protocol, in conjunction with the Oakfield Wind Energy Facility Operations Ordinance explained below, is designed to adequately identify and formulate a response to any future noise issues associated with the proposed wind energy facility. In that regard, the Complaint Protocol has been modified to incorporate the Committee's recommendations in support of the Operations Ordinance, which is attached as *Appendix H*.

As a result, the Committee recommends that the Selectmen request the Maine DEP to accept and require the version of the Complaint Protocol attached in *Appendix H*, if Evergreen II's amendment application is approved. In that regard, attached is the form of the proposed letter from Evergreen II to the Maine DEP. The Committee further recommends that the Selectmen endorse the Oakfield Wind Energy Facility Operations Ordinance for adoption at Town Meeting to provide the Town with an opportunity to independently address any future noise issues through a local control measure.

G. Proposed Oakfield Wind Energy Facility Operations Ordinance

One of the major concerns of the Committee in the past was that it was relying on the Maine DEP to enforce provisions of the noise standard. The concern was, in part, that the DEP may be slow in responding to actions requiring immediate resolution.

As a result, the Committee is recommending that the proposed Oakfield Wind Energy Facility Operations Ordinance be adopted by the Town. The ordinance provides for the creation of a new Complaint Review Officer, who will have the authority to

enforce provisions of the ordinance and issue Notices of Violation (NOVs) to the wind energy facility operator. The proposed ordinance states, in part,

“Upon any failure of the Operator to maintain compliance with the Site Law Permit, the Complaint Review Officer may issue a written Notice of Violation to the Operator describing the alleged violation and penalties imposed, if any. With respect to compliance with Site Law Permit conditions governing sound, all sound complaints shall first be processed and administered in accordance with the Sound Complaint Protocol. If the Complaint Review Officer determines that the Sound Complaint Protocol has not satisfactorily resolved a sound complaint and that the wind energy facility is not in compliance with the Site Law Permit conditions, the Complaint Review Officer may issue a written NOV to the Operator. Upon issuance of a written NOV, the Complaint Review Officer may informally meet with the Operator to address any violation. If the violation has not been abated or corrected within the specified time, the Complaint Review Officer shall report same to the Board of Selectmen for enforcement.”

A copy of the proposed Oakfield Wind Energy Facility Operations Ordinance is provided in *Appendix I*.

With the provisions of this Ordinance in place, the Town of Oakfield will obtain greater authority and control in enforcing provisions of any approved Site Law permit, and can work more closely with the wind energy facility operator in resolving complaints in a satisfactory and timely manner.

Accordingly, the Committee recommends that the Selectmen endorse the Oakfield Wind Energy Facility Operations Ordinance for adoption at Town Meeting to provide the Town with an opportunity to independently address any future wind energy facility issues through local control.

H. Maine Board of Environmental Protection Recommended Rules Revisions

The Maine Board of Environmental Protection [the “BEP”] recently made a recommendation to the Maine Legislature to modify Chapter 375 Section 10 of the Department of Environmental Protection Rules relating to noise standards for wind projects. A copy of these proposed rule changes is provided in *Appendix J*. The rule changes are summarized as:

- Establishing a daytime noise standard of 55 dBA and nighttime noise standard of 42 dBA. This is calculated as an average of twelve 10-minute equivalent sound level measurements rather than the highest single 10-minute interval.
- Defining a modeling protocol to include mixed ground ($G=0.5$) plus inclusion of an uncertainty factor based on the manufacturer's recommendations to account for sound power uncertainty plus another 0 to 2 dBA to account for model uncertainty in inland terrain.
- Definition of SDRS and revisions to how and when tonal and SDRS penalties are applied
- Requiring sound monitoring once during the first year of operation, and then every fifth year until decommissioning
- Detailing requirements for submission of information to DEP
- Detailing requirements for a complaint resolution protocol
- Detailing the monitoring requirements

Currently, these changes have not yet been approved by the Maine Legislature and Evergreen II's Revised Project may not be subject to the amended rules, since Evergreen II's completed application is now being reviewed by the Maine DEP. Nevertheless, the Committee has reviewed the proposed rules to determine whether it should change its recommendations to the Board of Selectmen as to any additional conditions it may want to recommend. The Committee's review is summarized as follows:

1. **Proposed New Nighttime Noise Standard** – The BEP approved a change in the nighttime noise standard at protected locations from 45 dBA to 42 dBA. At the same time, however, the BEP recommends lowering the conservative factors added to the modeling results from a total of plus 5 dBA to plus 2 dBA to 4 dBA for projects located on inland ridgelines. As a result, the highest modeled nighttime levels in Oakfield would range from 42 to 44 dBA depending on the level of conservatism chosen by the applicant and accepted by Maine DEP. Given the results of the Stetson monitoring, which found that the current modeling may be overpredicting noise by at least 3 dBA, and the allowance of BEP to reduce the modeled levels by as much as 3 dBA, the Committee feels comfortable that an average nighttime sound level of no more than 42 dBA at regulated protected locations will be achieved under the recommended NRO mitigation plan. The sound level limit for the highest 10-minute equivalent sound levels (LAeq) from the project remains 45 dBA during nighttime hours.

In addition, the Committee heard testimony regarding areas where there have been noise complaints from constructed and operating wind energy facilities in Maine.

For example, in Vinalhaven, a coastal community, they found that the conservative factors (such as the plus 3 dBA adjustment factor) were not used in the predictive modeling and, what may be due to excessive coastal wind shear, the monitored levels on at least one nearby home exceeded the 45 dBA nighttime noise standard. Conversely, the predictive modeling for the Revised Project included these conservative factors, such as the 3 dBA adjustment factor.

At Mars Hill, the 45 dBA standard was waived by a variance, with the result that monitored sound levels at protected locations exceeded 45 dBA. Conversely, the 45 dBA standard will not be waived for the Revised Project. The Committee also heard testimony that if modeling was performed to predict sound levels from Mars Hill using the same parameters at Oakfield, most reported complaints would be modeled as 45 dBA or above.

The Committee reviewed an article published online suggesting that the modeling performed for the original Oakfield Project (Oakfield I) may have predicted low noise levels when compared with the Mars Hill Wind Project.⁹ The Committee and its expert looked further into the author's comparison to see if any changes should be made to the modeling performed for the Revised Project (since it uses many of the same parameters as Oakfield I).

Based on its review, the Committee determined the following:

1 – It is not accurate to compare measured sound levels and model predictions from one project to another based on turbine setback distance alone. There are many factors that affect sound levels over distance at Mars Hill that are different from Oakfield, the largest being the spacing and arrangement of the wind turbines. As a result, the sound level at different receptor points located the same distance from the closest wind turbine can vary significantly. Terrain can also have an effect, which was not taken into account in the published article.

⁹ See "Oakfield Wind: Might the Model be Too Low?", available at, <http://randacoustics.com/oakfield-wind/>.

2 – The maximum sound level for the one location about a mile from Mars Hill was taken from the Quarter 1 monitoring for that project. On review, the Maine DEP peer review identified the necessity to screen out from the Quarter 1 results other contributing factors beyond turbine sounds, including the lack of ground level anemometers and the use of small wind screens that are inadequate for higher winds. If these Quarter 1 monitoring results are removed and Quarters 2, 3, and 4 results are evaluated, the maximum level measured at the distances reported in the article are reduced from 44 dBA to 38 dBA. (See also *Mars Hill Wind Farm, Mars Hill, Maine, Sound Level Study, Compilation of Ambient & Quarterly Operations Sound Testing, dated October 15, 2008.*)¹⁰

3 – The final Mars Hill post-construction study shows that a model with a plus 5 dBA factor added to the turbine sound power levels, as is done in Oakfield, would have included all measured results.

4 – The health effects cited in the chart are largely unsupported at the lower sound exposures.

Collectively, this gives the Committee confidence that the 45 dBA nighttime noise limit applied by the Applicant to the Revised Project is appropriate and consistent with both the current and potential future Maine DEP noise rules. The Committee recognizes, however, that wind turbine noise will be audible at many residences, and meeting the regulations may not eliminate complaints from some.

2. **Modeling Protocols** – The modeling protocol in the BEP’s proposed rules is less conservative than what has been used in both Oakfield applications (the original Oakfield I Application and the Revised Project Amendment Application). It allows up to a 3 dBA lower modeling adjustment factor and attenuation due to forestation. No forestation attenuation was assumed in either of the Oakfield applications. Other protocols are consistent with the Oakfield applications, including adjustment to the manufacturer’s sound power to account for uncertainty, modeling consistent with a point source at hub height, attenuation due to ground absorption and terrain, and the assumption of mixed hard and soft ground
3. **Changes to the SDRS standard** – The BEP approved significant changes to how SDRS and tonality penalties are applied. The full 5 dBA SDRS

¹⁰ Available at, http://www.maine.gov/dep/blwq/docstand/sitelaw/Selected%20developments/Mars_Hill/cumulative_monitoring_report.pdf.

penalty is now applied if more than 5 SDRS events (typically one second each) are recorded over a 10 minute period, and the level of amplitude modulation defining SDRS was reduced from 6 dBA to 5 dBA. The current standard allows for SDRS penalties to apply only to sound levels of the SDRS events and not the 10-minute sound level. While the Committee believes that there are problems with the way the SDRS rules are currently applied to wind energy facilities, the new rule does not necessarily address these problems. However, the Committee is not proposing new rules to address SDRS, and will rely on any permit condition granted by the Maine DEP in this regard.

4. **Changes to the Tonal Sounds Standard** – The BEP is also proposing to change the tonal sounds standard by applying a tonal penalty to the entire 10-minute period if the 10-minute one-third octave band sound levels (Leq. dB) meets the definition of a tonal sound. This is different from the current regulation which has been interpreted to only apply the penalty to the seconds at which tonal sounds are present or to the tonal sound component. In the Committee’s report for Oakfield I, it opposed the current interpretation of the standard, writing, “the Committee does not believe this interpretation of the 5 dBA penalty standard represents an approach that is adequately protective of the local community in Oakfield.” (*See p.18 of the Oakfield Wind Energy Review Committee’s Final Report dated September 4, 2009.*)

The Committee further recognizes that, in a well-designed and properly operated and maintained wind energy facility, prominent discrete tonal sounds, regardless of the existence or rigor of the applicable regulations, should not occur. As a result, the Committee recommends that (1) prominent discrete tonal sounds, including those that implicate the Maine DEP standards and any permit conditions, should be mitigated, (2) the Oakfield Wind Project Sound Complaint Response and Resolution Protocol will help identify such tonal sounds, (3) the proposed Oakfield Wind Energy Facility Operations Ordinance, if adopted, will also help to address such tonal sounds, and (4) with these understandings, there will be sufficient measures in place to address potential tonal sounds from the Revised Project, if approved, constructed, and operated.

I. Recommendations Including Appropriate Actions

1. *Low-Frequency Sound*

The Committee recommends that Evergreen II gather low-frequency data during all sound level measurements consistent with the Maine DEP noise standards. This will provide sufficient data in the event low-frequency sound levels require further analysis. In addition, the Committee recommends that Evergreen II address the ANSI standard S12.2-2008 for moderately perceptible acoustically induced vibration and rattle in the 16 Hz through 63 Hz whole octave bands. Sound levels exceeding ANSI specified levels will require further investigation to determine their cause.

APPROPRIATE ACTION: Evergreen II should collect 1/3 octave band data during monitoring carried out in accordance with Chapter 375.10 and the testing protocol. 1/3 octave band data should be reported as ten-minute equivalent sound levels (Leq) and extend at least to 20 Hz. 12 Hz is the lower third octave band limit in response to complaints of acoustically induced building vibration or rattle. For monitoring conducted in accordance with the Maine DEP noise standards, Evergreen II will report the 10-minute equivalent C-weighted sound levels (LCeq) to the Town of Oakfield for informational purposes only.

2. *Post-Construction Monitoring*

The Maine DEP quiet noise standards will be in place to protect non-participating Oakfield residences from undue adverse sound levels during operation of the proposed wind energy facility. However, because the Maine DEP noise standards were not specifically intended to address potential adverse effects from wind energy facilities, and due to inherent uncertainties with predictive sound modeling, there should be a monitoring plan to address the measurement of sound levels as part of assuring compliance with the Maine DEP noise standards. The monitoring should include provisions to report the overall sound level, SDRS events, and tonal sounds.

APPROPRIATE ACTION: Evergreen II should seek concurrence from the Maine DEP that any required post-construction monitoring protocol be consistent with the following (and if the Maine DEP does not require post-construction monitoring then Evergreen II

should nonetheless implement a post-construction monitoring protocol consistent with the following): within 12 months from when the project commences operation, First Wind shall conduct sound monitoring at six representative locations around the project; one sound monitoring station shall be located on or near each of the following roads: (i) the Spaulding Lake Road, (ii) the Brown Road, (iii) the Nelson Road, (iv) the South Road; with (v and vi) two sound monitoring stations shall be located on or near the Thompson Settlement Road. Specific locations of each monitoring station shall be chosen in consultation with the Maine DEP and the Town of Oakfield based on how well they represent local meteorology and their relative noise impact from the wind turbines (highest potential to exceed the applicable noise standards). In addition, special consideration shall be given to landowners that have registered sound complaints. Following the initial demonstration of compliance, the number of monitoring locations may be reduced in consultation with the Town and approval by the Maine DEP if it is determined they are not necessary to demonstrate compliance. The existing permitted protocol shall be followed, which includes provisions to monitor for overall sound level, SDRS events, and tonal sounds.

For any wind turbines in which NRO will be implemented, Evergreen II shall not reduce the degree of NRO without first providing substantial evidence (including collected sound data) to the Town and the Maine DEP demonstrating that sound levels will not exceed the 45 dBA nighttime and 55 dBA daytime noise limits including at locations within 500 feet of the dwellings on Thompson Settlement Road discussed above (regardless of the location of the property lines on those parcels). If NRO is reduced, then Evergreen II shall follow-up with additional compliance monitoring at affected locations.

Sound levels (dB) from wind turbines will be compared to ANSI S12.2-2008 indoor acoustically-induced moderately perceptible vibration and rattle standard for octave band frequencies up to 63 Hz. C-weighted sound levels will be reported for information purposes only.

3. Complaint-Based Sound Measurement and the Process for Remedial Action

A major concern of the Committee is how any future noise issues will be identified and resolved in order to prevent any continuing adverse effects caused by sound generated by the proposed wind energy facility.

The Committee has concluded that the Oakfield Wind Project Sound Complaint Response and Resolution Protocol and the Oakfield Wind Energy Facility Operations Ordinance are designed to adequately identify and formulate a response to any future noise issues associated with the proposed wind energy facility. As a result, the Committee recommends that the Selectmen request the Maine DEP to accept and require this protocol attached as *Appendix H*, if Evergreen II's amendment application is approved.

APPROPRIATE ACTION: **The Selectmen shall request that the Oakfield Wind Project Sound Complaint Response and Resolution Protocol attached in *Appendix H* be included in the Maine DEP permit as a condition of approval, and recommend that the Town Meeting approve the Wind Energy Facility Operations Ordinance (which allows the Town to enforce provisions of the Protocol and to take additional measures to address any future sound complaints).**

4. Overall Sound Levels

The Committee believes that it is important for the proposed wind energy facility to adhere to the overall quiet level noise standards (45 dBA and 55 dBA during the nighttime and daytime, respectively) and that it is sensible that any turbine sounds exceeding these limits be appropriately addressed.

APPROPRIATE ACTION:

Sound Emissions: The Committee recommends that Evergreen II take affirmative steps so that the V112 turbines will perform within stated limits on overall sound power. As reflected in its application, Evergreen II expects the Vestas V112 3.0 MW turbines to operate consistent with a maximum continuous sound power output of 106.5 dBA (+/- 2 dBA), except in applicable NRO modes. The Committee recommends that Evergreen II increase nighttime NRO as needed and up to a 4 dBA reduction in turbines N13, N14, and N15 when winds are from the south or southeast, or produce substantial evidence (including collected sound data) that noise levels will not exceed applicable DEP limits and the 45 dBA at night or 55 dBA during the day within 500 feet of the dwellings on Thompson Settlement Road discussed above (regardless of the location of the property line).

5. *Tonal Sound*

The Committee and Evergreen II have different views on how to apply the Maine DEP tonal sound penalties. Regardless, prominent discrete tones should not occur in a well-operated wind energy facility and, if they do develop, the best practice is to mitigate and eliminate these tones. The Committee recommends that Evergreen II utilize Vestas V112 3.0 MW turbines that reflect appropriate design adjustments to minimize the potential for tonal sounds. In this regard, Vestas has warranted that the turbines will not generate tonal sounds during either full or NRO operations. The Committee understands from Evergreen II that there will be measures in place to minimize the likelihood that tonal sounds will occur and if they do occur, that they will be adequately addressed.

APPROPRIATE ACTION:

If prominent discrete tonal sounds occur or are reasonably suspected to have occurred, Evergreen II shall perform a timely investigation to determine if the wind energy facility is properly operating or has been properly maintained, and determine if any applicable sound limits have been exceeded, as determined in accordance with the Maine DEP protocols for determining compliance, including but not limited to the Maine DEP's interpretation and application of any tonal or SDRS penalties. For tonal sounds that cause an exceedance of the

applicable sound limits, Evergreen II shall promptly notify the Maine DEP and the Town of Oakfield. Evergreen II shall then expedite an investigation of the sound level exceedance and the associated tonal sound and develop a mitigation plan, and a schedule to achieve compliance with the applicable sound level limits. Evergreen II shall provide copies of the mitigation plan to DEP and the Town, implement the mitigation plan and provide a written report describing the action(s) taken and new measurement results that demonstrate compliance. Mitigation options could include reduction of the overall sound level and/or the tonal sound component.

6. Applicable Nighttime Noise Standard

The Committee recommends that the proposed wind energy facility adhere to the more restrictive 45 dBA nighttime standard, even if the pre-development ambient (or background) sound levels are shown to be greater than 35 dBA.

APPROPRIATE ACTION: Evergreen II shall specifically state in its applications to the Maine DEP that its proposed development will comply with the 45 dBA quiet limit during nighttime hours, even if the pre-development ambient sound level is shown to be greater than 35 dBA.

7. Applicable Daytime Noise Standard

The Committee recommends that the proposed wind energy facility adhere to the more restrictive 55 dBA daytime standard, even if the pre-development ambient (or background) sound levels are shown to be greater than 45 dBA.

APPROPRIATE ACTION: Evergreen II shall specifically state in its applications to the Maine DEP that its proposed development will comply with the 55 dBA quiet limit during daytime hours, even if the pre-development ambient sound level is shown to be greater than 45 dBA.

II. Wildlife & Natural Resources

A. Wildlife

The nature and size of Evergreen II's Revised Project presents a potential for adverse impacts to wildlife. Evergreen II's application to the Maine DEP includes an assessment of the potential impact to a variety of wildlife species associated with the construction of the proposed facilities, including consultation with the Maine Department of Inland Fisheries and Wildlife with respect to the habitat of threatened or endangered species. Aside from limited impacts to wetland habitats (discussed below) the screening process has identified little in the way of potential for permanent impact. During the ensuing operational phase of the project the primary area of potential impact relates to the potential for bird and bat mortality from encountering the turbine blades (avian strikes).

1. Bird and Bat Considerations

The application materials submitted to the Maine DEP include reports that discuss monitoring for bird and bat populations and flight patterns within the project area, as well as anticipated mortality estimations when the proposed wind energy facility is operating. Based on visual and radar-based observations, coupled with observed mortality levels at other facilities, Evergreen II's consultants have projected bird and bat strikes to be at levels typically determined to be reasonable for this type of project.

2. Post-Construction Monitoring

Evergreen II's application to the Maine DEP states post-construction monitoring of bird and bat strikes will be conducted for a period of 3 of the first 5 years after the wind farm commences operation.

APPROPRIATE ACTION: **The Committee recommends that the Selectmen ensure Evergreen II complies with the Maine DEP's post-construction monitoring conditions for monitoring bird and bat strikes.**

B. Natural Resources

Given the presently undeveloped nature of the project area, there is the potential for adverse impacts to a variety of natural resources. Evergreen II's application to the Maine DEP includes an inventory of the natural resources that exist within the project area. Types of natural resources include wetlands (based on state and federal

jurisdictional guidelines) and the potential existence of rare or threatened species of vegetation. The application included the results of queries to the Natural Areas Program located within the Maine Department of Conservation. Evergreen II's project is not expected to impact rare or endangered plant species, and the project layout has been developed to minimize impacts to jurisdictional wetlands and waterbodies. While two plant species of Special Concern were found within the overall project area, the project is expected to have little direct impact to their populations.

1. Wetlands

While the layout for the proposed windfarm appears to have been developed in a way that minimizes impacts to jurisdictional wetlands, it appears that the construction of roadways to access the facilities will need to include several wetland and stream crossings. Where possible, Evergreen II has sited the proposed crossings to coincide with existing woods roads and included other measures to minimize impacts to the associated wetland and aquatic habitats.

2. Buffers

Based upon its review, the Committee has concluded the proposed facilities and activities of the project will include appropriate buffers to protect natural resources.

III. Stormwater Management

Projects of this nature and magnitude possess the potential for several types of stormwater-related impacts. They include: sediment transport during (and immediately following) construction, increases in long-term erosion potential due to concentrating flows along new roadways and increases in peak rates of runoff onto adjacent properties.

Mitigation: The application for state approval of the project includes an evaluation of stormwater runoff quantities and patterns, as well as proposed measures to address soil erosion and sediment transport. In general, Evergreen II's proposal relies on discharge of concentrated flows via plunge pools and level spreaders to re-convert runoff to sheet flows, as well as maintenance of vegetated buffers for compliance with the Maine DEP's Chapter 500 stormwater rules. The proposal for erosion control is outlined based on the Basic Standards as set forth by the Maine DEP. The Committee has concluded that these standards, if properly implemented, will be adequate.

Construction Monitoring: It is the Committee's understanding that the Maine DEP will require the provision of a "third-party inspector during construction to ensure that stormwater and erosion control measures are constructed and maintained in accordance with the approved design materials."

APPROPRIATE ACTION: The Selectmen shall request in writing that the Maine DEP use a third party inspector (to be selected by the Maine DEP in consultation with the Town) to review and ensure the stormwater and erosion control measures are constructed and maintained in accordance with the approved design materials.

IV. Blasting

Blasting is the practice of breaking up ledge or rock material through the use of explosives. Evergreen II anticipates that blasting will be required as part of the site preparation to accommodate the proposed 50 wind turbines in their planned locations (40 proposed within Oakfield). In addition, Evergreen II anticipates that blasting may be required for road construction and the placement of underground power lines.

Blasting is an important consideration because it may cause (1) vibrations that affect the structural integrity of buildings or wells; (2) sound and noise that is annoying; (3) flying debris that may cause serious bodily injury; and (4) the destruction of unique natural areas..

Mitigation: Evergreen II's application materials submitted to the Maine DEP indicate that all blasting will be done in conformance with guidelines published by the U.S Department of the Interior and that a pre-blast survey will be completed for any structures within 2000 feet of any blasting operations. Under the Maine DEP regulations, only landowners within 1000 feet must be given notice of any blasting under the Maine DEP regulations – even though pre-blast surveys must be completed for structures within 2000 feet. Moreover, since there are few or no structures within 1000 feet of any anticipated blasting areas, it is unlikely that any notices will be required under the Maine DEP regulations.

During the Oakfield I review process, Evergreen II agreed to include bedrock wells in all pre-blast surveys as well as provide written notices to the Town and all affected landowners within 2000 feet of any blasting area, which represent additional measures than what the current regulations require. Evergreen II, in its pending amendment application, has represented that it will continue to honor this agreement as to blasting.

APPROPRIATE ACTION: The Selectmen shall request that the Maine DEP accept and require Evergreen II's amendment application that represents all pre-blast surveys will

include consideration of bedrock wells and that Evergreen II, or its duly authorized representatives, will provide written notices to the Town and all affected landowners within 2000 feet of any blasting area at least three (3) days prior to commencing any blasting operations.

V. Shadow Flicker

Shadow flicker occurs when the angle of the sun aligns with rotating turbine blades causing a shadow to be cast. It can be described as the flickering effect of shadows cast by blades of a turbine blade passing between the sun and a given location called receptor (the effect is similar to a strobe light). Shadow flicker depends upon 6 main conditions:

- (1) The amount of sunlight;
- (2) The wind direction (which affects the rotor orientation);
- (3) The time of day;
- (4) The geographical position of a wind turbine;
- (5) The topographical position of a wind turbine; and
- (6) The distance to habituated areas or other significant areas in the vicinity of a wind turbine.

The effect of shadow flicker is most pronounced when the blades of the turbine are perpendicular to the line between the sun and the receptor. Obstacles, such as trees, terrain, or structures between a wind turbine and a receptor location, however, will reduce or eliminate shadow flicker effects. Further, shadow flicker intensity decreases as the distance from a receptor location to a wind turbine increases (i.e., as one moves further away from a wind turbine, shadow flicker will become less intense). In this regard, shadow flicker is more pronounced within 1000 feet of a turbine during sunrise and sunset, since the angle of the sun is lower and will cast longer shadows.

While there is little or no documented potential for health impacts associated with shadow flicker, it can constitute an annoyance for those who are subjected to it and, accordingly, the Maine DEP has set a limit of 30 hours per year as a reasonable upper limit for shadow flicker on residential properties.

Evergreen II used a modeling approach to predict shadow flicker under “worst case” conditions. This worst case analysis assumed that (i) the sun always shines from sunrise to sunset; (ii) the rotor plane is always perpendicular to the line from the wind turbine to the sun; (iii) the wind turbine is always turning; and (iv) there are no topographic or vegetative buffers between a wind turbine and a receptor location.

Evergreen II's application to the Maine DEP includes the results of its computer modeling, which suggests, under worst case conditions, that approximately 63 residences will be subject to shadow flicker impacts. *(See Evergreen II's Shadow Flicker Study/Report in Section 26 of the Application, which is attached as Appendix K.)*

Of these 63 residences, approximately 5 will be subject to language in leases/easements in which Evergreen II is released from liability for impacts associated with Shadow Flicker.

For the remaining 58 non-participating residences, the anticipated annual duration of these impacts will be less than 30 hours in all cases, and the majority of residential locations are expected to experience less than 15 hours of shadow flicker per year. The Committee notes that, consistent with published guidelines for the estimation of shadow flicker, these projections are based on assumptions relative to a variety of meteorological conditions (cloud cover, wind direction, wind speed, etc.), which have a bearing on the potential for shadow flicker, and are based on recorded meteorological conditions for the project area.

Based on this information, for the remaining 58 non-participating residences, the anticipated annual duration of these impacts will be less than 30 hours in all cases, and the majority of residential locations are expected to experience less than 15 hours of shadow flicker per year.

VI. Public Safety & Public Access

A. Setbacks & Safety

Setbacks represent a specific distance (or a range of distances) from one object or activity to another (e.g., a new building may need to be setback at least 100 feet from a body of water such as a lake).

In this instance setbacks are important because they are designed to promote safety by preventing unnecessary injuries or property damage. Although catastrophic failure of wind turbines is not a common event, units have been known to fail structurally sending turbine components a significant distance and presenting a potential for property damage and serious bodily injury. Lightning strikes, severe storms, damage to the concrete foundations, metal fatigue, brake overloading, faulty welding, and normal wear and tear may all lead to the structural failure of a wind turbine. Other elements of risk that can be addressed through setbacks include Ice Throw, which is discussed in more detail below.

Both the manufacturer of the proposed wind turbines and the Maine DEP appear to concur that, in the absence of site specific safety assessments, a safety-related setback of 1.5 times the maximum height of the wind turbine is appropriate (in this case 688.5

feet). This setback is further endorsed by agencies engaged in the certification of windpower installations (Germanischer Lloyd and the Deutsches Windenergie-Institute). This setback should be maintained between the turbines and occupied structures, roads, trails or other public use areas. The facility layout has been developed with this criterion in mind and the only identified area of concern, other than ITS 83 which is addressed later in this report, relates to the apparent proximity between the proposed turbines and the former Sam Drew Road, which is used for winter recreation and is discussed below.

B. Ice Throw

Ice throw consists of the shedding of accumulated ice from the blades of the turbine. The potential for ice throw is associated with freezing conditions and precipitation (generally in a liquid state). While studies of ice throw potential have been conducted in a number of locations, it is important to note that projections regarding the maximum size and distance for ice throw for a specific installation should be based on observations regarding the same equipment.

The combination of the height of the turbine with each turbine's location (usually at higher elevations with adjacent slopes) can cause ice to be thrown for a significant distance. This is a concern because ice throw can cause serious bodily injury to persons and animals that are in close proximity to wind turbines, as well as property damage.

While turbine manufacturers have researched coatings and other means to reduce the tendency for ice accumulation on turbine blades, the primary mechanisms for avoiding and mitigating the risks associated with ice throw include establishing appropriate setbacks to areas of public access, use of signage to warn the public of risks, and implementing appropriate operational protocols to identify and respond to specific conditions, including the potential accumulation of ice on turbine blades.

Setbacks: Research of available materials suggests that the designated safety buffer of 1.5 times the maximum height of the wind turbine (in this case 688.5 feet) is adequate to reasonably protect persons and property from Ice Throw. In general, the layout of the proposed windfarm, including buffer distances that will be under legal control of Evergreen II or First Wind (via lease, easement, or acquisition) meet or exceed the recommended minimum setback distance of 688.5 feet. The exception to this relates to the area where the Sam Drew Road (a town way) and the local snowmobile and ATV route (ITS 83) pass within this envelope.

Post-Construction Monitoring: While no formal program of post-construction monitoring of Ice Throw is recommended for this project, it is appropriate to maintain records of the locations of observed frozen debris that has been shed by the turbines, particularly in the event such debris appears near or beyond the recommended setback.

APPROPRIATE ACTION: Evergreen II or its successors shall cooperate with the Town in maintaining records of Ice Throw debris found within public ways or other areas in excess of the designated buffer distance (688.5 feet) from the base of turbines.

C. Public Access

Currently, the International Trail System [“ITS”] and a portion of the former Sam Drew Road are sited in areas where wind turbines are proposed to be located (including the ridgeline of Sam Drew Mountain). Because ice throw is a safety concern during the winter months, appropriate measures must be implemented to address snowmobiling and other types of winter recreational activities (such as hiking, cross-country skiing, snowshoeing, hunting, etc.).

Evergreen II has indicated that it is working with the local snowmobile club and individual landowners to facilitate re-routing the ITS in this area and a portion of the former Sam Drew Road to maintain the stipulated setback distance. Several alternative routes have been preliminary identified, and are depicted under *Appendix L* to this report.

The Committee appreciates the efforts of Evergreen II, the snowmobile club, and individual landowners to focus on a re-routing of those segments of the ITS 83 and the former Sam Drew Road that are within 688.5 feet of any turbine prior to turbine operation. Such measures will help maintain and promote public access and recreation within the Town of Oakfield, which are activities that provide significant economic benefit to the Town and surrounding communities.

The Committee urges prompt agreement on a final, safe re-routing of such specific segments of the ITS and the former Sam Drew Road before operation of Evergreen II’s Revised Project. Accordingly, the Committee recommends that Evergreen II undertake best efforts to finalize relocation of public access trails outside the setback area prior to commencement of operations and, for any trails that cannot be relocated beyond the setback areas after best efforts, Evergreen II shall implement specific and previously established measures to minimize risks to the users of the trails within the setback areas. Such previously established measures are: Installation and maintenance of appropriate signage warning of potential risks; maintenance of the on-site SCADA system (discussed in Section VIII) to monitor and track abnormal conditions; and, implementation of appropriate actions in response to abnormal operating conditions, including but not limited to shut-down of individual turbines due to accumulation of ice on turbine blades.

APPROPRIATE ACTION:

Evergreen II shall continue to work with the local snowmobile club and individual landowners to facilitate relocating snowmobile trails outside the setback areas and shall take appropriate steps to minimize risks associated with the use of trails within the setback areas, including providing signage and implementing operational constraints.

VII. Impacts to Town Ways

The transport of turbine components and equipment necessary for their erection will dictate uncharacteristic usage of several Town-owned ways, which may result in damage or impacts to Town roads and adjacent properties.

Mitigation: In anticipation of any such impacts, Evergreen II/First Wind and the Town have engaged in discussions relative to the anticipated need for temporary improvements to support access, as well as the potential for damage to the roadways (including the Thompson Settlement Road, Nelson Road, South Oakfield Road, Brown Road, and Spaulding Lake Road) and the responsibility for repairs. A separate document entitled "Road Authorization Agreement" is currently being updated to conform to the amended project scope. The subject agreement is expected to include provisions with respect to documentation of the current (pre-construction) conditions of the roadways to ensure that any impacts can be objectively identified.

APPROPRIATE ACTION:

Evergreen II shall not commence any construction until Evergreen II and the Town of Oakfield have reached concurrence on a revised "Road Authorization Agreement" which articulates responsibilities associated with improvement to Town ways and use of said ways by oversized vehicles/loads.

VIII. Wind Energy Facility Operation and Maintenance

Monitoring and maintenance activities will be required to ensure the continued operational and structural integrity of a wind turbine, and will have a bearing on the

potential for the facilities to constitute a risk or nuisance to the inhabitants of the community.

An on-site SCADA (supervisory control and data acquisition) system will be connected to each turbine generator's control system and link to both Evergreen II's operational centers and Vestas' customer support center. The system will track specific operating parameters for monitoring. The SCADA system uses automated algorithms to detect abnormal conditions and if one should occur, Evergreen II and Vestas staff will be automatically notified, provided with information regarding the event, and can troubleshoot, stop or reset turbines from their remote locations.

More specifically, each turbine will be equipped with vibration sensors designed to identify issues with wear of gears, bushings and bearings, as well as accumulation of ice or blade damage. Each turbine will be equipped with thermal sensors to identify unusual temperature rise in the windings of the generator and in the various lubricants (in the gearbox, for example). In addition to alarms when vibration or temperature reach pre-determined setpoints, a variety of parameters will be tracked on system computers (by Evergreen II and Vestas) which can identify trends before an issue results in damage to the turbine.

IX. Decommissioning

Decommissioning is the process of disassembling a wind turbine or wind turbines and restoring the site to a similar pre-development condition. The Governor's Advisory Committee on Windpower has recently acknowledged the limited lifespan of these projects, as well as the negative impacts associated with allowing them to remain in place after their useful lifetime has lapsed. To address this concern, permitting under Maine's Site Location of Development Law requires developers of grid-scale windfarms to set aside funding to support removal of the facilities and restoration of the site. If a specific wind turbine does not operate for 12 months, it must be decommissioned.

The primary concern with decommissioning is financial – will the Developer of a proposed wind farm project have sufficient funds to properly decommission a wind turbine project? If funds are not available, then wind turbines that are no longer operating may remain in place for a significant time period.

The funding concern relates to the solidity of the assumptions used in the computation of the reserve fund, given fairly significant fluctuations in both construction costs (associated with removal/restoration) and in the commodity values of copper and other components that will likely have a meaningful impact on the ultimate salvage value of the units - all key elements in the overall financial analysis.

Funding Projections: The application materials submitted by Evergreen II include computations relative to the projected net costs associated with removal and restoration of the Oakfield wind project. The designated protocol includes a \$50,000 annual contribution to the fund and allows for the basis for the reserve funding to be revisited in year 15 and for adjustments to be made in the annual amount set aside at that time.

APPROPRIATE ACTION: At such time as the Maine DEP provides for the computation of decommissioning costs to be revisited, documentation shall be submitted to substantiate both demolition costs and salvage values included within the analysis.

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COMMITTEE UPDATE

In the event that Evergreen II's Revised Project receives approval from the Maine DEP and is subsequently constructed, there may be issues that require review by the Committee. For this reason, the Committee recommends that the Selectmen retain the Committee for at least two years after operations at the proposed wind energy facility commence. The Committee should be charged with maintaining a record of all issues related to construction and operation of the proposed wind energy facility, including any sound complaints or other issues should they occur. Further, the Committee should be charged with developing a report, or an addendum to this report, to update the Selectmen on the operations of the proposed wind energy facility.

APPROPRIATE ACTION: **The Committee shall remain in place for at least two years after commencement of operations of the proposed wind energy facility and, prior to sunseting, the Committee shall issue a report to the Selectmen as an update.**

Dated at Oakfield, Maine, this 19th day of October, 2011.

TOWN OF OAKFIELD WIND ENERGY REVIEW COMMITTEE

By: James Sholler
Jim Sholler

By: Robin Crandall
Robin Crandall

By: _____
Linnwood Hersey

By: Anthony White
Anthony White

By: Ruby D. Hardy Jr

Kirby Hardy

By: _____
Kathy Briggs (1st Alternate)

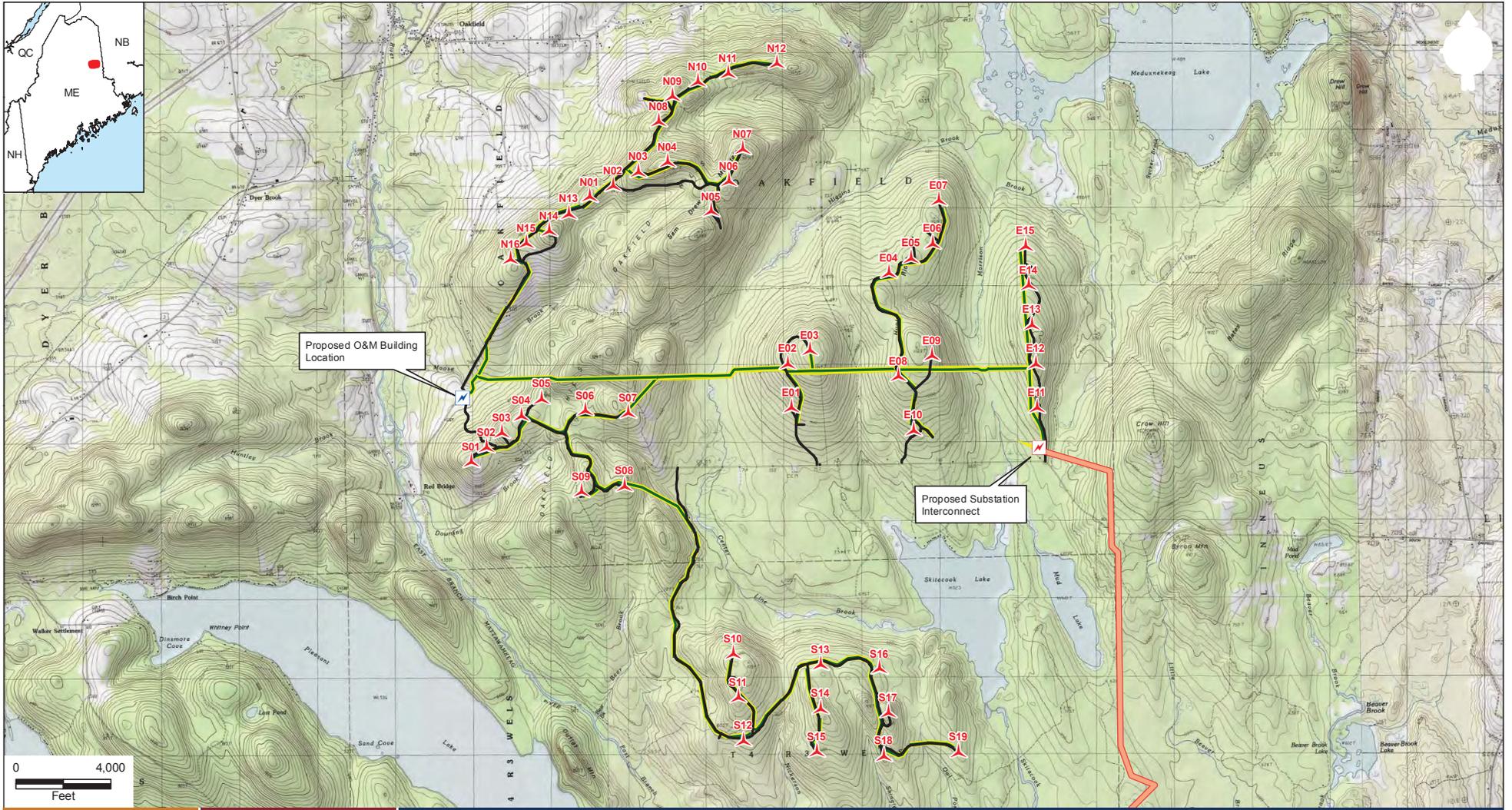
By: _____
Gina Clark (Alternate)

APPENDIX

- A. Project Area Map of the Proposed 2011 Oakfield Wind Project, as Revised*
- B. Project Area Map of the Proposed Transmission Corridor from Oakfield to Chester*
- C. Evergreen II's Sound and Noise Study*
- D. Maine DEP Regulations Chapter 375, Section 10 "Noise"*
- E. Noise Levels for Homes that Exceed 45 dBA, 50 dBA, and 55 dBA*
- F. Low Frequency Noise Levels for Non-Participating and Participating Landowners*
- G. Oakfield Wind Project Sound Complaint and Resolution Protocol (2009)*
- H. Oakfield Wind Project Sound Complaint and Resolution Protocol (2011)*
- I. Proposed Oakfield Wind Energy Facility Operations Ordinance*
- J. Proposed Noise Rule Changes by the Maine Board of Environmental Protection*
- K. Evergreen II's Shadow Flicker Study*
- L. Alternative ITS Snowmobile Trail Routes*

Appendix A

Project Area Map of the Proposed 2011 Oakfield Wind Project, as Revised



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

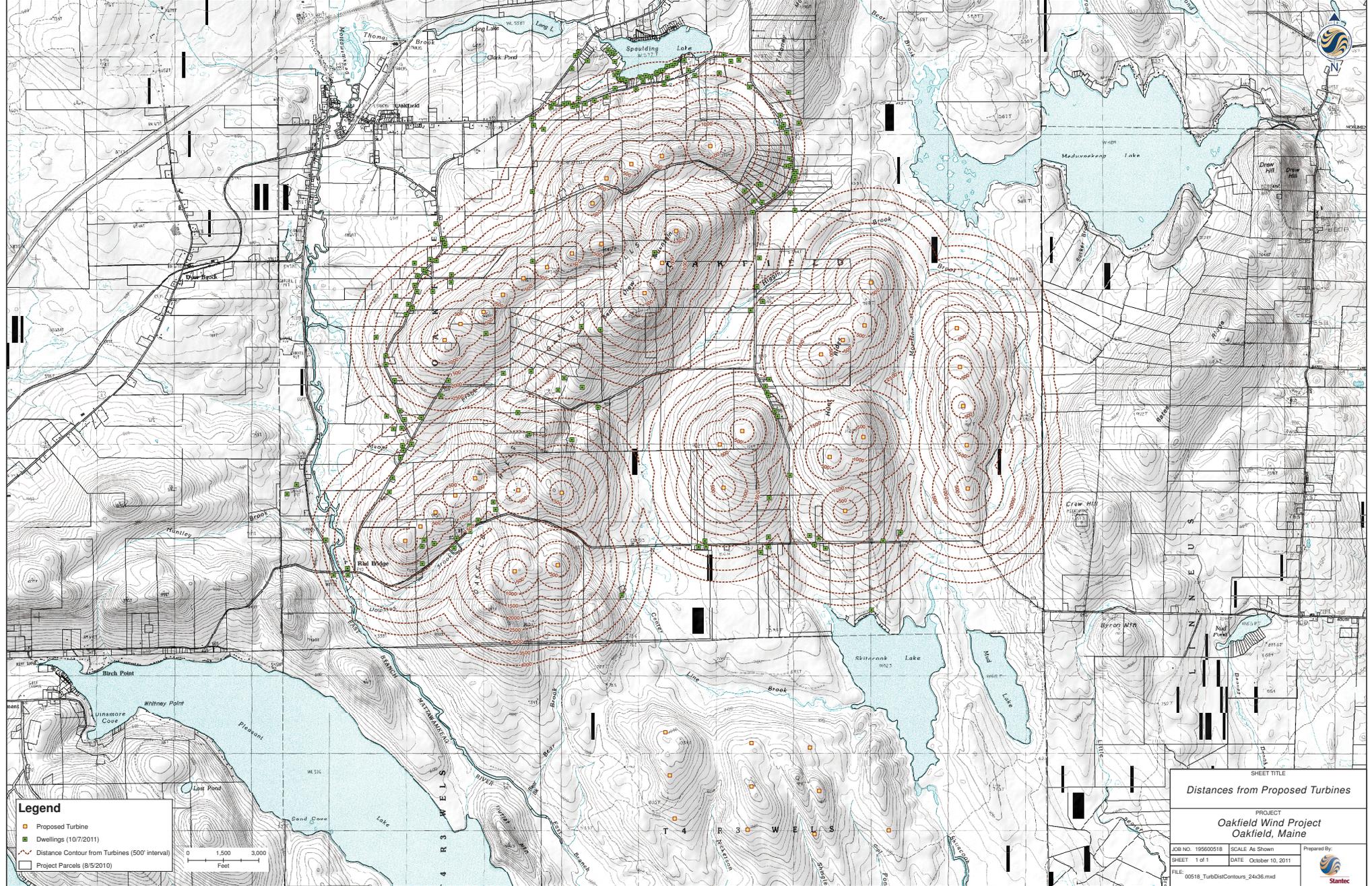
Legend

- Proposed Turbine (Vestas 50)
- Proposed 115kv Transmission Corridor
- Proposed Collector Corridor
- Proposed Access Roads

Client/Project
 Evergreen Wind Power II, LLC
 Oakfield Wind Project Amendment
 Oakfield, Maine

Figure No.
 1
 Title
 Summit Project Development Area
 May 2011

195600518



Legend

- Proposed Turbine
- Dwellings (10/7/2011)
- Distance Contour from Turbines (500' interval)
- Project Parcels (8/5/2010)



SHEET TITLE

Distances from Proposed Turbines

PROJECT
Oakfield Wind Project
Oakfield, Maine

JOB NO. 19560918 SCALE As Shown Prepared By:
SHEET 1 of 1 DATE October 10, 2011
FILE: 00518_TurbDistContours_24x36.mxd



Appendix B

Project Area Map of the Proposed Transmission Corridor from Oakfield to Chester



Figure 2
Transmission Project Area Map

Appendix C

Evergreen II's Sound and Noise Study

Section 5
Noise

Evergreen Wind Power II, LLC (Evergreen II) conducted a sound level assessment in order to ensure compliance with Maine Department of Environmental Protection (MDEP) regulatory requirements for control of noise as found in 06-096 CMR c. 375.10. The *Sound Level Assessment* by Bodwell EnviroAcoustics is included as Appendix 5-1. The assessment determines expected sound levels from the project and compares them to the MDEP sound level limits for “quiet areas” of 45 decibels (dBA) during the nighttime and 55 dBA during the daytime at protected locations. The report conservatively estimates wind turbine sound levels and propagation by:

- utilizing conservative factors for ground attenuation by specifically mapping lakes and ponds as reflective surfaces and excluding potential sound attenuation due to foliage;
- adding 2.0 dBA to the manufacturer’s wind turbine performance specification to account for uncertainty in measurements used to derive turbine sound output;
- adding 3 dBA to the turbine sound power level to account for the specified accuracy of ISO 9613-2 Attenuation of sound during propagation outdoors; and
- assuming that all turbines are operating simultaneously at continuous full sound output except where daytime only or noise restricted operation (NRO) is required.

The assessment includes an Operating Plan that identifies turbines that will operate during daytime hours only and where NRO is required for predicted sound levels to meet the MDEP quiet limits at all regulated protected locations. In those areas that are not part of the project where the assessment predicts MDEP sound level limits may be exceeded with the proposed noise abatement measures, Evergreen II has acquired sound level easements (Appendix 5-2).

Some additional sound commitments were made as part of the Town of Oakfield review process for the original Oakfield Wind Project and were incorporated into the MDEP permit process. These commitments include:

- Development of a Sound Complaint Response and Resolution Protocol to provide a transparent process for identifying and responding to potential sound complaints (see Exhibit 3 of Appendix 5-1);
- Implementation of Operations Sound Testing as set forth in an approved protocol and reporting of sound level exceedances including those caused by tonal sounds (see Exhibit 2 of Appendix 5-1);
- Development and implementation of a mitigation plan in the event of that a sound level exceedance occurs (also see Exhibit 2 of Appendix 5-1);
- Comply with the 45 dBA quiet nighttime limit at applicable regulatory locations even if the pre-development ambient sound level is more than 35 dBA; and
- Comply with the 45 dBA nighttime limit (at applicable regulatory locations) for the combined sound level of the proposed wind project and any future First Wind project.

The report concludes that, with the acquisition of the referenced sound level easements and implementation of the proposed Operating Plan, the construction and routine operation of the Amended Oakfield Wind Project will not exceed MDEP sound level limits at regulated protected locations.

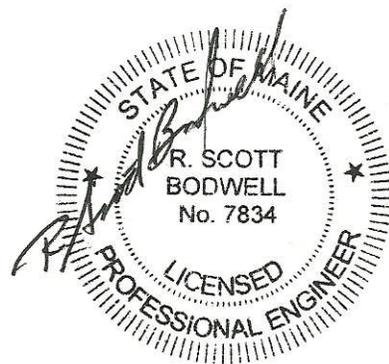
Appendix 5-1

**Sound Level Assessment
Evergreen Wind Power II, LLC
Revised Oakfield Wind Project
Aroostook County, Maine**

June 2011

Prepared for:
Stantec Consulting Services, Inc.

Prepared by:
R. Scott Bodwell PE
Bodwell EnviroAcoustics LLC
55 Ocean Drive
Brunswick, Maine 04011



1.0 Introduction

Bodwell EnviroAcoustics LLC (BEA) assessed sound levels expected to result from construction and operation of the Revised Oakfield Wind Project (Revised Project) proposed for Aroostook County, Maine. Evergreen Wind Power II, LLC (Evergreen II) amends the previously approved and permitted Oakfield Wind Project (Original Project) that will now consist of up to 50 Vestas V112-3.0 MW wind turbines to be located in Oakfield and T4 R3 WELS, Maine. The Vestas V112 has a rated output power of 3.075 megawatts and the total generating capacity of the proposed Revised Oakfield project is 153.75 megawatts (MW). The Original Project received approval in January 2010 (DEP #L-24572-24-A-N/L-24572-TF-B-N) for 34 General Electric 1.5 MW turbines totaling 51 MW of generating capacity. The GE turbines would be installed on 80 meter towers whereas the Vestas V112 turbines would have 84 meter towers. The rotor diameter of the Vestas V112 turbines is 112 meters compared to 77 meters for the GE turbines.

The main objective of this Sound Level Assessment is to calculate sound levels expected from full and simultaneous operation of all proposed wind turbines at noise sensitive land uses in the vicinity of the Revised Project. These sound level predictions are compared to applicable noise standards as set forth in Maine Department of Environmental Protection (DEP) Site Location of Development regulations for Control of Noise (ref. 06-096 CMR c. 375.10). In addition, this Sound Level Assessment addresses issues and concerns raised by the Town of Oakfield Wind Energy Review Committee in their Final Report dated September 9, 2009.

2.0 Environmental Acoustics

The study of environmental acoustics relates to the role that sound (or noise) plays in the environment. Geographically, this is an extremely diverse area of study ranging from wilderness to urban settings and from airborne sound to the underwater sound environment of oceans and lakes. Environmental acoustics is most commonly associated with assessing the noise impact of land-based developments such as wind energy projects. The following subsections provide an overview of acoustic terminology and wind turbine noise.

2.1 Sound and Decibels

Sound is produced by many different sources that generate pressure fluctuations in air that the human ear often has the capability to detect as audible. Sound can also travel through other media such as water or structural components of a building. The types of sounds that humans experience every day can generally be divided into two categories, natural and man-made sound.

There are many types of natural sounds that can be heard by humans. The most common of these are wildlife (e.g. birds, frogs and insects), sounds generated by the forces of wind acting on terrain and vegetation, and sounds generated by water action such as ocean waves, river flow and rain. There are also many man-made sounds generated by industrial, transportation and construction sources as well as

sounds generated for the purposes of enjoyment such as music. Residential sounds are also common in many areas and include recreation, yard maintenance, human voices, and amplified music.

The magnitude or loudness of sound waves is measured in units of pressure (pascals) that yield large numbers that are difficult to interpret. For simplicity, the decibel unit or dB was developed to quantify sound pressure levels to reduce the range of numbers. The dB unit represents a ratio of the sound pressure to a standard pressure, usually 20 micropascals. This is a logarithmic ratio similar to the Richter scale for earthquakes so that a small change in sound level expressed in dB represents a larger change in the sound pressure. For example, a 10 dB change in sound level is a tenfold increase in sound pressure. However, this does not mean that the sound is perceived as ten times as loud. A change in sound levels of 3 dB is a doubling of the sound pressure but is considered to be the minimum change that is perceptible to human hearing. A change of 5 dB becomes quite noticeable and an increase of 10 dB is perceived as twice as loud.

The frequency or pitch of sound is expressed in Hertz (Hz) and is the number of sound waves passing a specific point each second, i.e. cycles per second. Frequencies generally considered audible to the human ear range from 20 to 20,000 Hz. Within this range, there are octaves that represent a band of frequencies for purposes of characterizing sound and calculating sound propagation and attenuation. Standard whole octave bands are centered around 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1000 Hz, 2000 Hz, 4000 Hz and 8000 Hz. The center frequency of each octave is double that of the previous octave. Octave bands can be further divided (typically third octaves) and used to determine if a sound source generates an audible pure tone such as a whistle or hum that may be more perceptible than a broad mixture of frequencies. Low frequency sound is typically considered to be at frequencies of 200 Hz and below. Within this range, infrasound has frequencies below 20 Hz and is not generally considered audible to humans except at very high decibel levels.

Sound levels in frequencies ranging from 500 to 2500 Hz are more audible to humans compared with frequencies below 100 Hz. Consequently, the A-weighting scale was developed to measure sound levels in units of dBA to simulate the hearing response of humans. Under this weighting system, the sound pressure level at low frequencies is reduced based on its audibility to humans. The linear (no weighting) and C-weighting are often used to determine the relative contribution of low frequency sounds during a sound measurement. These low frequency sounds may not be audible to humans hence the use and wide acceptance of the A-weighting network. Figure 1 provides a graph that shows the reduction by frequency for A- and C-weighting scales.

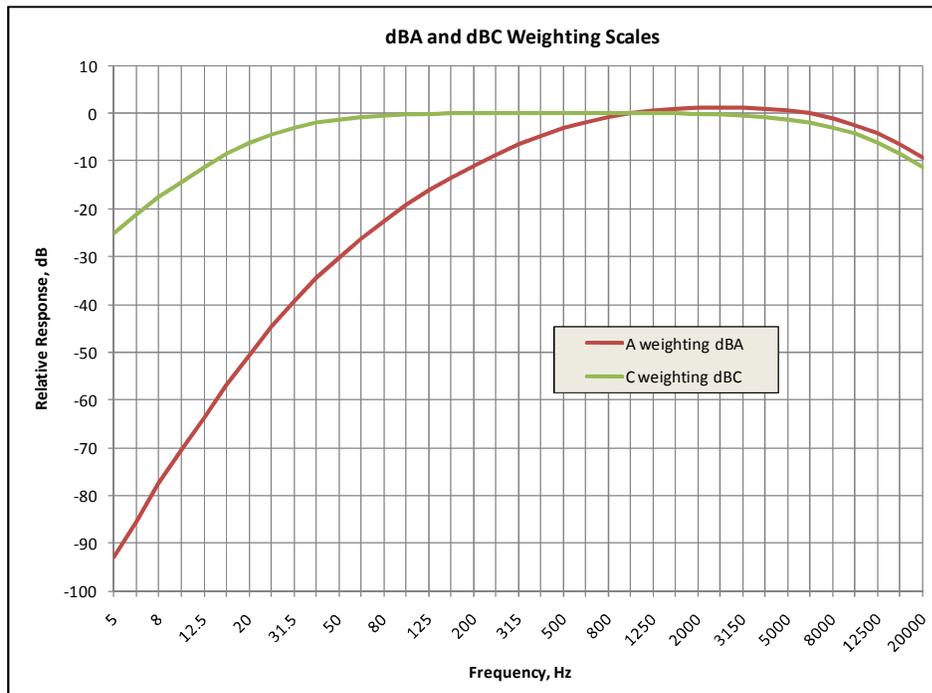


Figure 1. Weighting Curves for dBA and dBC Sound Levels

Sound level measurements are also time-weighted to represent the relevant parameters or timeframes of interest or identify short duration events. The most common time weightings are “Fast” and “Slow”. Fast-time weighting is based on 1/8 second intervals and is useful for determining rapid changes in sound levels. The slow-time weighting integrates the measured sound levels over a one-second period that reduces the rapid fluctuations for ease of observation.

Similar to the size and period of ocean waves, sound waves can vary considerably in amplitude and frequency. When using fast-time weighting, a sound level meter will measure a sound pressure level every 1/8 of second which results in 480 measurements each minute and 28,800 measurements in an hour. Because it would be nearly impossible to evaluate over 28,000 measurements per hour, numerous statistical parameters have been developed for use in quantifying long-term sound level measurements. The most common is the A-weighted equivalent sound level or LAeq, which represents the time-varying sound level as a single dBA level by effectively spreading the sound energy across the entire measurement period. Other common parameters are percentile levels that represent the percentage of time that a specific sound level was exceeded. For example, the LA10 provides the sound level that was exceeded 10% of the time during the measurement period. This means that 10% of the measured sound levels were higher and 90% were lower than the measured LA10. Other commonly used percentiles include the LA50 or median sound level and the LA90 for which 90% of the measured sound levels are higher. The LA90 is often referred to as the background sound level as it eliminates most fluctuations from short term sound events such as aircraft flights and wind gusts. Figure 2

presents a graph that shows the measured sound pressure levels and the resulting equivalent (LAeq), LA10 and LA90 sound level parameters.

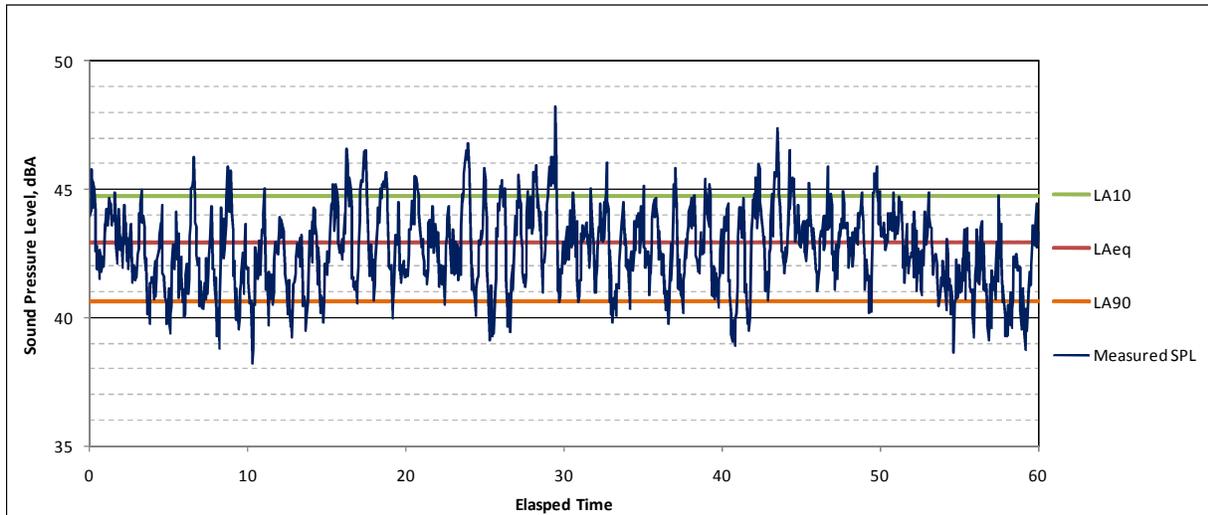


Figure 2. Measured Sound Pressure Levels and Statistical Parameters

For purposes of quantifying industrial and other man-made sound sources, the term “sound power level” is used. The unit of sound power level is watts and the term is commonly expressed as Lw. When applied to sound power, the dB unit represents a logarithmic ratio of the source sound power to a reference sound power (10^{-12} watt). Sound power levels are determined by measuring the sound pressure level from a source at a specific distance and calculating the sound attenuation between the source and measurement location. The sound power level provides a mechanism for ranking and quantifying noise sources, such as wind turbines, in a consistent and standardized manner. It is commonly used in sound performance specifications and as a source input to sound level prediction models. By its nature, the sound power level cannot be measured directly and can be a source of confusion to the public relative to sound pressure levels that are predicted and measured at community locations.

The combination of all existing sound sources, natural and man-made, at a specific location or in a community is known as the ambient sound environment or soundscape. The amplitude and characteristics of the soundscape vary significantly depending on the amount of industrial and residential development, proximity to transportation uses such as highways and airports, and the presence of natural sounds such as wind, flowing water, and wildlife. In general, the more rural or undeveloped an area is, the lower the ambient sound levels will be. Ambient sound levels are usually higher during daytime hours than at night due to more traffic and human activity, higher wind speeds and other natural sounds during the day. At night, these daytime sources typically diminish and sound levels are reduced with the exception of strong winds or rain occurring during the overnight period.

Noise is generally defined as unwanted sound. The perception of noise as an unwanted sound can vary significantly by individual and preferences concerning types of sound. A simple example of this is music. One person may enjoy a certain type of music that another may find extremely annoying. Some individuals find enjoyment and solitude in listening to natural sounds or the nighttime quiet of a rural area while others have little interest in such soundscapes.

The character of sound is determined by its loudness or amplitude and its pitch or frequency. Humans can detect a wide range of sound level amplitudes and frequencies as audible but are more sensitive to a specific range of frequencies. Consequently, the perceived loudness of sound also depends not only on its amplitude but on its frequency characteristics as well. For example, the sound of birds, frogs or flowing water is often perceived as quieter than man-made sounds at the same amplitude. The sound levels associated with some common noise sources and sound environments is presented as Table 1.

Sound travels through air at a speed of approximately 1126 feet per second or 768 miles per hour. Thus it takes just over two seconds for a sound wave to travel a half mile. The number of sound waves that travel past a given point in one second is determined by its frequency or pitch. The sound pressure level decreases or attenuates as sound spreads out and travels over distance through the air. Attenuation results from distance, atmospheric absorption, and terrain effects. The rate of attenuation due to distance or spreading of the sound wave (i.e. divergence) is the same for all frequencies, which is approximately 6 dB per doubling of distance from a simple point source.

Table 2 provides the sound pressure level at various distances from a point source having a sound power level of 106 dBA. This relationship is shown graphically in Figure 3. The sound level reduction shown in Table 2 and Figure 3 is due only to distance attenuation and does not include attenuation from atmospheric absorption, terrain and foliage, or reflection from hard surfaces.

| Indoor Setting | Outdoor Setting | Sound Sources | Sound Pressure Level, dBA |
|---------------------------------------|---|---|---------------------------|
| Rock Concert* | | Jet Takeoff at 300 feet* | 120 |
| Ship Engine Room | Loud Thunder* | Rifle Blast at 100 feet | 110 |
| Movie Theater* | | Chain Saw high rpm at 5 feet Siren at 100 ft | 100 |
| Heavy Industrial Work Space* | | Lawn Mower high rpm at 10 feet Large Truck or Loader high rpm 50 feet* | 90 |
| Busy Airport | Heavy Rain | Motor Boat high rpm at 100 feet | 80 |
| Light Industrial Workspace | Heavy Surf Beach* Busy City or Highway | AC Unit at 5 feet Automobile 45 mph at 50 feet | 70 |
| Busy Office/Conversation Room with TV | Urban Daytime | Strong Wind in Trees* Nighttime Frogs Airplane Flyover* | 60 |
| | Suburban Daytime/Urban Nighttime | Bird Calls/Morning Chorus Small waves on shoreline | 50 |
| Quiet Office Library | Rural Area Daytime | Moderate Wind in Trees | 40 |
| Sleeping Quarters at Night | Rural Area Nighttime | Light Wind in Trees | 30 |
| Idle Recording Studio | Very Remote Area Nighttime Perceived Silence | | 20 |
| | | | 10 |
| | | Threshold of Hearing | 0 |

Table 1. Typical A-Weighted Sound Levels

Note: These are typical sound levels and subject to significant variation depending on the number of and distances from sound and transportation sources.

*Sound with prominent Low Frequency components

Sources:

www.mvn.usace.army.mil/ss/osha600/s600/refer/menu14c.pdf

Measurements and Observations by R. Scott Bodwell, P.E.

| Source Sound Power Level (LwA) = 106 dBA | |
|---|------------------------------|
| Distance, Feet | Sound Pressure Level, dBA |
| 25 | 80 |
| 50 | 74 |
| 100 | 68 |
| 200 | 62 |
| 400 | 56 |
| 800 | 50 |
| 1600 | 44 |
| 3200 | 38 |

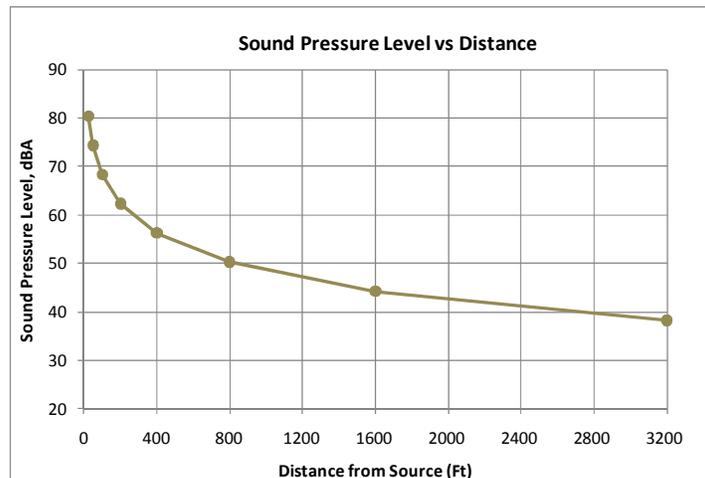


Table 2 & Figure 3. Attenuation of Sound Pressure Level over Distance

Sound energy is absorbed by the atmosphere as it travels through the air. The amount of absorption varies by the frequency of the sound and the temperature and humidity of the air. More sound is absorbed at higher frequencies than at lower frequencies due to the relative wavelengths.

In addition to temperature and humidity, wind speed and direction can affect outdoor sound propagation. When sound travels upwind the sound waves can bend upward creating a “shadow” zone near the ground where sound levels decrease when compared to downwind sound propagation. Wind gradients, temperature inversions and cloud cover can cause refraction or bending of sound waves toward the ground resulting in less sound attenuation from terrain and ground cover over large distances.

Sound attenuation can also result from intervening terrain and certain types of ground cover and vegetation. An example of intervening terrain is a hill or ridge that blocks the horizontal sound path between a sound source and receiver. This same effect can result from buildings and other solid structures such as a sound barrier fence. Sound will also attenuate as it travels over soft ground cover or through vegetation such as trees and shrubs. The amount of ground and foliage attenuation depends on the characteristics of the ground cover and the height and density of vegetation. Conversely, reflective ground or the surface of a water body can cause reflection of sound and less overall attenuation.

When multiple sound sources are present in an area, the sound level contribution from each source must be added to determine of the combined sound level of all sources. Due to logarithmic basis of the dB unit, adding sound levels is different than standard arithmetic. Adding two equal sound sources that each measure 50 dBA at a specific point will result in a combined sound level of 53 dBA. It will then take

two more equal sound sources of 50 dBA each, or four total, to cause the sound level to increase by another 3 dBA. Thus, four equal sources at 50 dBA results in a total sound level of 56 dBA.

Specifications for calculating outdoor sound propagation have been developed by international standards organizations as well as individual countries based on empirical data developed over many years. These specifications form the basis for computerized sound level prediction models that allow calculation of outdoor sound propagation through the use of three-dimensional terrain models. The most widely used and accepted standard for calculating outdoor sound propagation is ISO 9613-2 Acoustics - Attenuation of Sound During Propagation Outdoors - Part 2: General Method of Calculation. This standard has been applied to accurately calculate the sound levels that result from operation of wind turbines and is the standard applied in this analysis. Further details concerning the sound level prediction model developed for Oakfield Wind to account for various site and weather conditions can be found in Section 6.2 of this report.

2.3 Wind Turbine Sound

The sources of sound from operation of wind turbines are mechanical noise from gears, motors and cooling equipment in the turbine nacelle and the aerodynamic effects of the rotor blades traveling through the air. When operating at or near full sound output, the primary sound source from a wind turbine is rotation of the rotor blades with more sound energy generated from the outer sections of the blade and blade tip.

An international standard has been developed as IEC 61400-11 *Wind turbine generator systems – Part 11: Acoustic noise measurement techniques* that provides specific and detailed procedures for determining the sound power level from wind turbines. The IEC standard was developed by industry and acoustic experts to establish a consistent and repeatable methodology with full documentation for determining the sound output of any type of vertical blade wind turbine. Manufacturers of utility-scale wind turbines follow this methodology to determine the sound output and uncertainty of their turbines for purposes of estimating community sound levels and providing performance guarantees to owners and operators of wind energy facilities.

There has been much advancement in the technology of wind turbines over the last 10 to 20 years. The first generation of utility wind turbines consisted of downwind rotors that were capable of generating significant levels of low frequency sound. Turbines with upwind rotors have replaced the early designs and drastically reduced low frequency sound emissions. Modern wind turbines are known to generate a “whoosh” type sound under certain operating and weather conditions that results from the passage of each blade. A short-term increase in sound levels often occurs on the down-stroke motion of the blade that is referred to as “amplitude modulation” and generally results in sound level fluctuations of 2 to 5 dBA for utility-scale wind turbines with occasional excursions above 6 dBA.¹ Amplitude modulation

¹ Observations and analysis of sound level measurements for Mars Hill Wind Farm and Stetson Wind Project, R. S. Bodwell, P.E. G.P. van den Berg, The Sounds of High Winds.

occurs at a mixture of audible frequencies and should not be confused with low frequency sound and infrasound.

Sound from wind turbines has been the subject of extensive research, conferences and publications over the past 10 to 15 years. There is considerable technical and related information available that addresses the characteristics, control and impact of sound from wind turbines. There is an abundance of well-researched and informative studies and reports from reputable institutions and individuals.

It is a common assertion that wind turbines generate significant and perhaps harmful levels of infrasound and low frequency sound. In relation to the modern generation of upwind turbines, there is little basis for this claim that can be found in any well-researched and impartial technical studies and literature. In fact, the consensus of the independent research community is that annoyance from wind turbine sound is primarily in the most audible mid to high frequencies and not from infrasound or low frequency sound.²

2.4 Noise Impact and Regulation

The noise impact that results from wind turbines depends on several factors notably the change or increase in ambient or background sound levels that will result from turbine operation. For rural areas where hill or ridge top wind turbines are located, the ambient sound level at lower elevations and community locations varies by time of day, weather conditions, and to some degree, by season. Sound levels from wind turbines vary based on the wind speed and turbulence at the turbine hub and can range from no sound output during calm winds to full sound output when winds at the turbine hub reach approximately 20 miles per hour. Sound from wind turbines will be most noticeable during stable atmospheric conditions when surface winds are light and the winds aloft (at the turbine hub) remain high enough for full turbine sound output. At other times, when surface winds increase or when wind turbine output diminishes, the sound from operating wind turbines will be less noticeable.

During the planning stages of a wind energy project, considerable effort is made to accurately map land uses and the topography of the entire area potentially impacted by sound from wind turbine operation. Along with wind turbine sound level performance data, this information is used to develop a sound level prediction model for the project. The model inputs and settings are typically adjusted to produce conservative sound level predictions for wind turbine operation. These results are compared to various noise regulations and guidelines to assess the impact of the proposed wind energy project.

The Maine DEP has established sound level limits for developments as part of its Site Location of Development Law Regulations. The Maine DEP Regulation Chapter 375.10 specifies sound level limits based on land use and existing ambient sound levels. For rural areas, the quietest limits of 55 dBA daytime and 45 dBA nighttime for hourly equivalent sound levels (LAeq) emitted from a project usually

² G.P. van den Berg, The Sounds of High Winds.

Danish Electronics, Light and Acoustics (DELTA), Low Frequency Noise from Large Wind Turbines.

apply. Maine DEP nighttime limits apply within 500 feet of a residence on a protected location so that the resulting sound levels at the residence will be below the limit. Beyond 500 feet, the daytime limit applies 24 hours per day. The Maine DEP regulation applies sound level limits on an hourly basis with no averaging over daytime, nighttime or longer periods. There are also special provisions and “penalties” that apply when the sound levels generated by a development result in tonal or short duration repetitive sounds. This standard is described in more detail in the remainder of this report.

3.0 Project Description

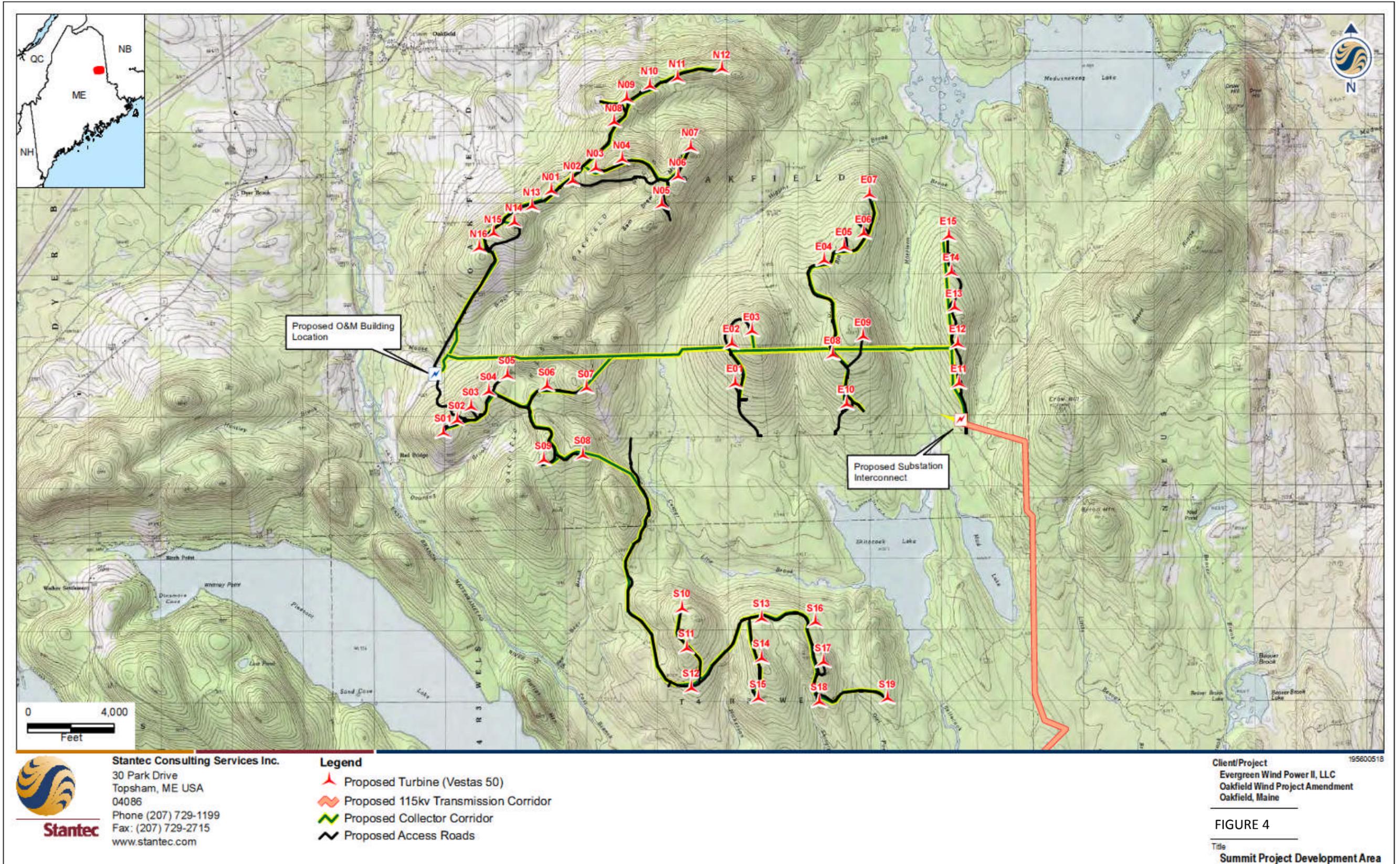
Evergreen II is amending the original Oakfield Wind Project that was approved by the Maine DEP in January 2010 (ref. Order L-24572-24-A-N). The Revised Oakfield Project consists of 50 wind turbines arranged in four primary groups: one to the north, one to the east, and two to the south. As proposed, the north group consists of 16 wind turbines; the east group has 15 wind turbines; the south group in Oakfield consists of 9 wind turbines; and a second south group in unorganized township T4 R3 WELS consists of 10 wind turbines. All of the proposed wind turbines are Vestas Model V112-3.0 MW manufactured by Vestas Wind Systems A/S. The proposed Vestas V112 has a rated capacity of 3.075 megawatts (MW), a hub height of 84 meters, and a rotor diameter of 112 meters. The total height with a rotor blade fully extended at the top of the blade rotation is approximately 140 meters (459 feet).

Other key components of the Revised Oakfield Project are electrical transmission facilities including a proposed substation and an Operations & Maintenance Building. The proposed substation is located off South Road south of the easternmost turbine string. The proposed O&M Building is located in Oakfield along the Thompson Settlement Road northwest of the nearby south turbine group.

Surrounding land uses consist mostly of undeveloped forestry land and rural residential and seasonal properties such as hunting camps. The majority of residential properties in the vicinity of the north turbine group are located north and east of the proposed turbines along Spaulding Lake Road and Brown Road. There are also several residential parcels to the west along Thompson Settlement Road. Several of these residences are situated on large parcels of land and there also many large undeveloped parcels nearby. To the south, there are a few dwellings on large lots (generally 40 acres or more) that were created in 1987 as part of the “Patten Subdivision”, which is located in Oakfield between the north and south turbine groups.

Residential parcels in proximity to the south turbine groups are located in Oakfield west of the proposed turbines along both the Thompson Settlement Road and along the South Road. Residential uses in the vicinity of the east turbine group are located along South Road south of the proposed turbines and Brown Road which bisects the east group. Much of the land surrounding the east and both south turbine groups is undeveloped forest land. Figure 4 provides a Project Location Map that shows proposed wind turbines and other facilities in relation to surrounding land uses.

Evergreen II has purchased property or obtained leases with local landowners to install and operate wind turbines at the proposed locations. Evergreen II has also obtained agreements with landowners who may experience sound levels from the project that have the potential to exceed applicable sound level limits. Figure 5 provides a map of the proposed wind turbine locations along with parcel and land use information including topographic contours of the study area. Figure 5 depicts parcels within the study area that Evergreen II has purchased or leased and shows parcels where required sound easements have been obtained for the proposed turbine operations. As set forth by Maine DEP 375.10, Section C.5.s, a noise (sound) easement exempts the project from Maine DEP noise limits for the specific noise, parcel of land and term covered by the agreement.



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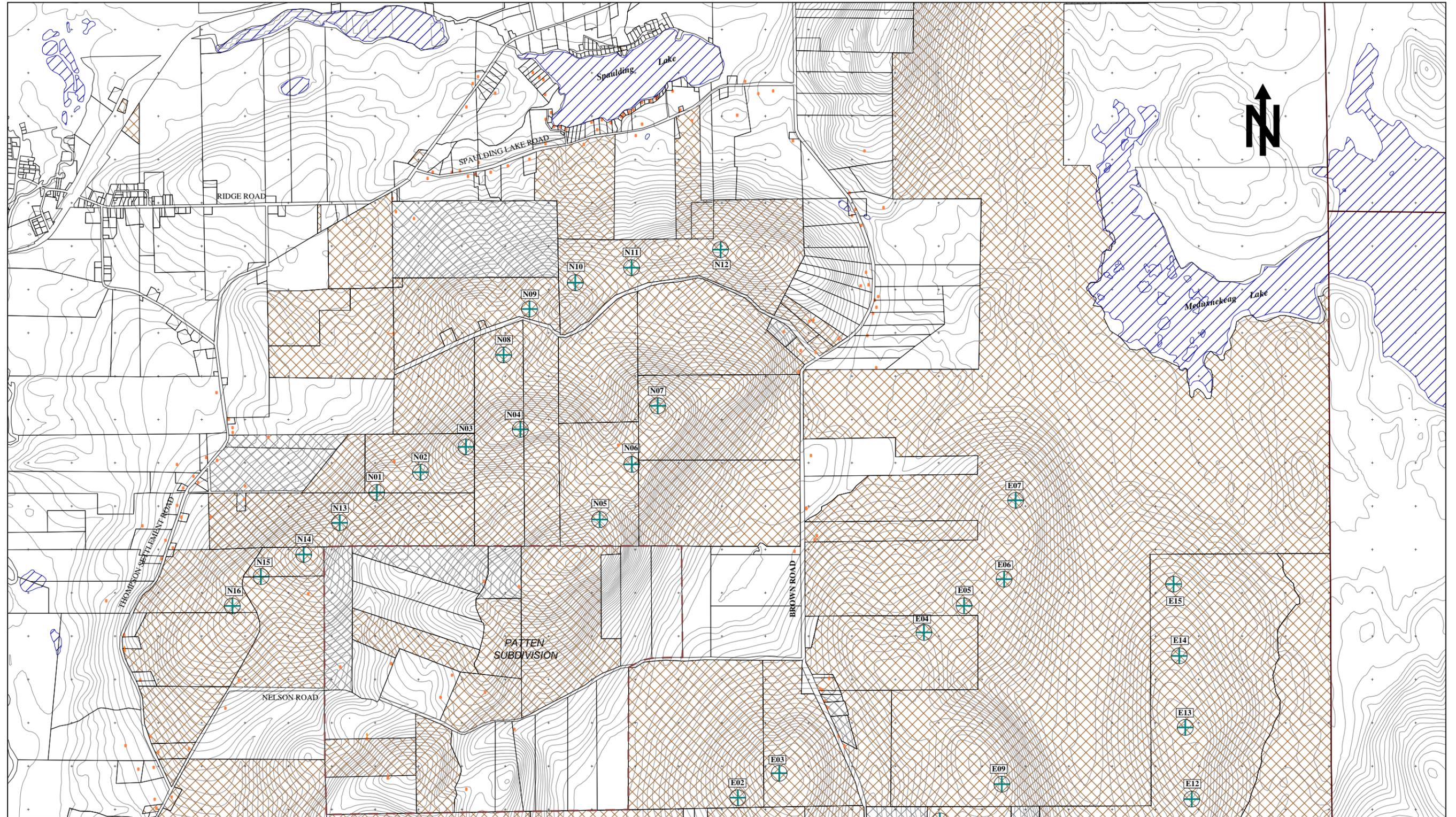
Legend

- Proposed Turbine (Vestas 50)
- Proposed 115kv Transmission Corridor
- Proposed Collector Corridor
- Proposed Access Roads

Client/Project
 Evergreen Wind Power II, LLC
 Oakfield Wind Project Amendment
 Oakfield, Maine

FIGURE 4
 Title
 Summit Project Development Area

Figure 5 (1 of 2). Land Uses and Proposed Wind Turbines (North)



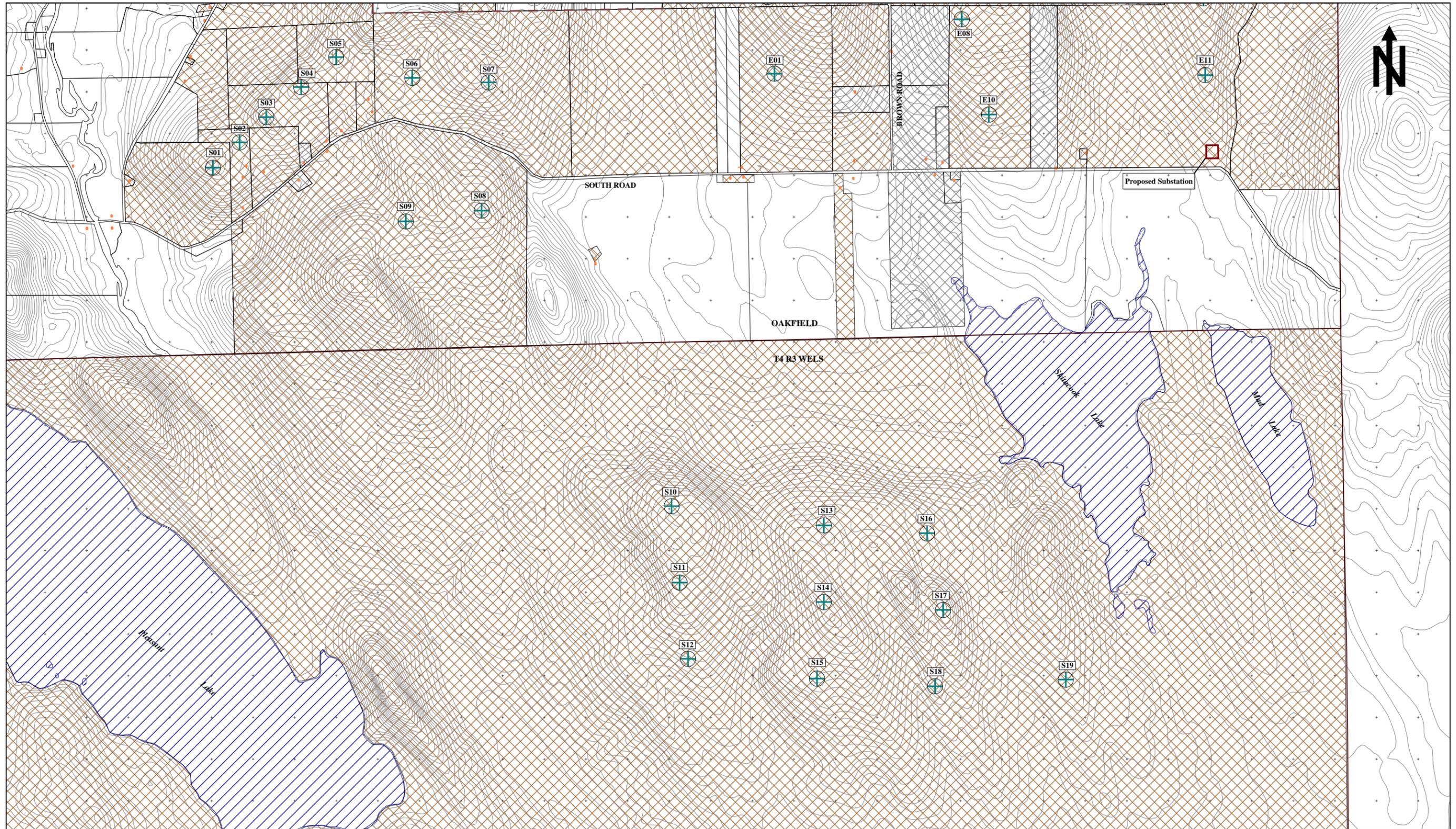
 Participating Landowner
 Sound Easement

 Wind Turbine
 Dwelling

Coordinate Grid Spacing = 1000 ft

Topographic Contour Interval = 5 meters (16 ft) ft

Figure 5 (2 of 2). Land Uses and Proposed Wind Turbines (South)



 Participating Landowner
 Sound Easement

 Wind Turbine
 Dwelling

Coordinate Grid Spacing = 1000 ft
Topographic Contour Interval = 5 meters (16 ft) ft

4.0 Vestas Wind Turbine Sound Levels

Evergreen II proposes to erect Vestas V112-3.0 MW wind turbines to generate electric power for the Revised Project. The Vestas V112 is a pitch-regulated upwind turbine with a rotor diameter of 112 meters and a rated capacity of 3.075 megawatts (MW). The turbine operates at variable speeds ranging from 6.2 to 17.7 rpm depending on the wind speed acting on the turbine rotor and operational settings.

Vestas Wind Systems A/S has provided sound level performance specifications for the proposed V112 wind turbine. In its unrestricted operating mode, the overall sound power levels produced by the V112 range from 97.3 dBA at low rpm to 106.5 dBA at full rpm. Table 3 provides octave band sound levels at various wind speeds by octave bands ranging from 16 to 8,000 Hz.

| <i>The values are valid for the following conditions:</i> | | | | | | | | | | | | |
|---|-----------------------|-------------|--------------|--------------|------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Meas. Standard: IEC 61400-11:2002, using amendment procedure above 95% RP | | | | | | | | | | | | |
| Wind shear: 0.16 Hub Height: 84 m | | | | | | | | | | | | |
| Maximum turbulence intensity at 10 meters above ground level: 16% | | | | | | | | | | | | |
| Inflow angle (vertical): 0 ± 2 | | | | | | | | | | | | |
| Noise Mode 0 Wind Shear 0.16 Hub Height 84 m | Wind Speed @10m [m/s] | | | | | | | | | | | |
| | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| Frequency | | | | | | | | | | | | |
| 16Hz [dB(A)] | NAN | 49.8 | 52.5 | 58.8 | 57.6 | 60.6 | 61.1 | 63.2 | 63.2 | 63.2 | 63.2 | 63.2 |
| 31.5Hz [dB(A)] | NAN | 68.1 | 71.8 | 78.2 | 77.1 | 78.3 | 78.9 | 79.1 | 79.1 | 79.1 | 79.1 | 79.1 |
| 63Hz [dB(A)] | NAN | 77.8 | 81.2 | 87.7 | 86.7 | 87.7 | 88.2 | 88.2 | 88.2 | 88.2 | 88.2 | 88.2 |
| 125Hz [dB(A)] | NAN | 85.5 | 90.2 | 90.2 | 95.5 | 95.5 | 95.7 | 95.3 | 95.3 | 95.3 | 95.3 | 95.3 |
| 250Hz [dB(A)] | NAN | 87.6 | 91.2 | 92.3 | 96.4 | 97.0 | 97.5 | 97.0 | 97.0 | 97.0 | 97.0 | 97.0 |
| 500Hz [dB(A)] | NAN | 91.6 | 95.1 | 96.9 | 100.5 | 100.8 | 101.0 | 100.8 | 100.8 | 100.8 | 100.8 | 100.8 |
| 1000Hz [dB(A)] | NAN | 91.7 | 95.4 | 97.5 | 100.5 | 100.9 | 100.7 | 100.7 | 100.7 | 100.7 | 100.7 | 100.7 |
| 2000Hz [dB(A)] | NAN | 90.7 | 93.9 | 98.5 | 98.6 | 99.3 | 99.0 | 99.6 | 99.6 | 99.6 | 99.6 | 99.6 |
| 4000Hz [dB(A)] | NAN | 84.2 | 87.5 | 97.7 | 92.4 | 94.1 | 93.5 | 93.9 | 93.9 | 93.9 | 93.9 | 93.9 |
| 8000Hz [dB(A)] | NAN | 69.1 | 72.6 | 79.1 | 76.3 | 81.0 | 80.2 | 81.1 | 81.1 | 81.1 | 81.1 | 81.1 |
| Spectra Value [dB(A)] | NAN | 97.3 | 100.9 | 104.3 | 106 | 106.5 |

Notify: NAN indicates data not available
 Disclaimer:
 The values are valid for the A-weighted sound power levels
 Octave band values must be regarded as informative
 Site specific values are not warranted

Table 3. Sound Power Levels for Vestas V112 Wind Turbine – Unrestricted Operation (Mode 0)

The sound power levels were derived from acoustic testing in accordance with IEC 61400-11 and proprietary computer models and are intended for use in order to calculate the measureable sound pressure levels at nearby community points and protected locations. At full unrestricted operation, the Vestas V112 wind turbine generates a sound power level of 106.5 dBA with an uncertainty of 2.0 dBA.

Vestas specification data also provides sound power levels for Noise-Restricted Operating modes (NRO) of the proposed wind turbines. These NRO modes can be implemented as part of the turbine operating plan to reduce sound emissions by restricting the rotational speed of the wind turbines. Sound performance data from Vestas for NRO modes achieving 1 dBA (Mode 5), 2 dBA (Mode 2) and 4 dBA (Mode 4) sound level reductions are presented in Table 4 through Table 6.

The values are valid for the following conditions:
 Meas. Standard: IEC 61400-11:2002, using amendment procedure above 95% RP
 Wind shear: **0.16** Hub Height: **84 m**
 Maximum turbulence intensity at 10 meters above ground level: 16%
 Inflow angle (vertical): 0 ± 2

| Noise Mode 5 Wind Shear 0.16 Hub Height 84 m | Wind Speed @10m [m/s] | | | | | | | | | | | |
|--|-----------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| Frequency | | | | | | | | | | | | |
| 16Hz [dB(A)] | NaN | 49.8 | 52.5 | 58.8 | 57.1 | 59.6 | 60.1 | 62.2 | 62.2 | 62.2 | 62.2 | 62.2 |
| 31.5Hz [dB(A)] | NaN | 68.1 | 71.8 | 78.2 | 76.6 | 77.3 | 77.9 | 78.1 | 78.1 | 78.1 | 78.1 | 78.1 |
| 63Hz [dB(A)] | NaN | 77.8 | 81.2 | 87.7 | 86.2 | 86.7 | 87.2 | 87.2 | 87.2 | 87.2 | 87.2 | 87.2 |
| 125Hz [dB(A)] | NaN | 85.5 | 90.2 | 90.2 | 95.0 | 94.5 | 94.7 | 94.3 | 94.3 | 94.3 | 94.3 | 94.3 |
| 250Hz [dB(A)] | NaN | 87.6 | 91.2 | 92.3 | 95.9 | 96.0 | 96.5 | 96.0 | 96.0 | 96.0 | 96.0 | 96.0 |
| 500Hz [dB(A)] | NaN | 91.6 | 95.1 | 96.9 | 100.0 | 99.8 | 100.0 | 99.8 | 99.8 | 99.8 | 99.8 | 99.8 |
| 1000Hz [dB(A)] | NaN | 91.7 | 95.4 | 97.5 | 100.0 | 99.9 | 99.7 | 99.7 | 99.7 | 99.7 | 99.7 | 99.7 |
| 2000Hz [dB(A)] | NaN | 90.7 | 93.9 | 98.5 | 98.1 | 98.3 | 98.0 | 98.6 | 98.6 | 98.6 | 98.6 | 98.6 |
| 4000Hz [dB(A)] | NaN | 84.2 | 87.5 | 97.7 | 91.9 | 93.1 | 92.5 | 92.9 | 92.9 | 92.9 | 92.9 | 92.9 |
| 8000Hz [dB(A)] | NaN | 69.1 | 72.6 | 79.1 | 75.8 | 80.0 | 79.2 | 80.1 | 80.1 | 80.1 | 80.1 | 80.1 |
| Spectra Value [dB(A)] | NaN | 97.3 | 100.9 | 104.3 | 105.5 | 105.5 | 105.5 | 105.5 | 105.5 | 105.5 | 105.5 | 105.5 |

Notify: NAN indicates data not available
Disclaimer:
 The values are valid for the A-weighted sound power levels
 Octave band values must be regarded as informative
 Site specific values are not warranted

Table 4. Sound Power Levels for Vestas V112 Wind Turbine – NRO 1 (Mode 5)

The values are valid for the following conditions:
 Meas. Standard: IEC 61400-11:2002, using amendment procedure above 95% RP
 Wind shear: **0.3** Hub Height: **84 m**
 Maximum turbulence intensity at 10 meters above ground level: 16%
 Inflow angle (vertical): 0 ± 2

| Noise Mode 2 Wind Shear 0.3 Hub Height 84 m | Wind Speed @10m [m/s] | | | | | | | | | | | |
|---|-----------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| Frequency | | | | | | | | | | | | |
| 16Hz [dB(A)] | 47.3 | 51.4 | 55.9 | 58.6 | 60.0 | 61.2 | 61.2 | 61.2 | 61.2 | 61.2 | 61.2 | 61.2 |
| 31.5Hz [dB(A)] | 65.6 | 70.8 | 75.4 | 76.3 | 77.0 | 77.1 | 77.1 | 77.1 | 77.1 | 77.1 | 77.1 | 77.1 |
| 63Hz [dB(A)] | 75.3 | 80.2 | 85.0 | 85.7 | 86.2 | 86.2 | 86.2 | 86.2 | 86.2 | 86.2 | 86.2 | 86.2 |
| 125Hz [dB(A)] | 83.1 | 86.7 | 92.1 | 93.5 | 93.5 | 93.3 | 93.3 | 93.3 | 93.3 | 93.3 | 93.3 | 93.3 |
| 250Hz [dB(A)] | 85.1 | 88.1 | 93.3 | 95.0 | 95.3 | 95.0 | 95.0 | 95.0 | 95.0 | 95.0 | 95.0 | 95.0 |
| 500Hz [dB(A)] | 89.1 | 92.3 | 97.5 | 98.8 | 98.9 | 98.8 | 98.8 | 98.8 | 98.8 | 98.8 | 98.8 | 98.8 |
| 1000Hz [dB(A)] | 89.2 | 92.7 | 97.7 | 98.9 | 98.7 | 98.7 | 98.7 | 98.7 | 98.7 | 98.7 | 98.7 | 98.7 |
| 2000Hz [dB(A)] | 88.2 | 92.2 | 96.6 | 97.3 | 97.3 | 97.6 | 97.6 | 97.6 | 97.6 | 97.6 | 97.6 | 97.6 |
| 4000Hz [dB(A)] | 81.7 | 87.9 | 91.8 | 92.1 | 91.7 | 91.9 | 91.9 | 91.9 | 91.9 | 91.9 | 91.9 | 91.9 |
| 8000Hz [dB(A)] | 66.6 | 71.6 | 75.0 | 78.9 | 78.6 | 79.1 | 79.1 | 79.1 | 79.1 | 79.1 | 79.1 | 79.1 |
| Spectra Value [dB(A)] | 94.8 | 98.5 | 103.4 | 104.5 | 104.5 | 104.5 | 104.5 | 104.5 | 104.5 | 104.5 | 104.5 | 104.5 |

Notify: NAN indicates data not available
Disclaimer:
 The values are valid for the A-weighted sound power levels
 Octave band values must be regarded as informative
 Site specific values are not warranted

Table 5. Sound Power Levels for Vestas V112 Wind Turbine – NRO 2 (Mode 2)

The values are valid for the following conditions:
 Meas. Standard: IEC 61400-11:2002, using amendment procedure above 95% RP
 Wind shear: **0.3** Hub Height: **84 m**
 Maximum turbulence intensity at 10 meters above ground level: 16%
 Inflow angle (vertical): $0 \pm 2^\circ$

| Noise Mode 4 Wind Shear 0.3 Hub Height 84 m | Wind Speed @10m [m/s] | | | | | | | | | | | |
|---|-----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| Frequency | | | | | | | | | | | | |
| 16Hz [dB(A)] | 49.9 | 54.2 | 54.9 | 56.6 | 58.0 | 59.2 | 59.2 | 59.2 | 59.2 | 59.2 | 59.2 | 59.2 |
| 31.5Hz [dB(A)] | 68.3 | 73.6 | 74.3 | 74.3 | 75.0 | 75.1 | 75.1 | 75.1 | 75.1 | 75.1 | 75.1 | 75.1 |
| 63Hz [dB(A)] | 77.9 | 83.0 | 83.9 | 83.7 | 84.2 | 84.2 | 84.2 | 84.2 | 84.2 | 84.2 | 84.2 | 84.2 |
| 125Hz [dB(A)] | 85.7 | 89.5 | 91.0 | 91.5 | 91.5 | 91.3 | 91.3 | 91.3 | 91.3 | 91.3 | 91.3 | 91.3 |
| 250Hz [dB(A)] | 87.7 | 90.9 | 92.3 | 93.0 | 93.3 | 93.0 | 93.0 | 93.0 | 93.0 | 93.0 | 93.0 | 93.0 |
| 500Hz [dB(A)] | 91.7 | 95.1 | 96.5 | 96.8 | 96.9 | 96.8 | 96.8 | 96.8 | 96.8 | 96.8 | 96.8 | 96.8 |
| 1000Hz [dB(A)] | 91.9 | 95.5 | 96.7 | 96.9 | 96.7 | 96.7 | 96.7 | 96.7 | 96.7 | 96.7 | 96.7 | 96.7 |
| 2000Hz [dB(A)] | 90.8 | 95.0 | 95.5 | 95.3 | 95.3 | 95.6 | 95.6 | 95.6 | 95.6 | 95.6 | 95.6 | 95.6 |
| 4000Hz [dB(A)] | 84.3 | 90.8 | 90.8 | 90.1 | 89.7 | 89.9 | 89.9 | 89.9 | 89.9 | 89.9 | 89.9 | 89.9 |
| 8000Hz [dB(A)] | 69.2 | 74.4 | 74.0 | 76.9 | 76.6 | 77.1 | 77.1 | 77.1 | 77.1 | 77.1 | 77.1 | 77.1 |
| Spectra Value [dB(A)] | 97.4 | 101.3 | 102.5 | 102.5 | 102.5 | 102.5 | 102.5 | 102.5 | 102.5 | 102.5 | 102.5 | 102.5 |

Notify: NAN indicates data not available
 Disclaimer:
 The values are valid for the A-weighted sound power levels
 Octave band values must be regarded as informative
 Site specific values are not warranted

Table 6. Sound Power Levels for Vestas V112 Wind Turbine – NRO 4 (Mode 4)

Sound power levels for unrestricted Mode 0 in relation to wind speed at a height of 10 meters, based on an assumed wind shear of 0.16, are shown graphically in Figure 6.

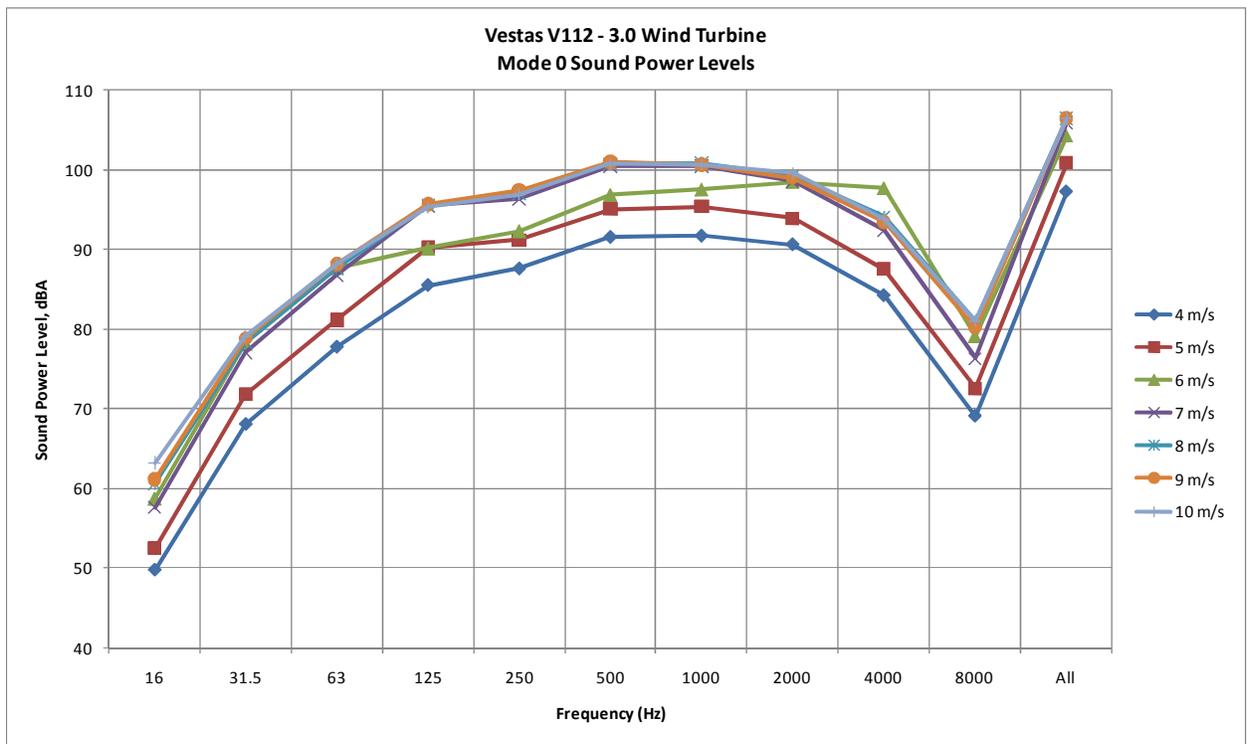


Figure 6. Sound Power Levels for Vestas V112 Wind Turbine Mode 0 and Wind Speeds of 4 to 10 meters/second

5.0 Noise Standards and Guidelines

Maine DEP Chapter 375.10, Control of Noise, establishes hourly sound level limits for wind energy facilities and other developments based on time of day, land use, local zoning and pre-construction sound levels. Although the DEP noise regulation specifies a 75 dBA at the facility property line, the most restrictive limits apply at noise sensitive land uses defined as “protected locations”. A protected location is defined as:

“Any location accessible by foot, on a parcel of land containing a residence or planned residence or approved residential subdivision, house of worship, academic school, college, library, duly licensed hospital or nursing home near the development site at the time a Site Location of Development application is submitted; or any location within a State Park, Baxter State Park, National Park, Historic Area, a nature preserve owned by the Maine or National Audubon Society or the Maine Chapter of the Nature Conservancy, The Appalachian Trail, the Moosehorn National Wildlife Refuge, federally-designated wilderness area, state wilderness area designated by statute (such as the Allagash Wilderness Waterway), or locally-designated passive recreation area; or any location within consolidated public reserve lands designated by rule by the Bureau of Public Lands as a protected location.

At protected locations more than 500 feet from living and sleeping quarters within the above noted buildings or areas, the daytime hourly sound level limits shall apply regardless of the time of day.

Houses of worship, academic schools, libraries, State and National Parks without camping areas, Historic Areas, nature preserves, the Moosehorn National Wildlife Refuge, federally-designated wilderness areas without camping areas, state wilderness areas designated by statute without camping areas, and locally-designated passive recreation areas without camping areas are considered protected locations only during their regular hours of operation and the daytime hourly sound level limits shall apply regardless of the time of day.

Transient living accommodations are generally not considered protected locations; however, in certain special situations where it is determined by the Board that the health and welfare of the guests and/or the economic viability of the establishment will be unreasonably impacted, the Board may designate certain hotels, motels, campsites and duly licensed campgrounds as protected locations.” (ref. MDEP Chapter 375.10 G(16))

Maine DEP Chapter 375.10 defines a “residence” as:

“A building or structure, including manufactured housing, maintained for permanent or seasonal residential occupancy providing living, cooking and sleeping facilities and having permanent indoor or outdoor sanitary facilities, excluding recreational vehicles, tents and watercraft.” (ref. MDEP Chapter 375.10 G(14))

Most of the protected locations in areas surrounding proposed turbine sites for the Revised Project are parcels containing a year-round residence. Other protected locations are parcels containing seasonal residences or “camps”, and an approved residential subdivision.

Under Maine DEP 375.10, hourly sound level limits at protected locations range from 55 to 70 dBA during daytime hours (7 am to 7 pm) and from 45 to 60 dBA during nighttime hours. The lowest limits of 55 dBA daytime and 45 dBA nighttime apply where existing pre-development sound levels are at or below 45 dBA during the daytime and at or below 35 dBA during the nighttime. Ambient sound level measurements can be taken to demonstrate that existing pre-development sound levels are above these threshold values. In recognition of the rural nature of the project area, Evergreen II has elected to apply the more stringent limits of 55 dBA daytime and 45 dBA nighttime to the Revised Project. The nighttime limit of 45 dBA applies on portions of the protected location that are within 500 feet of a residence or other sleeping quarters. At locations greater than 500 feet from the residence or sleeping quarters, the daytime limit applies 24 hours a day. Consistent with the permitted Oakfield Wind Project, BEA assumes the 55 dBA nighttime limit also applies across the entire parcels within an approved residential subdivision where no residence exists and no residential building or plumbing permit has been issued. Sound from regular and routine maintenance of the project is subject to the same sound level limits as routine operation.

Maine DEP Chapter 375.10 requires that 5 dBA be added to tonal and short duration repetitive sounds when determining compliance with hourly sound level limits. Further details and an assessment of these types of sound for the Revised Project are presented in Section 6.3 of this report.

Construction during daytime or daylight hours, whichever is longer, is exempt from the Maine DEP sound limits by Maine statute (ref. 38 MRSA 484). Sound from nighttime construction that occurs beyond daytime or daylight hours is subject to the nighttime limits that apply to routine operation. More information concerning construction of the Revised Project is presented in Section 6.1 of this report.

Sound associated with specific equipment and activities is exempt from Maine DEP noise regulation. Examples that may be associated with the proposed project include:

- Registered and inspected vehicles traveling to and from the project
- Forest management, harvesting and transportation
- Snow removal and landscaping
- Emergency maintenance and repairs, warning signals and alarms
- Major concrete pours when started before 3:00 pm
- Sounds from a regulated development received at a protected location when the generator of the sound has been conveyed a noise easement for that location
- A force majeure event and other causes not reasonably within control of the owners or operators of the development

When a development is located in a municipality that has duly enacted a quantifiable noise standard that (1) contains limits that are not higher than the Maine DEP limits by more than five dBA, and (2) limits or addresses the types of sounds regulated by the MDEP, then the MDEP is to apply the local standard rather than the Maine DEP standard. When noise produced by a facility is received in another

municipality, the quantifiable noise standards of the other municipality must be taken into consideration (ref. Maine DEP 375.10.B.1).

All but ten of the proposed wind turbines for the Revised Project are located in the Town of Oakfield, Maine. One of the two south groups (S10 to S19) is located in Township T4 R3 WELS south of Oakfield. Although the Town of Oakfield has not enacted a local quantifiable noise standard, the Town did form a Wind Energy Review Committee and held a series of public workshops that included a thorough review of the Maine DEP noise regulation and sound levels associated with the Original Project. The Committee issued a Final Report dated September 4, 2009 that provides additional guidelines for operations testing, low frequency sound, and complaint resolution. These guidelines are described in more detail in the remaining Sections of this report. The Maine DEP noise regulation applies in Township T4 R3 WELS.

6.0 Sound Assessment

A sound level prediction model was prepared to calculate the sound levels from daytime and nighttime operation of the Revised Oakfield Wind Project. The sound model for the Revised Project was created using Cadna/A software developed by DataKustik of Germany. Cadna/A provides the platform to construct topographic surface models of area terrain for calculating sound attenuation from multiple sound sources such as wind turbines. Mapping of proposed turbine locations, roads, parcels, land uses and water bodies has been entered into Cadna/A in order to calculate the resulting sound levels at points within the study area. Although substation transformers emit sound, they are not considered to be significant sound sources due to their relatively low sound output and distances from regulated protected locations.

Sound level predictions are calculated in accordance with ISO 9613-2, an international standard for calculating outdoor sound propagation. This method calculates sound levels as if the receiver locations were all simultaneously downwind from the sound sources, which is for calculation purposes and not a physical possibility. According to ISO 9613-2, the calculation method is also equivalent to sound propagation for a “well-developed moderate ground-based temperature inversion”. The stated accuracy of the ISO 9613-2 method is ± 3 dBA for a source and receiver mean height of 5 to 30 meters and a distance of 100 to 1000 m. Although the mean source height between wind turbines (84 meters) and receivers (1.5 meters) is closer to 43 meters, use of Cadna/A and ISO 9613-2 has been found to be accurate for prediction of wind turbine sound levels at distances of the compliance locations.³

³ K. Kaliski and E. Duncan, Propagation Modeling Parameters for Wind Power Projects.
Town of Oakfield, Wind Energy Review Committee, Final Report.
Stetson Wind, Operations Compliance Sound Level Study.
EnRad Consulting, Oakfield Wind Project Amendment, Sound Level Assessment – Peer Review.
Stetson II Wind Project, Operations Sound Testing.

The terrain for the surface model was mapped from USGS topographic contours at five meter intervals (16.4 ft) provided to BEA by TRC Consulting with turbine base elevations ranging from 722 to 1,427 feet above mean sea level. The parcel boundaries and dwelling locations for the model were provided to BEA by TRC, Stantec Consulting and First Wind. Dwellings locations were mapped through use of aerial photography and field verification with the parcel associations confirmed from review of tax assessor records. Parcels with approved residential building permits or that are part of an approved residential subdivision were identified by TRC, Stantec Consulting and First Wind from review of municipal records and interviews with local officials.

The following provides an assessment of sound levels associated with construction and operation of the Revised Oakfield Wind Project.

6.1 Construction Sound Levels

Construction of the Revised Project will involve the use of heavy machinery to clear and grade roads, turbine pads, erect the wind turbine towers, and assemble the nacelle and turbine blades. This equipment will include heavy trucks, excavators, loaders, bull dozers, portable generators and compressors among other machines. Construction staging yards will also be established in designated areas for storage of equipment, materials, and wind turbine components.

Depending upon whether aggregate material can be found on site or will be transported to the project, there may also be equipment operating at the project site to excavate gravel, crush rock and process aggregate. Sound levels from mobile construction and portable processing equipment is likely to generate sound levels in the range of 75 to 95 dBA at 50 feet. Due to the arrangement and size of the project site, most of this equipment will be well distributed and not focused in a single area.

Operation of heavy equipment for site work and other major construction activity between 7 am and 7 pm or during daylight hours is not subject to the Maine DEP noise control regulation as set forth by Maine statute (ref. 38 MRSA Section 484). Operation of construction equipment during nighttime non-daylight hours must comply with the nighttime limits applicable to routine facility operation. All construction equipment must also comply with applicable federal noise regulations and include environmental noise control devices in proper working condition as originally provided by the equipment manufacturer.

6.2 Operating Sound Levels

Wind turbine sound power levels were provided by Vestas Wind Systems A/S based on sound testing as set forth in IEC 61400-11 and proprietary computer models. The IEC method establishes detailed procedures for measurement of wind turbine sound and calculation methods for determining the sound power level of a wind turbine as a point source for the stated purpose of conducting community assessments of sound levels resulting from wind turbine operation. Vestas reports that the full rated sound power of the Vestas V112 is 106.5 dBA with an uncertainty of ± 2.0 dBA. Vestas has issued a Sound

Level Performance Standard for the V112, which is attached to this report as Exhibit 1. In its V112 Standard, Vestas warrants the overall sound power level of the V112. Adding the uncertainty to the full sound output yields a maximum continuous sound power level of 108.5 dBA for modeling purposes. At a hub height of 84 meters (275.6 ft) above ground, the resulting elevations of the turbine hubs (modeled point sources) range from 997 feet (E15) to 1703 feet (N04) above msl.

Cadna/A allows flexibility in defining model settings and adjustments related to calculation methods, ground absorption and other factors. Additionally, as discussed above, conservative assumptions are utilized with respect to each of these factors. Turbine sound measurements can be used to ensure that model is “calibrated” to actual sound levels for reliable model predictions. As the following describes, model settings have been applied to predict the highest wind turbine sound levels as measured under a wide variety of site and weather conditions at other projects in Maine.

Although the proposed Vestas wind turbines are different than the turbines operating at other projects in Maine, sound power levels are determined by the same international specification for wind turbine testing (IEC 61400-11). Results from other wind energy facilities in Maine where wind turbines are located on similar ridge top settings indicate that the high end of the measurement range can be predicted by adding the sound power level uncertainty and the stated accuracy of ISO 9613-2. For this reason, the sound power levels of the Vestas V112 were increased by 5.0 dBA for modeling purposes.

Other model settings were selected to calculate ground attenuation using the spectral method per ISO 9613-2 and using a default ground absorption factor of 0.5 to represent a mix of hard and soft ground. Surface water bodies were mapped and assigned a ground absorption factor of 0.0 similar to hard ground for an acoustically reflective surface. Attenuation resulting from intervening terrain and atmospheric absorption using standard day conditions (temperature 10°C, relative humidity 70%) was also calculated. No attenuation was calculated due to trees or other foliage that could act to reduce sound levels at community locations.

Wind turbine sound level predictions were calculated for a height of 5 feet above ground level as specified by Maine DEP 375.10. Sound levels were calculated and presented specifically for community receptor points. “Receptor points” are the locations in each direction from the project with the greatest potential to exceed the Maine DEP sound level limits. In addition, sound level contours were calculated to provide model predictions at all locations within the study area. A grid spacing of 20 meters by 20 meters was used to calculate the sound level contours.

Initial sound level predictions for the Revised Project were calculated with all proposed wind turbines operating at full rated sound power output, and the addition of 5 dBA for modeling purposes, and are presented in Figure 7. The model predictions are presented for selected receptor points and as sound level contours at 1 dBA intervals. The sound level contours corresponding to Maine DEP quiet daytime and nighttime limits of 55 dBA and 45 dBA are shown as bold lines. Figure 7 also shows the turbine locations and number designations, parcel boundaries, dwelling locations, a residential subdivision,

public roads, and water bodies. Parcels that are owned or will be leased by Evergreen II and parcels with required sound easements are shown by hatching.

A review of predicted sound levels for proposed daytime operation indicates that when operating at full sound output, the Revised Oakfield Project will comply with Maine DEP daytime sound level limit of 55 dBA at all regulated protected locations. The model predictions further indicate that some curtailment of nighttime operations will be required in order to meet the nighttime limit of 45 dBA that applies within 500 feet of a dwelling at a regulated protected location. The Maine DEP limits do not apply to noise received within the project boundary or where Evergreen II has obtained a sound easement.

Curtailment options are: 1) limit the operation of a specific turbine to daytime hours only or 2) implement Noise Restricted Operation (NRO) to reduce turbine sound levels at night. Turbine specifications from Vestas provide warranted overall sound power levels for NRO modes that reduce sound output from 1 dBA to 4 dBA based on turbine settings. For example, when operating at NRO 2 (Mode 2), the sound power level of the Vestas V112 wind turbine is reduced by 2 dBA, from 106.5 dBA to 104.5 dBA. Figure 8 presents the octave band sound power levels at rated sound output for full operations and NRO modes including NRO 1, NRO 2 and NRO 4 as provided in the Vestas sound performance specification (see Exhibit 1). The sound level spectrum for each mode varies depending on wind speed and shear (see Section 4.0) and was selected to yield the highest predicted sound levels at the receptor points.

Sound level reductions for the NRO modes are accomplished by lowering the rotational speed of the turbine rotor to slow the blade tips. Although operating a turbine in NRO mode reduces turbine sound output, it also results in lower energy production from the wind turbine.

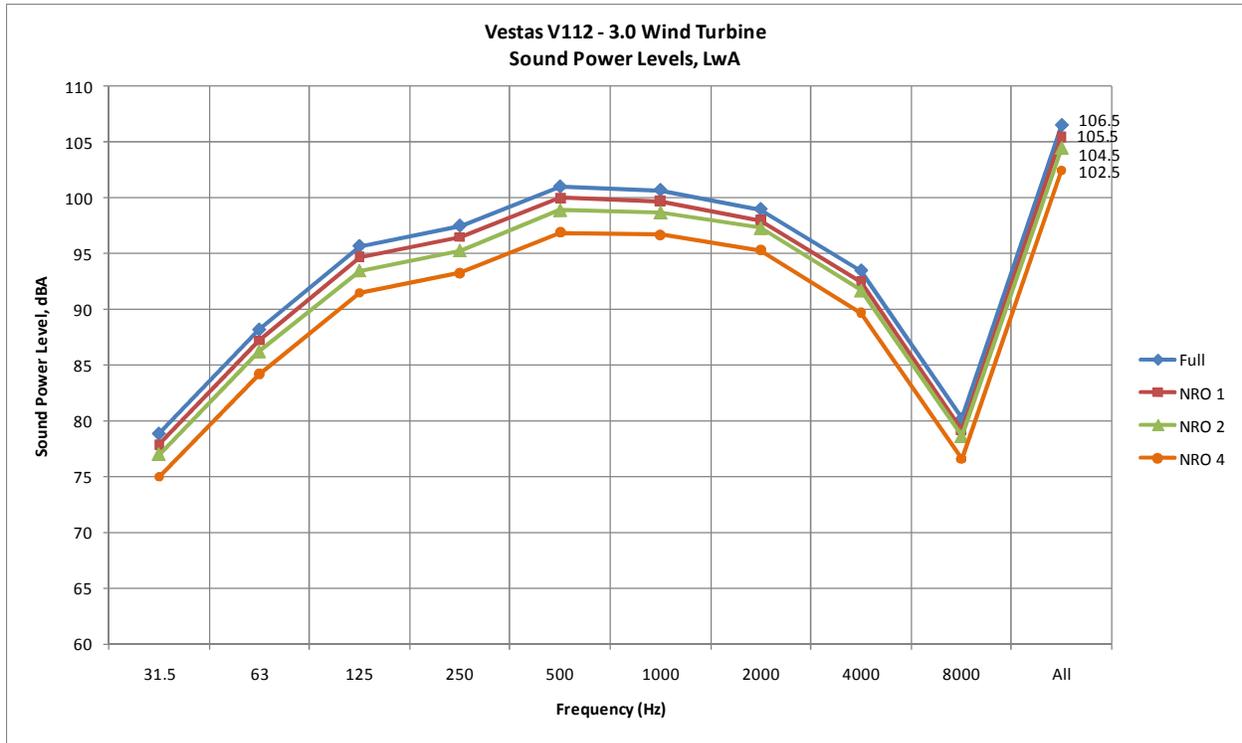


Figure 8. Sound Power Levels for Vestas V112 – Full Operation and NRO Modes

A nighttime operations plan for the Revised Oakfield Project was developed so that sound levels emitted from wind turbines would meet the nighttime sound level limit at all regulated protected locations. This plan consists of curtailing nighttime operation of five wind turbines in the north group, three turbines in the east group, and six in the Oakfield south group. Wind turbines with reduced nighttime operation are listed in Table 7. The facility operations plan will include provisions to implement NRO during nighttime hours as presented in Table 7.

| Turbine No. | Nighttime Operation | Net Sound Power Level, dBA* |
|----------------|---------------------|-----------------------------|
| N11, N13 & N14 | NRO 1 | 105.5 |
| N15 | NRO 2 | 104.5 |
| N16 | NRO 4 | 102.5 |
| E01 | NRO 1 | 105.5 |
| E03 | NRO 2 | 104.5 |
| E04 | NRO 2 | 104.5 |
| S01 to S04 | NRO 2 | 104.5 |
| S05 | NRO 1 | 105.5 |
| S07 | NRO 2 | 104.5 |

*Model predictions include uncertainty of +2.0 dBA

Table 7. Wind Turbines with Reduced Nighttime Operation

Predicted sound levels for nighttime operation are presented in Figure 9. Other than the nighttime operating modes and model predictions, the information on Figure 9 is the same as shown on Figure 7 for daytime operations. Sound level predictions were calculated at receptor points designated as P1 through P13 that represent the protected location(s), in each compass direction from wind turbines, with the greatest potential to exceed the Maine DEP nighttime sound level limits.

A summary of predicted sound levels at the receptor points for daytime and nighttime operation is provided in Table 8. This table also provides the distance from each receptor point to the nearest turbine operating at full output during daytime and nighttime periods, and the sound level reduction resulting from nighttime operation. Model predictions for the proposed nighttime operating mode, including curtailment of fourteen wind turbines, indicate that resulting sound levels will be at or below Maine DEP nighttime sound level limit of 45 dBA at all regulated protected locations.

| Receptor Point | Approximate Distance to Nearest Turbine Operating at Full Output (ft) | | Predicted Hourly Sound Level, dBA | | |
|----------------|---|-----------|-----------------------------------|-----------|-----------|
| | Daytime | Nighttime | Daytime | Nighttime | Reduction |
| P1 | 2546 | 2864 | 44.5 | 44.2 | 0.3 |
| P2 | 2621 | 2621 | 41.0 | 40.9 | 0.1 |
| P3 | 3681 | 3996 | 43.7 | 43.3 | 0.4 |
| P4 | 2431 | 3402 | 45.8 | 44.8 | 1.0 |
| P5 | 1923 | 3629 | 45.5 | 44.7 | 0.8 |
| P6 | 1804 | 2651 | 45.8 | 44.5 | 1.3 |
| P7 | 2595 | 5276 | 46.2 | 44.4 | 1.8 |
| P8 | 1982 | 5417 | 46.7 | 44.6 | 2.1 |
| P9 | 2746 | 3638 | 45.8 | 44.5 | 1.3 |
| P10 | 1860 | 4849 | 47.1 | 44.9 | 2.2 |
| P11 | 2306 | 3881 | 46.4 | 45.0 | 1.4 |
| P12 | 2835 | 3130 | 45.6 | 44.7 | 0.9 |
| P13 | 2605 | 2605 | 44.9 | 44.7 | 0.2 |

Table 8. Predicted Daytime and Nighttime Sound Levels from Wind Turbine Operations at Receptor Points

6.3 Tonal and Short Duration Repetitive Sounds

The Maine DEP regulation requires an adjustment to the measured sound level at a protected location if sound from a development generates certain types of sound that are considered to be more annoying than relatively steady sound with no prominent tones or frequencies. These regulated types of sound are 1) tonal sounds and 2) short duration repetitive sounds.

6.3.1 Tonal Sounds

Tonal sounds are similar to prominent discrete tones that are audible from a development at a protected location. The Maine DEP defines a tonal sound as follows:

“For the purpose of this regulation, a tonal sound exists if, at a protected location, the one-third octave band sound pressure level in the band containing the tonal sound exceeds the arithmetic average of the sound pressure levels of the two contiguous one-third octave bands by 5 dB for center frequencies at or between 500 Hz and 10,000 Hz, by 8 dB for center frequencies at or between 160 and 400 Hz, and by 15 dB for center frequencies at or between 25 Hz and 125 Hz. (ref. Maine DEP Chapter 375.10.G(24)).”

The Vestas V112 Sound Level Performance Standard (Exhibit 1) warrants the overall sound power level of the V112 and further warrants that the V112 will not produce a tonal sound as defined by Maine DEP 375.10. Measurement reports by Delta for the V90 and V100 turbines, similar Vestas turbines, indicates potential for tonality in some frequencies but at levels well below the Maine DEP criteria for regulated tonal sounds. From the available turbine testing data (for the Vestas V90 and V100 turbines) and Vestas V112 Sound Level Performance Standard, the proposed V112 wind turbines are not expected to generate regulated tonal sounds during routine operation.⁴

6.3.2 Short Duration Repetitive Sounds

Maine DEP Chapter 375.10 defines short duration repetitive sounds as:

“A sequence of repetitive sounds which occur more than once within an hour, each clearly discernible as an event and causing an increase in the sound level of at least 6 dBA on the fast meter response above the sound level observed immediately before and after the event, each typically less than ten seconds in duration, and which are inherent to the process or operation of the development and are foreseeable.” (ref. Maine DEP Chapter 375.10.G(19)).

Concerning assessment of the 5 dBA penalty for SDR sounds, the Maine DEP noise regulation states:

“For short duration repetitive sounds, 5 dBA shall be added to the observed sound levels of the short duration repetitive sounds that result from routine operation of the development for the purposes of determining compliance with the above sound level limits.” (ref. MDEP Chapter 375.10.C.1.e.i.)

The 5 dBA penalty is added to the sound levels of the SDR sounds and not to the overall equivalent sound level (LAeq) for the time period.

For wind turbines, short duration changes in sound levels occur with the passage of rotor blades. This is commonly referred to as “amplitude modulation”. The highest sound levels are generally recognized to occur on the down stroke of each rotor blade which occurs at a rate of just over once per second at full

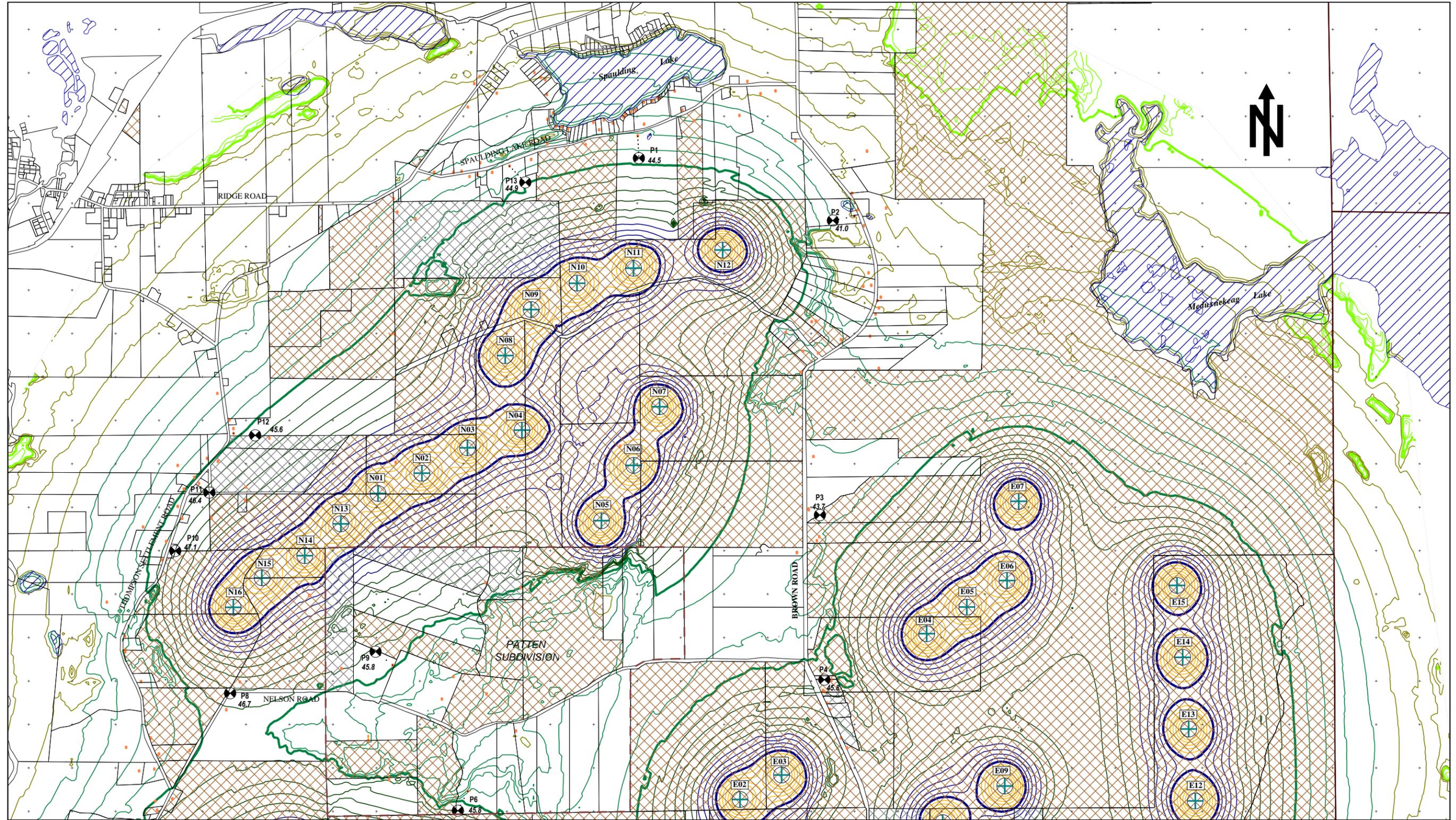
⁴ Delta, Measurement of Noise Emission from a Vestas V90 1.815 MW Wind Turbine, AV 122/10, March 26, 2010.
Delta, Measurement of Noise Emission from a Vestas V100 1.8 MW VCS Wind Turbine, AV 172/10, 29 October 2010

rotational speed (17.7 rpm). The Delta reports on sound measurements of the Vestas V90 and V100 turbines do not specifically address the sound level change that occurs due to amplitude modulation. Measurements of operating wind turbines at other projects in Maine and published literature concerning amplitude modulation from wind turbines indicates that sound level fluctuations during the blade passage of wind turbines typically range from 2 to 5 dBA (see also Section 2.3), with occasional but infrequent events reaching 6 dBA or more. The occurrences of these higher fluctuations or SDR sound events are so small that they are not expected to affect the predicted sound levels.

6.4 Infrasound and Low Frequency Sound

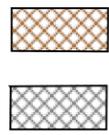
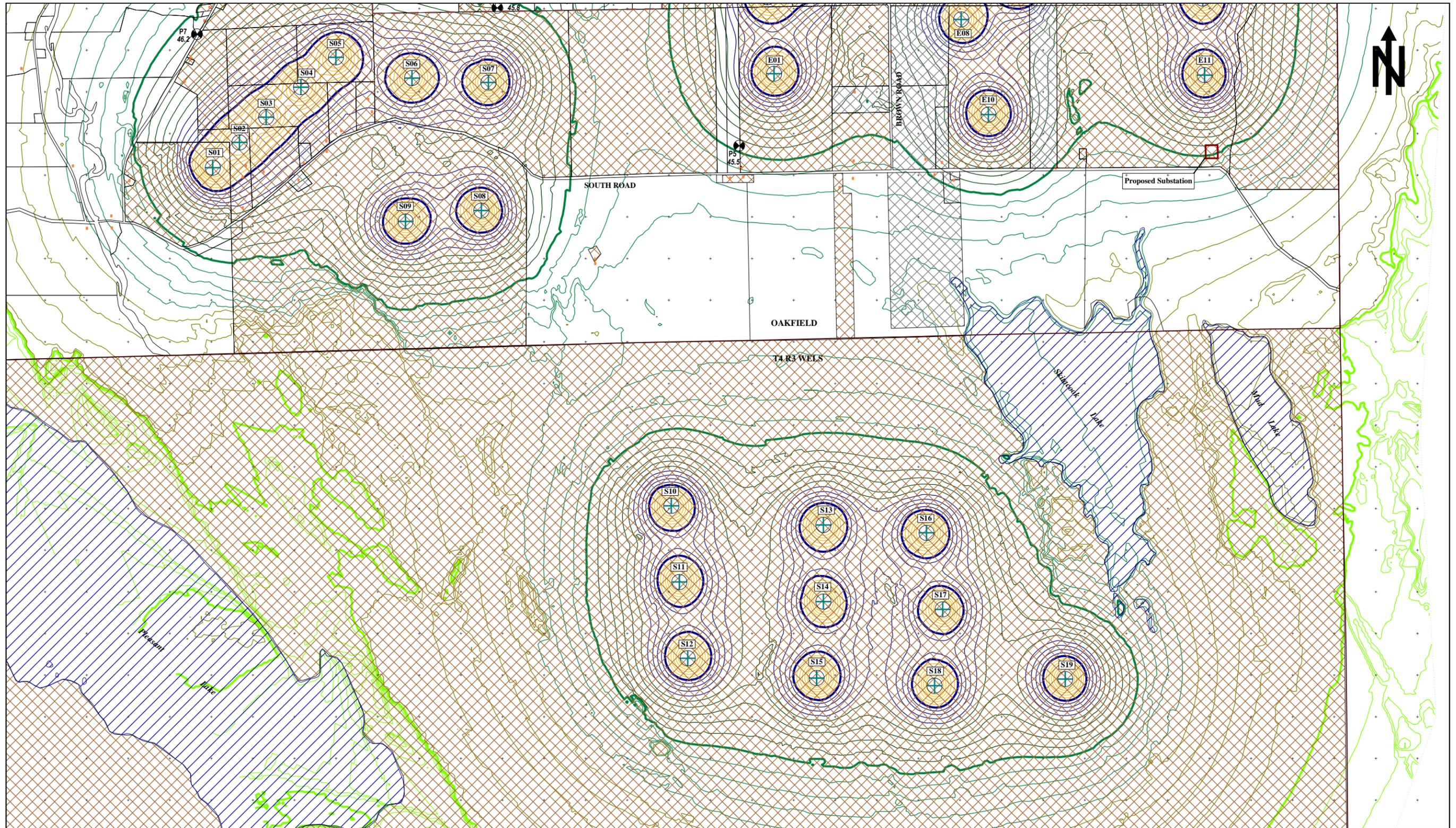
Maine DEP does not specifically regulate infrasound or low frequency sound or vibrations and other impacts that may result from such sounds. Independent research and testing have indicated that impacts from infrasound and low frequency sounds from wind turbines are uncommon and not likely to be of concern from a properly sited, designed, and operated wind energy facility. The findings of several of these independent sources are outlined in the Site Location of Development Order issued by the Maine DEP for the original Oakfield Wind Project and therefore will not be discussed in this report. Further, the DEP found “that compliance with Chapter 375§10 is likely to ensure that there are no adverse health effects due to the proposed project.”

Figure 7 (1 of 2). Predicted Sound Levels from Daytime Operation (North)



| | | | | | | | | |
|---|-------------------------|---|--------------|---|--|---|--------------------------|---|
|  | Participating Landowner |  | Wind Turbine |  | Receptor Point & Predicted Sound Level |  | 55 dBA (Daytime Limit) | Coordinate Grid Spacing = 1000 ft Sound Level Contour Interval = 1 dBA |
|  | Sound Easement |  | Dwelling | | |  | 45 dBA (Nighttime Limit) | |
| | | | | | |  | 35 dBA | |

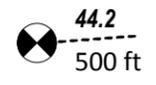
Figure 7 (2 of 2). Predicted Sound Levels from Daytime Operation (South)



Participating Landowner
 Sound Easement



Wind Turbine
 Dwelling

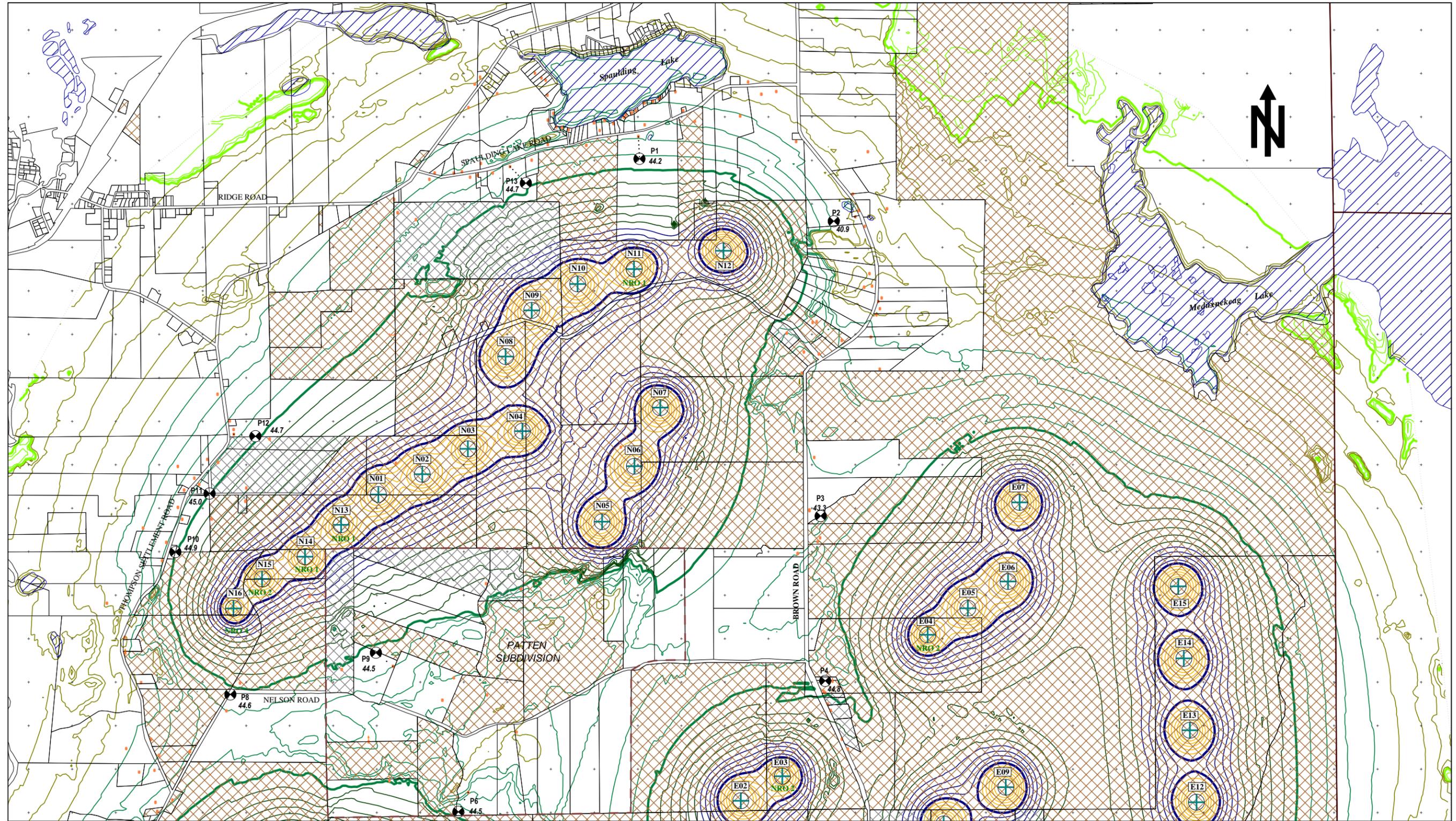


Receptor Point & Predicted Sound Level

55 dBA (Daytime Limit)
 45 dBA (Nighttime Limit)
 35 dBA

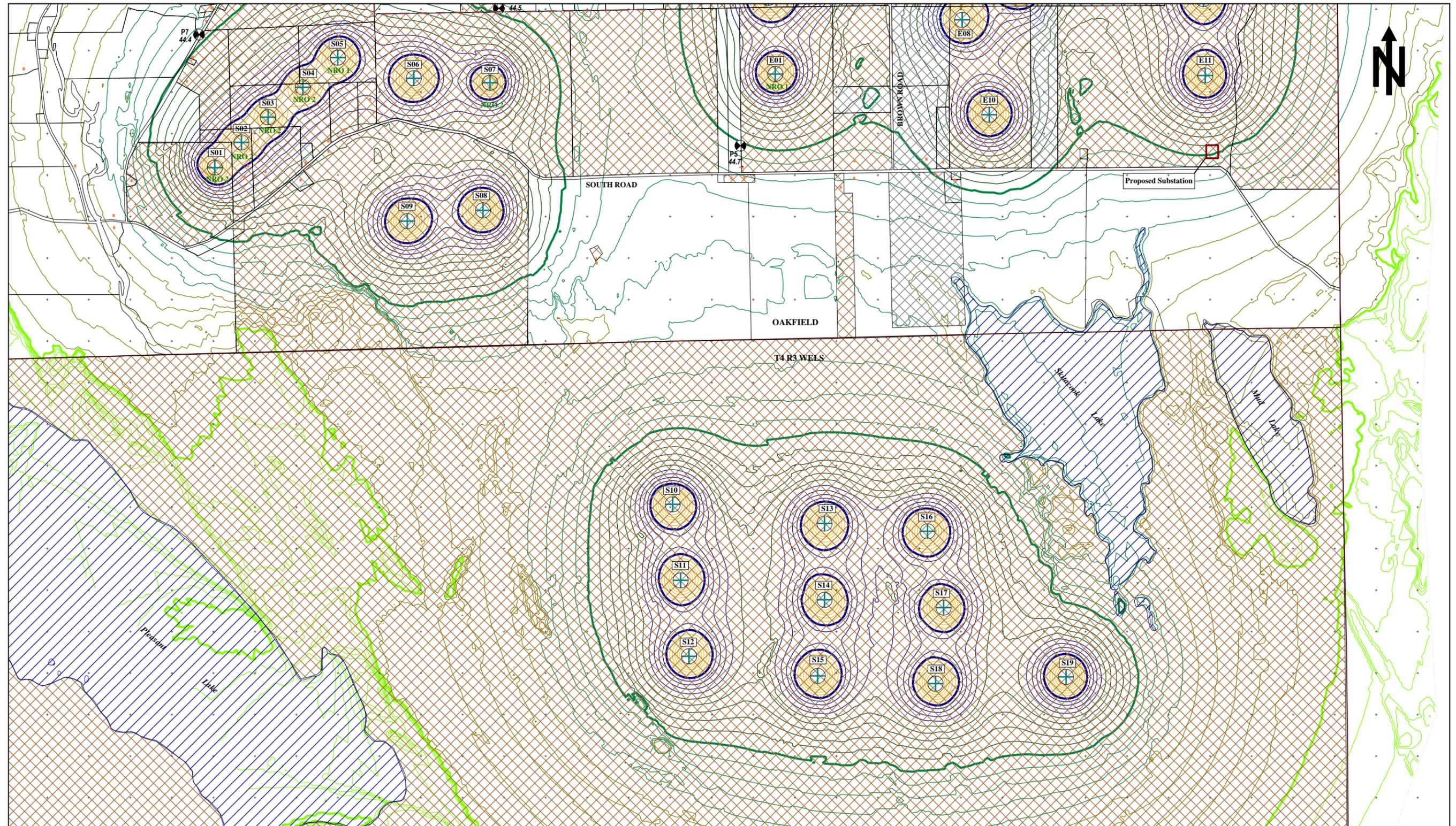
Coordinate Grid Spacing = 1000 ft
 Sound Level Contour Interval = 1 dBA

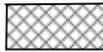
Figure 9 (1 of 2). Predicted Sound Levels from Nighttime Operation (North)



| | | | | | | | | | |
|---|-------------------------|---|--------------|---|----------------|--|---|--------------------------|---|
|  | Participating Landowner |  | Wind Turbine |  | 44.2 500 ft | Receptor Point & Predicted Sound Level |  | 55 dBA (Daytime Limit) | Coordinate Grid Spacing = 1000 ft Sound Level Contour Interval = 1 dBA |
|  | Sound Easement |  | Dwelling |  | | |  | 45 dBA (Nighttime Limit) | |
| | | | |  | | |  | 35 dBA | |

Figure 9 (2 of 2). Predicted Sound Levels from Nighttime Operation (South)



| | | | | | |
|---|--|--|--|--|---|
|  Participating Landowner |  Wind Turbine |  44.2 500 ft | Receptor Point & Predicted Sound Level |  55 dBA (Daytime Limit) | Coordinate Grid Spacing = 1000 ft Sound Level Contour Interval = 1 dBA |
|  Sound Easement |  Dwelling | | |  45 dBA (Nighttime Limit) | |
| | | | |  35 dBA | |

7.0 Sound Level Testing

The purpose of sound level testing is to confirm by measurement that sound levels emitted by the Revised Oakfield Project are at or below the sound level limits applicable to all phases of the project.

7.1 Project Construction

Construction of the Revised Project is planned to primarily occur during daylight and daytime hours when sound levels generated by construction activity are exempt from the Maine DEP sound level limits by Maine statute. Therefore, no sound level testing is planned for the construction phase of the project.

If nighttime non-daylight construction occurs, such construction activity is required to comply with nighttime sound level limits for routine operation and maintenance of the project.

7.2 Wind Turbine Operations

Sound level testing of wind turbine operations is a complex and critical component of the proper and responsible operation of a wind energy facility. The most difficult aspect of wind turbine sound testing is to perform the required measurements under the proper site and weather conditions. Operation of wind turbines at full sound output requires a significant level of wind acting on the turbine hubs for an extended period of time. Often when hub wind speeds are at the required levels, surface winds will also be high enough to cause extraneous sound levels from wind forces acting on terrain and vegetation. These extraneous sound levels make it difficult to isolate turbine sound.

However, during nighttime periods, the winds aloft along the project ridges and wind turbine hubs can remain strong while the surface winds at lower elevations near protected locations can reduce to light or nearly calm. These conditions are commonly referred to as a “stable atmosphere” and are the best conditions under which to measure the sound level contributions of wind turbines for several reasons. First, the ambient (non-wind turbine) sound levels from wind and daytime activities are diminished so that the sound levels from wind turbines become more prominent and easier to quantify. Second, technical literature concerning wind turbine noise emissions indicates that the potential for amplitude modulation increases with wind shear. Therefore, full sound output under stable atmospheric conditions is the preferable for measuring sound levels for the presence of short duration repetitive sounds.

BEA has worked closely with the Maine DEP and EnRad Consulting, acoustical consultant to Maine DEP, to develop a specific and detailed testing protocol for measuring sound levels from wind turbines in Maine. The purpose of this protocol is to measure wind turbine sound levels to evaluate compliance with Maine DEP sound level limits including appropriate adjustments for tonal and short duration repetitive sounds.

The specific test protocol for the original Oakfield Project that will be used to develop a similar protocol for sound level testing of the Revised Oakfield Wind Project is presented as Exhibit 2. The test protocol for the Revised Project will contain provisions for conducting sound measurements with specific turbines operating at NRO levels established for nighttime operations per Section 6.2 (Table 7). Once operations sound testing demonstrates compliance with applicable limits, Evergreen II may implement a post-construction monitoring program to demonstrate that nighttime operation of some turbines at the proposed NRO levels is unnecessary.

8.0 Complaint Response Protocol

In collaboration with the Town of Oakfield Wind Energy Review Committee, Evergreen II has developed a formal protocol for addressing sound complaints from local residents during wind turbine operations. The purpose of this protocol is to ensure that local residents are informed on how to report a sound complaint and that each sound complaint is fully documented and resolved in a consistent manner. The Oakfield Wind Sound Complaint Response and Resolution Protocol can be found in Exhibit 3 of this report. It establishes guidelines for reporting, documenting, investigating, reporting and responding to sound complaints.

The response to each complaint will depend upon the circumstances involved in the complaint and may include a site visit, inspection of nearby wind turbines, and/or sound level measurements. An important aspect of the complaint process is to fully document the site, weather and operating conditions at the time of the complaint so that trends can be identified and any sound evaluation conducted under equivalent conditions.

As appropriate, Evergreen II will use the complaint information collected during operations to assist in selecting compliance monitoring locations for testing in accordance with the Maine DEP regulations. Complaint information will also be used to schedule monitoring to ensure it is conducted under weather and operating conditions when sound from the project is most noticeable.

If Evergreen II determines that there is a consistent pattern of complaints that suggest sound levels from wind turbine operations may exceed applicable DEP sound level limits, an appropriate operations plan and mitigation measures will be developed and implemented to ensure that turbine operations continue to meet applicable sound level limits.

9.0 Summary of Findings

This Sound Level Assessment establishes sound level limits to be applied to the Revised Oakfield Wind Project and provides sound level predictions for daytime and nighttime turbine operations using a terrain-based computer model. Model settings reflect the results of turbine sound level testing of similar wind energy facilities in Maine. The most stringent Maine DEP hourly sound level limits of 55 dBA daytime and 45 dBA nighttime will be applied to the Revised Project. Sound level predictions

indicate that with all wind turbines operating simultaneously at full capacity, Evergreen II will meet Maine DEP daytime sound level limit of 55 dBA at all regulated protected locations. During nighttime hours, Evergreen II will implement noise-restricted operation of specific turbines to meet the DEP nighttime sound level limit of 45 dBA at all regulated protected locations.

The Sound Level Assessment establishes procedures for sound level testing of turbine operations to evaluate compliance with applicable sound level limits, including methods for measurement and analysis of tonal and short duration repetitive sounds. A formal protocol for response and resolution of sound complaints is also established to reduce the potential for noise problems associated with long-term operation of the Revised Project.

10.0 References

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EXHIBIT 1: SOUND LEVEL PERFORMANCE STANDARD⁵

**Sound Level Performance Standard and
Testing Procedure**

Warranted Sound Power Level V112 – 3.0 MW WTG

When measured in accordance with these testing procedures the **V112 – 3.0MW WTG IEC Class I** warranted maximum Sound Level Performance Standard is as follows:

- Mode 0 Operation: Lwa = 106.5 dB(A).
- Mode 1 Operation: Lwa = 106.5 dB(A).
- Mode 2 Operation: Lwa = 104.5 dB(A).
- Mode 4 Operation: Lwa = 102.5 dB(A).
- Mode 5 Operation: Lwa = 105.5 dB(A).

This warranted sound level is subject to a tolerance for measurement uncertainties of the greater of (i) the actual measurement uncertainty determined in accordance with the Sound Level Test Standard and (ii) ± 2 dB(A). If the measured sound power level is at or below the warranted sound power level plus the uncertainty, the standard has been met.

Supplier also warrants that the sound generated by any Wind Turbine shall not produce a Tonal Sound during operation in any mode when measured in accordance with the Sound Level Test Standard and on the linear scale for one-third octave bands with center frequencies ranging from 20 to 12,500 Hz. A Tonal Sound is defined to exist if the one-third (1/3) octave band sound pressure level in the band, including the tone, exceeds the arithmetic average of the sound pressure levels of the two (2) contiguous one-third (1/3) octave bands by five (5) dB for center frequencies between five hundred (500) Hz and ten thousand (10,000) Hz, by eight (8) dB for center frequencies between one hundred and sixty (160) Hz and four hundred (400) Hz, or by fifteen (15) dB for center frequencies twenty-five (25) Hz between one hundred and twenty-five (125) Hz.

“Sound Level Test Standard” means the test protocol as defined in IEC 61400-11-ed2:2002.

⁵ Source: Oakfield Turbine Supply Agreement, Exhibit D.2, Vestas Wind Systems A/S

EXHIBIT 2: OPERATIONS SOUND TESTING PROTOCOL FOR THE ORIGINAL OAKFIELD WIND PROJECT⁶

Maine Department of Environmental Protection Department Order L-24572-24-A-N, January 2010:

C. Municipal Review Committee. The Town of Oakfield's Wind Energy Review Committee (WERC) retained the services of Resource Systems Group (RSG), a professional engineering noise consultant, to address sound and noise issues related to the proposed project. RSG performed an independent review of the sound modeling submitted by the applicant, as described in the WERC's Final Report dated September 4, 2009. That report found that "Under all circumstances, the Committee consultant's modeling scenarios showed predicted sound levels of 45 dBA or lower from the wind turbines at each non-participating residence." As a result of that review the Town of Oakfield's WERC concluded that the applicant's sound predictions and modeling are appropriate and may be conservative, and recommended additional measures to ensure compliance with the Department's quiet area sound level limits. The applicant, by letter dated September 15, 2009, agreed to the following measures and incorporated these measures into the proposed Oakfield Wind Project application before the Department:

- i. The applicant proposes to implement a Sound Complaint Response and Resolution Protocol to provide a transparent process for identifying and responding to potential sound complaints. This protocol includes measures to ensure a consistent approach to documenting complaints, a process for the applicant to communicate with the Town and the Department regarding potential complaints, and flexibility for ensuring appropriate actions are taken in response to potential complaints. A copy of the protocol is attached to the September 15 letter.
- ii. The applicant proposes to implement a post-construction monitoring protocol consistent with the following:

Within 12 months from when the project becomes operational, Evergreen shall conduct sound monitoring at two or more representative locations around the project. These locations shall be chosen in consultation with the Department and the Town based on how well they represent local meteorology and their relative noise impact from the wind turbines (highest potential to exceed the applicable noise standards). In addition, special consideration shall be given to landowners that have registered sound complaints. The April 6, 2009 Rollins protocol shall be followed except that the weather conditions in Section b of the protocol shall be relaxed if either A or B are met:

- A is met if (i), (ii) and (iii) are satisfied:
 - (i) the difference between the LA90 and LA10 during any 10-minute period is less than 5 dBA, and
 - (ii) the surface wind speed (10 meter height) is 6 mph or less for 80% of the measurement period and did not exceed 10 mph at any time or the turbines are shut down during the

⁶ Town of Oakfield, Wind Energy Review Committee, FINAL REPORT, September 2009.

monitoring period and the difference in the observed LA50 after the shut down is equal to or greater than 6 dB, and

(iii) observer logs or recorded sound files clearly indicate the dominance of turbine sounds.

- B is met if (iv) is satisfied:

(iv) the overall 10 minute LAeq is 40 dBA or less.

iii. The applicant has agreed that if tonal sounds cause an exceedance of Chapter 375.10 sound limits, Evergreen will promptly notify the Department and the Town. Evergreen will then expedite an investigation of the sound level exceedance and the associated tonal sound and develop a mitigation plan and schedule to achieve compliance with the applicable sound level limits. Evergreen will provide copies of the mitigation plan to the Department and the Town, implement the mitigation plan, and provide a written report describing the actions taken and new measurement results that demonstrate compliance. Mitigation options could include reduction of the overall sound level and/or the tonal sound component. The Department reserves the right to order immediate actions to be taken to mitigate such sounds while this process is taking place, or to take such other enforcement action it finds appropriate.

iv. The applicant has restated its commitment that the project will comply with the 45 dBA quiet nighttime limit during nighttime hours at applicable regulatory locations even if the pre-development ambient sound level is more than 35 dBA. Similarly, the project will comply with the 55 dBA quiet daytime limit during daytime hours at applicable regulatory locations even if the pre-development ambient sound is greater than 45 dBA.

v. The applicant has stated its commitment that any future First Wind wind power project sited proximate to the project that is the subject of the application will be sited and operated in a manner to ensure that the combined sound, i.e. the sound associated with the existing project and potential future project, complies with the quiet noise limits (45 dBA) at applicable regulatory locations. The Department notes that this commitment waives the option of applying the 3 dBA allowance of Chapter 375.10 (C)(1)(c), and any future expansion would also be required to comply with any applicable Department standards on control of noise in effect at the time of application.

To confirm that the modeling accurately predicted sound levels and ensure that the sound level limits in this permit are met, EnRad Consulting recommended that the Oakfield Wind Project be required to conduct routine operational noise compliance measurements at a minimum of six protected locations designated in the application noise assessment as "Receiver Positions" R1, R4-7 and R9, and provided recommendations for addressing these locations in the final monitoring plan. EnRad stated that these particular sites not only represent the highest predicted sound levels, but also address both the northern and southern turbine arrays from multiple directions and elevations. EnRad recommended that the applicant should be required to demonstrate compliance at these locations based on following outlined conditions for 12, 10-

minute measurement intervals per monitoring location meeting 06-096 CMR 375.10 requirements.

EnRad further stated that background ambient monitoring may be required in the areas where extraneous sounds could potentially or do complicate routine operation compliance assessment. If required, background ambient monitoring locations and times will be determined with concurrence from the Department.

a. Compliance will be demonstrated when the required operating/test conditions have been met for twelve 10-minute measurement intervals at each monitoring location.

b. Measurements will be obtained during weather conditions when wind turbine sound is most clearly noticeable, i.e. when the measurement location is downwind of the development and maximum surface wind speeds are ≤ 6 mph with concurrent turbine hub-elevation wind speeds sufficient to generate the maximum continuous rated sound power from the five nearest wind turbines to the measurement location. Measurement intervals affected by increased biological activities, leaf rustling, traffic, high water flow or other extraneous ambient noise sources that affect the ability to demonstrate compliance will be excluded from reported data. A downwind location is defined as within 45° of the direction between a specific measurement location and the acoustic center of the five nearest wind turbines.

c. Sensitive receiver sound monitoring locations should be positioned to most closely reflect the representative protected locations for purposes of demonstrating compliance with applicable sound level limits, subject to permission from the respective property owner(s). Selection of monitoring locations should require concurrence from MDEP.

d. Meteorological measurements of wind speed and direction should be collected using anemometers at a 10-meter height above ground at the center of large unobstructed areas and generally correlated with sound level measurement locations. Results should be reported, based on 1-second integration intervals, and be reported synchronously with hub level and sound level measurements at 10 minute intervals. The wind speed average and maximum should be reported from surface stations. Department concurrence on meteorological site selection is required.

e. Sound level parameters reported for each 10-minute measurement period, should include A-weighted equivalent sound level, 10/90% exceedance levels and ten 1-minute 1/3 octave band linear equivalent sound levels (dB). Short duration repetitive events should be characterized by event duration and amplitude. Amplitude is defined as the peak event amplitude minus the average minima sound levels immediately before and after the event, as measured at an interval of 50 ms or less, A-weighted and fast time response, i.e. 125 ms. For each 10-minute measurement period short duration repetitive sound events should be reported by percentage of 50 ms or less intervals for each observed amplitude integer above 4 dBA. Reported

measurement results should be confirmed to be free of extraneous noise in the respective measurement intervals to the extent possible and in accordance with (b).

f. Compliance data collected in accordance with the assessment methods outlined above for representative locations selected in accordance with this protocol will be submitted to the Department for review and approval prior to the end of the first year of facility operation. Compliance data for each location will be gathered and submitted to the Department at the earliest possible opportunity after the commencement of operation, with consideration for the required weather, operations, and seasonal constraints.

... to confirm that the modeling accurately predicted sound levels and to ensure that the standards are met, the Department finds that the applicant must implement the assessment plan referenced above, including the modifications to which the applicant agreed in response to the Town of Oakfield's Wind Energy Review Committee and the additional requirements proposed by EnRad as described above. If the compliance data indicates that the Oakfield Wind Project is not in compliance with Department standards as described above, within 60 days of a determination of non-compliance by the Department, the applicant must submit, for review and approval, a compliance plan that proposes actions to bring the project into compliance at all the protected locations surrounding the development. This compliance plan must include, among other strategies, consideration and analysis of how potential turbine shutdown scenarios may bring the project into compliance with the terms of this permit. The Department will consult with sound engineering professionals in the review of any such compliance plan and reserves the right to require additional mitigation measures. The Department reserves the right to order immediate actions to be taken to mitigate such sounds while this process is taking place, or to take such other enforcement action it finds appropriate to ensure compliance with the applicable provisions of Chapter 375(10).

EXHIBIT 3: SOUND COMPLAINT RESPONSE AND RESOLUTION

Oakfield Wind Project Sound Complaint Response
and Resolution Protocol



Evergreen will complete the Sound Complaint Record Form by providing the following:

- Nearest turbine to complaint location
- Date and time call or form processed
- Power output (kW), wind speed and direction of closest turbines during sound event
- Local/surface weather conditions—cloud cover, precipitation, relative wind speed and direction, temperature, and relative humidity
- Ground conditions – field, wooded, snow, foliage, frozen/icing

A log of complaints will be kept and managed by the operational staff at the Project site. Evergreen will provide a copy of the complaint log to the Town and DEP on a quarterly basis or more frequently upon request by the Town or DEP.

The response to each complaint will depend on each situation, but may include, without limitation, a visit to the location of the complaint; inspection of the operating condition of the turbines closest to the complaint location to evaluate potential upset conditions that might increase sound levels; informal sound monitoring by Evergreen; an informal evaluation of the complaint by Evergreen’s sound consultant; or formal sound monitoring. In the event that Evergreen conducts formal sound monitoring at a complaint location, it will notify the Town ahead of time, allow the Town Manager the opportunity to observe, and will provide the results to the Town. In addition, if Evergreen conducts a visit to a complainant or conducts informal sound monitoring at a complaint location, it will undertake best efforts to notify the Town Manager and allow him or her the opportunity to observe. In any event, a Sound Complaint Response Form and Follow-up Record will be completed by Evergreen staff.

Evergreen will use the information collected during the first three months of operation to assist in selecting compliance monitoring locations for testing in accordance with the DEP post-construction sound level compliance assessment plan, as well as timing to ensure monitoring is conducted under weather and operating conditions when sound from the project is most noticeable.

If Evergreen or the DEP determines that there is a consistent pattern of complaints that suggest sound levels from the Project may exceed applicable DEP sound level limits, Evergreen will develop and implement an appropriate protocol for ensuring that the Project continues to meet applicable sound level limits. Evergreen shall take reasonable steps to provide a copy of the protocol to the Town and DEP prior to its implementation, and will provide the results of testing undertaken as part of the protocol to the DEP and the Town. If the Project is not in compliance with the DEP standards, and as set forth in the DEP Site Law permit, Evergreen will submit a revised operation protocol to the DEP and provide a copy to the Town that demonstrates the Project will be in compliance at all the protected locations surrounding the Project.

Oakfield Wind Project Sound Complaint Response and Resolution Protocol



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Oakfield Wind Project Sound Complaint Response and Resolution Protocol



Protocol Implementation:

Evergreen Wind will hold an initial public information meeting in conjunction with the Town to explain the complaint response and resolution process, including how to properly file complaints and complete the form(s).

Forms will be mailed to project abutters and will be available at the Town Office and the DEP.

The 24/7 hotline number will be mailed to abutters and posted at the Town Office.

For the first year of operations, Evergreen will hold quarterly meetings in conjunction with the Town to discuss complaints and their resolution. This process can also be used to report the results of compliance testing per the DEP protocol.

Evergreen Wind will develop and schedule in consultation with the DEP compliance testing to occur sometime after commercial operations but during the first year of routine operations so that complainant locations can be incorporated as appropriate.

The proactive and innovative measures identified in this sound complaint response and resolution protocol will facilitate a more complete understanding and evaluation of potential sound complaints and will ensure that those complaints are appropriately addressed. Evergreen invites the public to participate in this process to ensure that the Oakfield Wind Project remains a positive contributor to the community.

Appendix 5-2

| Index | Tax Map | Lot(s) | Grantor Name(s) | EWPII, LLC Interest |
|--------------|----------------|---------------|---|----------------------------|
| 1 | OAK 1 | 15 | Walter V. Mitchell and Patricia A. Mitchell | Easement |
| 2 | OAK 1 | 21 | Vincent J. Franco | Easement |
| 3 | OAK 1 | 20 | Brian Collins | Easement |
| 4 | OAK 2 | 7 | MaryAnne S. Hare | Easement |
| 5 | OAK 2 | 8.1 | Paul Mantegna | Easement |
| 6 | OAK 2 | 8.2 | Gregory Scott McNally | Easement |
| 7 | OAK 2 | 8.9 | Dave W. Kitchin and Dennis M. Kitchin | Easement |
| 8 | OAK 2 | 9 | Kenneth Emerson and Janet Emerson | Easement |
| 9 | OAK 2 | 9.1 | Howard I. Smith | Easement |
| 10 | OAK 2 | 10 | Andrew M. Seder and Scott R. Althouse | Easement |
| 11 | OAK 3 | 1.1 | Gary A. Martin | Easement |
| 12 | OAK 4 | 20 | Joseph A. Gattuso, Jr. and Lori M. Gattuso | Easement |
| 13 | OAK 4 | 20-1 | Gregory Scott McNally | Easement |
| 14 | OAK 4 | 36-A | Hiram White and Joan White | Easement |
| 15 | OAK 5 | 2-10 | Alex Hutchinson and Lisa Hutchinson | Easement |
| 16 | OAK 5 | 2.15 | Jon A. Provost and Tamara R. Greenlaw | Easement |
| 17 | OAK 5 | 2.18 | Janine H. Michaud | Easement |
| 18 | OAK 6 | 4.1 and 5.3 | Roger D. Hagan | Easement |
| 19 | OAK 6 | 5.1 | Fred I. Sweet | Easement |
| 20 | OAK 6 | 5.2 | Randall M. Gove | Easement |
| 21 | OAK 6 | 5.4 | Larry A. Sanford | Easement |
| 22 | OAK 8 | 22 | Gary C. Sico and Janine C. Sico | Easement |
| 23 | OAK 8 | 29.8 | Steven C. Greenlaw and Sydney Greenlaw | Easement |

Appendix D

Maine DEP Regulations Chapter 375, Section 10 “Noise”

- (3) Written permission of the Department of Environmental Protection for activities which may adversely affect a body of water or wildlife habitat protected by a natural buffer strip, such as: removal of live trees, stump and hot systems, and the displacement of rocks, topsoil and similar activities which would cause or allow increased soil erosion.
- (4) The establishment of particular species of vegetation.
- (5) The use of particular materials, colors, and styles in the construction of architectural screens.

10. Control of Noise

A. Preamble. The Board recognizes that the construction, operation and maintenance of developments may cause excessive noise that could degrade the health and welfare of nearby neighbors. It is the intent of the Board to require adequate provision for the control of excessive environmental noise from developments proposed after the effective date of this regulation.

B. Applicability

- (1) This regulation applies to proposed developments within municipalities without a local quantifiable noise standard and in unorganized areas of the State. When a proposed development is located in a municipality which has duly enacted by ordinance an applicable quantifiable noise standard, which (1) contains limits that are not higher than the sound level limits contained in this regulation by more than 5 dBA, and (2) limits or addresses the various types of noises contained in this regulation or all the types of noises generated by the development, that local standard, rather than this regulation, shall be applied by the Board within that municipality for each of the types of sounds the ordinance regulates. This regulation applies to developments located within one municipality when the noise produced by the development is received in another municipality and, in these cases, the Board will also take into consideration the municipalities' quantifiable noise standards, if any.
- (2) This regulation applies to expansions and modifications of developments when such expansions and modifications are proposed after the effective date of this regulation and subject to site location approval, but only to the noise produced by the proposed expansion or modification of the development, unless (1) the existing development was constructed since 1-1-70 and (2) at the time of construction, the existing development was too small to require site location approval. In situations where conditions (1) and (2) above apply, then this regulation applies to the whole development (both existing facility and proposed expansion or modification). This regulation also applies to expansions and modifications of existing developments when such expansions and modifications require an amendment to the development's Site Law permit, but only to the noise produced by the expansion or modification.
- (3) This regulation does not apply to existing developments or portions of existing developments constructed prior to 1-1-70 or approved under the Site Law prior to the effective date of this regulation. This regulation does not apply to relicensing of existing solid waste facilities previously approved under the Site Law.

- (4) The sound level limits contained in this regulation apply only to areas that are defined as protected locations, and to property lines of the proposed development or contiguous property owned by the developer, whichever are farther from the proposed development's regulated sound sources.
- (5) The sound level limits contained in this regulation do not apply to noise received within the development boundary.

NOTE: The Board will reconsider the effect and operation of the regulation one year from its effective date.

C. Sound Level Limits

(1) Sound From Routine Operation of Developments.

- (a) Except as noted in subsections (b) and (c) below, the hourly sound levels resulting from routine operation of the development and measured in accordance with the measurement procedures described in subsection H shall not exceed the following limits:

- (i) At any property line of the development or contiguous property owned by the developer, whichever is farther from the proposed development's regulated sound sources:

75 dBA at any time of day.

- (ii) At any protected location in an area for which the zoning, or, if unzoned, the existing use or use contemplated under a comprehensive plan, is not predominantly commercial, transportation, or industrial;

60 dBA between 7:00 a.m. and 7:00 p.m.
(the "daytime hourly limit"), and
50 dBA between 7:00 p.m. and 7:00 a.m.
(the "nighttime hourly limit").

- (iii) At any protected location in an area for which the zoning, or, if unzoned, the existing use or use contemplated under a comprehensive plan, is predominantly commercial, transportation, or industrial:

70 dBA between 7:00 a.m. and 7:00 p.m.
(the "daytime hourly limit"), and
60 dBA between 7:00 p.m. and 7:00 a.m.
(the "nighttime hourly limit").

- (iv) For the purpose of determining whether the use of an unzoned area is predominantly commercial, transportation, or industrial (e.g. non-residential in nature), the Department shall consider the municipality's comprehensive plan, if any. Furthermore, the usage of properties abutting each protected location shall be determined, and the limits applied for that protected location shall be based upon the

usage occurring along the greater portion of the perimeter of that parcel; in the event the portions of the perimeter are equal in usage, the limits applied for that protected location shall be those for a protected location in an area for which the use is not predominantly commercial, transportation, or industrial.

- (v) When a proposed development is to be located in an area where the daytime pre-development ambient hourly sound level at a protected location is equal to or less than 45 dBA and/or the nighttime pre-development ambient hourly sound level at a protected location is equal to or less than 35 dBA, the hourly sound levels resulting from routine operation of the development and measured in accordance with the measurement procedures described in subsection H shall not exceed the following limits at that protected location:

55 dBA between 7:00 a.m. and 7:00 p.m.
 (the "daytime hourly limit"), and
 45 dBA between 7:00 p.m. and 7:00 a.m.
 (the "nighttime hourly limit").

For the purpose of determining whether a protected location has a daytime or nighttime pre-development ambient hourly sound level equal to or less than 45 dBA or 35 dBA, respectively, the developer may make sound level measurements in accordance with the procedures in subsection H or may estimate the sound-level based upon the population density and proximity to local highways. If the resident population within a circle of 3,000 feet radius around a protected location is greater than 300 persons, or the hourly sound level from highway traffic at a protected location is predicted to be greater than 45 dBA in the daytime or 35 dBA at night (as appropriate for the anticipated operating schedule of the development), then the developer may estimate the daytime or nighttime pre-development ambient hourly sound level to be greater than 45 dBA or 35 dBA, respectively.

NOTE: Highway traffic noise can be predicted using the nomograph method of FHWA Highway Traffic Noise Prediction Model, FHWA-RD-77-108, December, 1978.

- (vi) Notwithstanding the above, the developer need not measure or estimate the pre-development ambient hourly sound levels at a protected location if he demonstrates, by estimate or example, that the hourly sound levels resulting from routine operation of the development will not exceed 50 dBA in the daytime or 40 dBA at night.
- (b) If the developer chooses to demonstrate by measurement that the daytime and/or nighttime pre-development ambient sound environment at any protected location near the development site exceeds the daytime and/or nighttime limits in subsection 1(a)(ii) or 1(a)(iii) by at least 5 dBA, then the daytime and/or nighttime limits shall be 5 dBA less than the measured daytime and/or nighttime pre-development ambient hourly sound level at the location of the measurement for the corresponding time period.
- (c) For any protected location near an existing development, the hourly sound level limit for routine operation of the existing development and all future expansions of that

development shall be the applicable hourly sound level limit of 1(a) or 1(b) above, or, at the developer's election, the existing hourly sound level from routine operation of the existing development plus 3 dBA.

- (d) For the purposes of determining compliance with the above sound level limits, 5 dBA shall be added to the observed levels of any tonal sounds that result from routine operation of the development.
- (e) When routine operation of a development produces short duration repetitive sound, the following limits shall apply:
 - (i) For short duration repetitive sounds, 5 dBA shall be added to the observed levels of the short duration repetitive sounds that result from routine operation of the development for the purposes of determining compliance with the above sound level limits.
 - (ii) For short duration repetitive sounds resulting from scrap metal, drop forge and metal fabrication operations or developments which the Board determines, due to their character and/or duration, are particularly annoying or pose a threat to the health and welfare of nearby neighbors, 5 dBA shall be added to the observed levels of the short duration repetitive sounds that result from routine operation of the development for the purposes of determining compliance with the above sound level limits, and the maximum sound level of the short duration repetitive sounds shall not exceed the following limits:
 - (a) At any protected location in an area for which the zoning, or, if unzoned, the existing use or use contemplated under a comprehensive plan, is not predominantly commercial, transportation, or industrial:

65 dBA between 7:00 a.m. and 7:00 p.m., and
55 dBA between 7:00 p.m. and 7:00 a.m.
 - (b) At any protected location in an area for which the zoning, or, if unzoned, the existing use or use contemplated under a comprehensive plan, is predominantly commercial, transportation, or industrial:

75 dBA between 7:00 a.m. and 7:00 p.m., and
65 dBA between 7:00 p.m. and 7:00 a.m.
 - (c) The methodology described in subsection 1(a)(iv) shall be used to determine whether the use of an unzoned area is predominantly commercial, transportation, or industrial.
 - (d) If the developer chooses to demonstrate by measurement that the pre-development ambient hourly sound level at any protected location near the development site exceeds 60 dBA between 7:00 a.m. and 7:00 p.m., and/or 50 dBA between 7:00 p.m. and 7:00 a.m., then the maximum sound level limit for short duration repetitive sound shall be 5 dBA greater than the measured pre-development ambient hourly sound level at the location of the measurement for the corresponding time period.

- (e) For any protected location near an existing development, the maximum sound level limit for short duration repetitive sound resulting from routine operation of the existing development and all future expansions and modifications of that development shall be the applicable maximum sound level limit of (e)(ii)(a) or (e)(ii)(b) above, or, at the developer's election, the existing maximum sound level of the short duration repetitive sound resulting from routine operation of the existing development plus 3 dBA.

NOTE: The maximum sound level of the short duration repetitive sound shall be measured using the fast response [L_{AFmax}]. See the definition of maximum sound level.

(2) Sound From Construction of Developments

- (a) The sound from construction activities between 7:00 p.m. and 7:00 a.m. is subject to the following limits:
- (i) Sound from nighttime construction activities shall be subject to the nighttime routine operation sound level limits contained in subsections 1(a) and 1(b).
 - (ii) If construction activities are conducted concurrently with routine operation, then the combined total of construction and routine operation sound shall be subject to the nighttime routine operation sound level limits contained in subsections 1(a) and 1(b).
 - (iii) Higher levels of nighttime construction sound are permitted when a duly issued permit authorizing nighttime construction sound in excess of these limits has been granted by:
 1. the local municipality when the duration of the nighttime construction activity is less than or equal to 90 days,
 2. the local municipality and the Board when the duration of the nighttime construction activity is greater than 90 days.
- (b) Sound from construction activities between 7:00 a.m. and 7:00 p.m. shall not exceed the following limits at any protected location:

| Duration of Activity | Hourly Sound Level Limit |
|----------------------|--------------------------|
| 12 hours | 87 dBA |
| 8 hours | 90 dBA |
| 6 hours | 92 dBA |
| 4 hours | 95 dBA |
| 3 hours | 97 dBA |
| 2 hours | 100 dBA |
| 1 hour or less | 105 dBA |

- (c) All equipment used in construction on development sites shall comply with applicable federal noise regulations and shall include environmental noise control devices in proper working condition, as originally provided with the equipment by its manufacturer.

(3) Sound From Maintenance Activities

- (a) Sound from routine, ongoing maintenance activities shall be considered part of the routine operation of the development and the combined total of the routine maintenance and operation sound shall be subject to the routine operation sound level limits contained in subsection 1.
- (b) Sound from occasional, major, scheduled overhaul activities shall be subject to the construction sound level limits contained in subsection 2. If overhaul activities are conducted concurrently with routine operation and/or construction activities, the combined total of the overhaul, routine operation and construction sound shall be subject to the construction sound level limits contained in subsection 2.

(4) Sound From Production Blasting

Sound exceeding the limits of subsection 1 and resulting from production blasting at a mine or quarry shall be limited as follows:

- (a) Blasting shall not occur in the period between sundown and sunrise the following day or in the period between the hours of 7:00 p.m. and 7:00 a.m., whichever is greater. In addition, no routine production blasting shall be allowed in the daytime on Sundays.
- (b) Blasting shall not occur more frequently than four times per day.
- (c) Sound from blasting shall not exceed the following limits at any protected location:

| Number of Blasts Per Day | Sound Level Limit |
|--------------------------|-------------------|
| 1 | 129 dBL |
| 2 | 126 dBL |
| 3 | 124 dBL |
| 4 | 123 dBL. |

Blast sound shall be measured in peak linear sound level (dBL) with a linear response down to 5 Hz.

NOTE: See Bureau of Mines Report of Investigations 8485 for information on airblast sound levels and pertinent scaled distances.

(5) Exemptions

Sound associated with the following shall be exempt from regulation by the Board:

- (a) Railroad equipment which is subject to federal noise regulations.

- (b) Aircraft operations which are subject to federal noise regulations.
- (c) Registered and inspected vehicles:
 - (i) while operating on public ways, or
 - (ii) which enter the development to make a delivery or pickup and which are moving, starting or stopping, but not when they are parked for over 60 minutes in the development.
- (d) Watercraft while underway.
- (e) Residential developments, except during construction of such developments.
- (f) Bells, chimes and carillons.
- (g) occasional sporting, cultural, religious or public events allowed by the local municipality where the only affected protected locations are contained within that municipality.
- (h) The unamplified human voice and other sounds of natural origin.
- (i) Firing, fishing and aquacultural activity.
- (j) Forest management, harvesting and transportation activities.
- (k) Making, maintaining and grooming snow where the only affected protected locations are contained within the general boundaries of a ski area development.
- (l) Snow removal, landscaping and street sweeping activities.
- (m) Emergency maintenance and repairs.
- (n) Warning signals and alarms.
- (o) Safety and protective devices installed in accordance with code requirements.
- (p) Test operations of emergency equipment occurring in the daytime and no more frequently than once per week.
- (q) Boiler start-up, testing and maintenance operations occurring no more frequently than once per month.
- (r) Major concrete pours that must extend after 7:00 p.m., when started before 3:00 p.m.
- (s) Sounds from a regulated development received at a protected location when the generator of the sound has been conveyed a noise easement for that location. This exemption shall only be for the specific noise, land and term covered by the easement.

- (t) A force majeure event and other causes not reasonably within the control of the owners or operators of the development.

(6) Noise Abatement Structures.

Noise abatement structures of a non-permanent nature in any one location for a duration of less than one year and erected for the sole purpose of noise control shall not be considered structures as defined in 38 MRSA subsection 482(6).

D. Submissions

(1) Developments with Minor Sound Impact.

An applicant for a proposed development with minor sound impact may choose to file as part of the site location application a statement attesting to the minor nature of the anticipated sound impact of their development. An applicant proposing an expansion or modification of an existing development with minor sound impact may follow the same procedure as described above. For the purpose of this regulation, a development or an expansion or modification of an existing development with minor sound impact means a development where the developer demonstrates, by estimate or example, that the regulated sound from routine operation of the development will not exceed 5 dBA less than the applicable limits established under subsection C. It is the intent of this subsection that an applicant need not conduct sound level measurements to demonstrate that the development or an expansion or modification of an existing development will have a minor sound impact.

NOTE: Examples include subdivisions without structures, office buildings, storage buildings which will not normally be accessed at night, and golf courses.

(2) Other Developments

Technical information shall be submitted describing the applicant's plan and intent to make adequate provision for the control of sound. The applicant's plan shall contain information such as the following, when appropriate:

- (a) Maps and descriptions of the land uses, local zoning and comprehensive plans for the area potentially affected by sounds from the development.
- (b) A description of major sound sources, including tonal sound sources and sources of short duration repetitive sounds, associated with the construction, operation and maintenance of the proposed development, including their locations within the proposed development.
- (c) A description of the daytime and nighttime hourly sound levels and, for short duration repetitive sounds, the maximum sound levels expected to be produced by these sound sources at protected locations near the proposed development.
- (d) A description of the protected locations near the proposed development.

- (e) A description of proposed major sound control measures, including their locations and expected performance.
- (f) A comparison of the expected sound levels from the proposed development with the sound level limits of this regulation.
- (g) A comparison of the expected sound levels from the proposed development with any quantifiable noise standards of the municipality in which the proposed development will be located and of any municipality which may be affected by the noise.

E. Terms and Conditions

The Board may, as a term or condition of approval, establish any reasonable requirement to ensure that the developer has made adequate provision for the control of noise from the development and to reduce the impact of noise on protected locations. Such conditions may include, but are not limited to, enclosing equipment or operations, imposing limits on hours of operation, or requiring the employment of specific design technologies, site design, modes of operation, or traffic patterns.

The sound level limits prescribed in this regulation shall not preclude the Board under Chapter 375.15 from requiring a developer to demonstrate that sound levels from a development will not unreasonably disturb wildlife or adversely affect wildlife populations. In addition, the sound level limits shall not preclude the Board, as a term or condition of approval, from requiring that lower sound level limits be met to ensure that the developer has made adequate provision for the protection of wildlife.

F. Variance From Sound Level Limits

The Board recognizes that there are certain developments or activities associated with development for which noise control measures are not reasonably available. Therefore, the Board or Commissioner may grant a variance from any of the sound level limits contained in this rule upon (1) a showing by the applicant that he or she has made a comprehensive assessment of the available technologies for the development and that the sound level limits cannot practicably be met with any of these available technologies, and (2) a finding by the Board that the proposed development will not have an unreasonable impact on protected locations. In addition, a variance may be granted by the Board or Commissioner if (1) a development is deemed necessary in the interest of national defense or public safety and the applicant has shown that the sound level limits cannot practicably be met without unduly limiting the development's intended function, and (2) a finding is made by the Board or Commissioner that the proposed development will not have an unreasonable impact on protected locations. The Board or Commissioner shall consider the request for a variance as part of the review of a completed Site Location of Development Law application. In granting a variance, the Board or Commissioner may, as a condition of approval, impose terms and conditions to ensure that no unreasonable sound impacts will occur.

G. Definitions

Terms used herein are defined below for the purpose of this noise regulation.

- (1) AMBIENT SOUND: At a specified time, the all-encompassing sound associated with a given environment, being usually a composite of sounds from many sources at many directions, near and far, including the specific development of interest.
- (2) CONSTRUCTION: Activity and operations associated with the development or expansion of a project or its site.
- (3) EMERGENCY: An unforeseen combination of circumstances which calls for immediate action.
- (4) EMERGENCY MAINTENANCE AND REPAIRS: Work done in response to an emergency.
- (5) ENERGY SUM OF A SERIES OF LEVELS: Ten times the logarithm of the arithmetic sum of the antilogarithms of one-tenth of the levels. [Note: See Section H(4.2).]
- (6) EXISTING DEVELOPMENT: A development constructed before 1-1-70 or a development approved under the Site Law prior to the effective date of this regulation or a proposed development for which the site location application is complete for processing on or before the effective date of this regulation. Any development with a site location approval which has been remanded to the Board by a court of competent jurisdiction for further proceedings relating to noise limits or noise levels prior to the effective date of these regulations shall not be deemed an existing development and these regulations shall apply to the existing noise sources at that development.
- (7) EXISTING HOURLY SOUND LEVEL: The hourly sound level resulting from routine operation of an existing development prior to the first expansion that is subject to this regulation.
- (8) EQUIVALENT SOUND LEVEL: The level of the mean-square A-weighted sound pressure during a stated time period, or equivalently the level of the sound exposure during a stated time period divided by the duration of the period.

NOTE: For convenience, a one hour equivalent sound level should begin approximately on the hour.

- (9) HISTORIC AREAS: Historic sites administered by the Bureau of Parks and Recreation of the Maine Department of Conservation, with the exception of the Arnold Trail.
- (10) HOURLY SOUND LEVEL: The equivalent sound level for one hour measured or computed in accordance with this regulation.
- (11) LOCALLY-DESIGNATED PASSIVE RECREATION AREA: Any site or area designated by a municipality for passive recreation that is open and maintained for public use and which:
 - (a) has fixed boundaries,
 - (b) is owned in fee simple by a municipality or is accessible by virtue of public easement,

- (c) is identified and described in a local comprehensive plan, and
- (d) has been identified and designated at least nine months prior to the filing of the applicant's Site Location of Development application.
- (12)MAXIMUM SOUND LEVEL: Ten times the common logarithm of the square of the ratio of the maximum sound to the reference sound of 20 micropascals. Symbol: L_{AFmax} .
- (13)MAXIMUM SOUND: Largest A-weighted and fast exponential-time-weighted sound during a specified time interval. Unit: pascal (Pa).
- (14)RESIDENCE: A building or structure, including manufactured housing, maintained for permanent or seasonal residential occupancy providing living, cooking and sleeping facilities and having permanent indoor or outdoor sanitary facilities, excluding recreational vehicles, tents and watercraft.
- (15)PRE-DEVELOPMENT AMBIENT: The ambient sound at a specified location in the vicinity of a development site prior to the construction and operation of the proposed development or expansion.
- (16)PROTECTED LOCATION: Any location, accessible by foot, on a parcel of land containing a residence or planned residence or approved residential subdivision, house of worship, academic school, college, library, duly licensed hospital or nursing home near the development site at the time a Site Location of Development application is submitted; or any location within a State Park, Baxter State Park, National Park, Historic Area, a nature preserve owned by the Maine or National Audubon Society or the Maine Chapter of the Nature Conservancy, The Appalachian Trail, the Moosehorn National Wildlife Refuge, federally-designated wilderness area, state wilderness area designated by statute (such as the Allagash Wilderness Waterway), or locally-designated passive recreation area; or any location within consolidated public reserve lands designated by rule by the Bureau of Public Lands as a protected location.

At protected locations more than 500 feet from living and sleeping quarters within the above noted buildings or areas, the daytime hourly sound level limits shall apply regardless of the time of day.

Houses of worship, academic schools, libraries, State and National Parks without camping areas, Historic Areas, nature preserves, the Moosehorn National Wildlife Refuge, federally-designated wilderness areas without camping areas, state wilderness areas designated by statute without camping areas, and locally-designated passive recreation areas without camping areas are considered protected locations only during their regular hours of operation and the daytime hourly sound level limits shall apply regardless of the time of day.

Transient living accommodations are generally not considered protected locations; however, in certain special situations where it is determined by the Board that the health and welfare of the guests and/or the economic viability of the establishment will be unreasonably

impacted, the Board may designate certain hotels, motels, campsites and duly licensed campgrounds as protected locations.

This term does not include buildings and structures located on leased camp lots, owned by the applicant, used for seasonal purposes.

For purposes of this definition, (1) a residence is considered planned when the owner of the parcel of land on which the residence is to be located has received all applicable building and land use permits and the time for beginning construction under such permits has not expired, and (2) a residential subdivision is considered approved when the developer has received all applicable land use permits for the subdivision and the time for beginning construction under such permits has not expired.

- (17)QUANTIFIABLE NOISE STANDARD: A numerical limit governing noise from developments that has been duly enacted by ordinance by a local municipality.
- (18)ROUTINE OPERATION: Regular and recurrent operation of regulated sound sources associated with the purpose of the development and operating on the development site.
- (19)SHORT DURATION REPETITIVE SOUNDS: A sequence of repetitive sounds which occur more than once within an hour, each clearly discernible as an event and causing an increase in the sound level of at least 6 dBA on the fast meter response above the sound level observed immediately before and after the event, each typically less than ten seconds in duration, and which are inherent to the process or operation of the development and are foreseeable.
- (20)SOUND COMPONENT: The measurable sound from an audibly identifiable source or group of sources.
- (21)SOUND LEVEL: Ten times the common logarithm of the square of the ratio of the frequency-weighted and time-exponentially averaged sound pressure to the reference sound of 20 micropascals. For the purpose of this regulation, sound level measurements are obtained using the A-weighted frequency response and fast dynamic response of the measuring system, unless otherwise noted.
- (22)SOUND PRESSURE: Root-mean-square of the instantaneous sound pressures in a stated frequency band and during a specified time interval. Unit: pascal (Pa).
- (23)SOUND PRESSURE LEVEL: Ten times the common logarithm of the square of the ratio of the sound pressure to the reference sound pressure of 20 micropascals.
- (24)TONAL SOUND: for the purpose of this regulation, a tonal sound exists if, at a protected location, the one-third octave band sound pressure level in the band containing the tonal sound exceeds the arithmetic average of the sound pressure levels of the two contiguous one-third octave bands by 5 dB for center frequencies at or between 500 Hz and 10,000 Hz, by 8 dB for center frequencies at or between 160 and 400 Hz, and by 15 dB for center frequencies at or between 25 Hz and 125 Hz.

Additional acoustical terms used in work associated with this regulation shall be used in accordance with the following American National Standards Institute (ANSI) standards:

ANSI S12.9-1988 - American National Standard Quantities and Procedures for Description and Measurements of Environmental Sound, Part 1;

ANSI S3.20-1973 - American National Standard Psychoacoustical Terminology;

ANSI S1.1-1960 - American National Standard Acoustical Terminology.

H. Measurement Procedures

(1) Scope. These procedures specify measurement criteria and methodology for use, with applications, compliance testing and enforcement. They provide methods for measuring the ambient sound and the sound from routine operation of the development, and define the information to be reported. The same methods shall be used for measuring the sound of construction, maintenance and production blasting activities. For measurement of the sound of production blasting activities for comparison with the limits of subsection C(4)(c), these same methods shall be used with the substitution of the linear sound level for the A-weighted sound level.

(2) Measurement Criteria

2.1 Measurement Personnel

Measurements shall be supervised by personnel who are well qualified by training and experience in measurement and evaluation of environmental sound, or by personnel trained to operate under a specific measurement plan approved by the Board or Commissioner.

2.2 Measurement Instrumentation

- (a) A sound level meter or alternative sound level measurement system used shall meet all of the Type 1 or 2 performance requirements of American National Standard Specifications for Sound Level Meters, ANSI S1.4-1983.
- (b) An integrating sound level meter (or measurement system) shall also meet the Type 1 or 2 performance requirements for integrating/averaging in the International Electrotechnical Commission Standard on Integrating-Averaging Sound Level Meters, IEC Publication 804 (1985).
- (c) A filter for determining the existence of tonal sounds shall meet all the requirements of American National Standard Specification for Octave-Band and Fractional Octave-Band Analog and Digital Filters, ANSI S1.11-1986 for Order 3, Type 3-D performance.
- (d) An acoustical calibrator shall be used of a type recommended by the manufacturer of the sound level meter and that meets the requirements of American National Standard Specification for Acoustical Calibrators, ANSI S1.40-1984.

- (e) A microphone windscreen shall be used of a type recommended by the manufacturer of the sound level meter.

2.3 Calibration

- (a) The sound level meter shall have been calibrated by a laboratory within 12 months of the measurement, and the microphone's response shall be traceable to the National Bureau of Standards.
- (b) Field calibrations shall be recorded before and after each measurement period and at shorter intervals if recommended by the manufacturer.

2.4 Measurement Location, Configuration and Environment

- (a) Except as noted in subsection (b) below, measurement locations shall be at nearby protected locations that are most likely affected by the sound from routine operation of the development.
- (b) For determining compliance with the 75 dBA property line hourly sound level limit described in subsection C(1)(a)(i), measurement locations shall be selected at the property lines of the proposed development or contiguous property owned by the developer, as appropriate.
- (c) The microphone shall be positioned at a height of approximately 4 to 5 feet above the ground, and oriented in accordance with the manufacturer's recommendations.
- (d) Measurement locations should be selected so that no vertical reflective surface exceeding the microphone height is located within 30 feet. When this is not possible, the measurement location may be closer than 30 feet to the reflective surface, but under no circumstances shall it be closer than 6 feet.
- (e) When possible, measurement locations should be at least 50 feet from any regulated sound source on the development.
- (f) Measurement periods shall be avoided when the local wind speed exceeds 12 mph and/or precipitation would affect the measurement results.

2.5 Measurement Plans. Plans for measurement of pre-development ambient sound or post-development sound may be discussed with the Department staff.

(3) Measurement of Ambient Sound

3.1 Pre-Development Ambient Sound

Measurements of the pre-development ambient sound are required only when the developer elects to establish the sound level limit in accordance with subsections C(1)(b) and C(1)(e)(ii)(d) for a development in an area with high ambient sound levels, such as near highways, airports, or pre-existing developments; or when the developer elects to establish

that the daytime and nighttime ambient hourly sound levels at representative protected locations exceed 45 dBA and 35 dBA, respectively.

- (a) Measurements shall be made at representative protected locations for periods of time sufficient to adequately characterize the ambient sound. At a minimum, measurements shall be made on three different weekdays (Monday through Friday) during all hours that the development will operate. If the proposed development will operate on Saturdays and/or Sundays, measurements shall also be made during all hours that the development will operate.
- (b) Measurement periods with particularly high ambient sounds, such as during holiday traffic activity, significant insect activity or high coastline waves, should generally be avoided.
- (c) At any measurement location the daytime and nighttime ambient hourly sound level shall be computed by arithmetically averaging the daytime and nighttime values of the measured one hour equivalent sound levels. Multiple values, if they exist, for any specific hour on any specific day shall first be averaged before the computation described above.

3.2 Post-Development Ambient Sound

- (a) Measurements of the post-development ambient one hour equivalent sound levels and, if short duration repetitive sounds are produced by the development, the maximum sound levels made at nearby protected locations and during representative routine operation of the development that are not greater than the applicable limits of subsection C clearly indicate compliance with those limits.
 - (b) Compliance with the limits of subsection C(1)(b) may also be demonstrated by showing that the post-development ambient hourly sound level, measured in accordance with the procedures of subsection 3.1 above during routine operation of the development, does not exceed the pre-development ambient hourly sound level by more than one decibel, and that the sound from routine operation of the development is not characterized by either tonal sounds or short duration repetitive sounds.
 - (c) Compliance with the limits of subsection C(1)(e)(ii)(d) may also be demonstrated by showing that the post development maximum sound level of any short duration repetitive sound, measured in accordance with the procedures of subsection 3.1 above, during routine operation of the development, does not exceed the pre-development ambient hourly sound level by more than five decibels.
 - (d) If any of the conditions in (a), (b) or (c) above are not met, compliance with respect to the applicable limits must be determined by measuring the sound from routine operation of the development in accordance with the procedures described in subsection 4.
- (4) Measurement of the Sound from Routine Operation of Developments.

4.1 General

- (a) Measurements of the sound from routine operation of developments are generally necessary only for specific compliance testing purposes in the event that community complaints result from operation of the development, for validation of an applicant's calculated sound levels when requested by the Board or Commissioner, for determination of existing hourly sound levels for an existing development or for enforcement by the Department.
- (b) Measurements shall be obtained during representative weather conditions when the development sound is most clearly noticeable. Preferable weather conditions for sound measurements at distances greater than about 500 feet from the sound source include overcast days when the measurement location is downwind of the development and inversion periods (which most commonly occur at night).
- (c) Measurements of the development sound shall be made so as to exclude the contribution of sound from development equipment that is exempt from this regulation.

4.2 Measurement of the Sound Levels Resulting from Routine Operation of the Development.

- (a) When the ambient sound levels are greater than the sound level limits, additional measurements can be used to determine the hourly sound level that results from routine operation of the development. These additional measurements may include diagnostic measurements such as measurements made close to the development and extrapolated to the protected location, special checkmark measurement techniques that include the separate identification of audible sound sources, or the use of sound level meters with pause capabilities that allow the operator to exclude non-development sounds.
- (b) For the purposes of computing the hourly sound level resulting from routine operation of the development, sample diagnostic measurements may be made to obtain the one hour equivalent sound levels for each sound component.
- (c) Identification of tonal sounds produced by the routine operation of a development for the purpose of adding the 5 dBA penalty in accordance with subsection C(1)(d) requires aural perception by the measurer, followed by use of one-third octave band spectrum analysis instrumentation. If one or more of the sounds of routine operation of the development are found to be tonal sounds, the hourly sound level component for tonal sounds shall be computed by adding 5 dBA to the one hour equivalent sound level for those sounds.
- (d) Identification of short duration repetitive sounds produced by routine operation of a development requires careful observations. For the sound to be classified as short duration repetitive sound, the source(s) must be inherent to the process or operation of the development and not the result of an unforeseeable occurrence. If one or more of the sounds of routine operation of the development are found to be short duration repetitive sounds, the hourly sound level component for short duration repetitive sounds shall be computed by adding 5 dBA to the one hour equivalent sound level for those sounds. If required, the maximum sound levels of short duration repetitive sounds shall be

measured using the fast response [L_{AFmax}]. The duration and the frequency of occurrence of the events shall also be measured. In some cases, the sound exposure levels of the events may be measured. The one hour equivalent sound level of a short duration repetitive sound may be determined from measurements of the maximum sound level during the events, the duration and frequency of occurrence of the events, and their sound exposure levels.

- (e) The daytime or nighttime hourly sound level resulting from routine operation of a development is the energy sum of the hourly sound level components from the development, including appropriate penalties, (see (c) and (d) above). If the energy sum does not exceed the appropriate daytime or nighttime sound level limit, then the development is in compliance with that sound level limit at that protected location.
- (5) Reporting Sound Measurement Data. The sound measurement data report should include the following:
- (a) The dates, days of the week and hours of the day when measurements were made.
 - (b) The wind direction and speed, temperature, humidity and sky condition.
 - (c) Identification of all measurement equipment by make, model and serial number.
 - (d) The most recent dates of laboratory calibration of sound level measuring equipment.
 - (e) The dates, times and results of all field calibrations during the measurements.
 - (f) The applicable sound level limits, together with the appropriate hourly sound levels and the measurement data from which they were computed, including data relevant to either tonal or short duration repetitive sounds.
 - (g) A sketch of the site, not necessarily to scale, orienting the development, the measurement locations, topographic features and relevant distances, and containing sufficient information for another investigator to repeat the measurements under similar conditions.
 - (h) A description of the sound from the development and the existing environment by character and location.

11. Preservation of Historic Sites

- A. Preamble.** The Board recognizes the value to society of preserving sites of historic significance.
- B. Definition.** As used in this section, "historic site" means any site, structure, district or archaeological site which has been officially included on the National Register of Historic Places and/or on the Maine Historic Resource Inventory, or which is established by qualified testimony as being of historic significance.

Appendix E

Noise Levels for Homes that Exceed 45 dBA, 50 dBA, and 55 dBA

SECOND ROUND OF DATA REQUESTS – INITIAL REPLY 8/26/11

| Oakfield V112 Sound Level Prediction Model | | | | | | | | |
|--|-------------|--|---------------|--------------|------------|-----------------|--------------|------------|
| Dwelling ID | Map and Lot | Dwelling Type | Daytime (dBA) | 31.5 Hz (dB) | 63 Hz (dB) | Nighttime (dBA) | 31.5 Hz (dB) | 63 Hz (dB) |
| 1 | 1-15 | Camp | 47.1 | 65.1 | 61.1 | 45.3 | 63.5 | 59.5 |
| 2 | 1-14 | First Wind Owned – No Dwelling | 47.9 | 65.6 | 61.6 | 46.1 | 64 | 59.9 |
| 3 | 4-36 | First Wind Owned | 47.6 | 65.5 | 61.5 | 45.3 | 63.7 | 59.6 |
| 4 | 1-20b | Camp | 56.8 | 72.5 | 68.5 | 54.8 | 70.7 | 66.6 |
| 5 | 1-20d | First Wind Owned | 53.8 | 70 | 66.1 | 51.9 | 68.3 | 64.3 |
| 6 | 1-21 | Uninhabitable Camp | 50.2 | 67.3 | 63.4 | 46.8 | 65.9 | 61.9 |
| 7 | 1-20a | Camp | 51.2 | 67.9 | 64 | 49.5 | 66.4 | 62.5 |
| 8 | 1-20e | Year Round Dwelling – Occupants have moved | 51.2 | 68.1 | 64.1 | 49.9 | 66.9 | 62.9 |
| 9 | 1-22 | Do not Exist | 50.6 | 67.7 | 63.8 | 49.2 | 66.5 | 62.4 |
| 10 | 1-20 | Do Not Exist | 51.3 | 68.3 | 64.3 | 49.8 | 66.9 | 62.9 |
| 11 | 5-2-15 | Camp | 46 | 63.9 | 59.9 | 45.6 | 63.5 | 59.5 |
| 12 | 4-39 | Camp | 55.8 | 71.5 | 67.6 | 55.8 | 71.5 | 67.6 |
| 13 | 1-20g | Camp | 52.6 | 69.2 | 65.3 | 51.8 | 68.4 | 64.4 |
| 14 | 1-20g | Camp | 51.7 | 68.6 | 64.6 | 50.9 | 67.7 | 63.8 |
| 15 | 5-4 | Camp | 56 | 71.8 | 67.8 | 56 | 71.8 | 67.8 |
| 16 | 4-36 | First Wind Owned - Camp | 53.3 | 69.3 | 65.3 | 51.8 | 67.7 | 63.8 |
| 17 | 4-20-1 | Year Round Dwelling | 46.4 | 64.6 | 60.6 | 45.6 | 63.8 | 59.8 |
| 18 | 7-34-4 | Camp | 46.1 | 64.2 | 60.2 | 45.9 | 64 | 60 |
| 19 | 4-36-1 | Camp | 48.9 | 66.3 | 62.3 | 47.5 | 65.1 | 61.1 |
| 20 | 4-21-1 | Camp | 48.1 | 65.6 | 61.6 | 46.3 | 64.1 | 60.1 |
| 21 | 1-20b | Camp | 55.3 | 71.2 | 67.3 | 53.4 | 69.4 | 65.4 |
| 22 | 1-20b | Trailer – unoccupied | 50.6 | 67.4 | 63.4 | 48.8 | 65.8 | 61.7 |
| 23 | 2-8-2 | Camp | 45.2 | 63.7 | 59.7 | 45 | 63.5 | 59.4 |
| 24 | 2-8-9 | Camp | 45.6 | 63.9 | 59.8 | 45.5 | 63.7 | 59.6 |
| 25 | 2-7-2 | Camp | 46.9 | 64.9 | 60.9 | 46.3 | 64.4 | 60.4 |
| 26 | 2-10 | Camp | 47 | 64.4 | 60.4 | 46.7 | 64.1 | 60.1 |

SECOND ROUND OF DATA REQUESTS – INITIAL REPLY 8/26/11

| Oakfield V112 Sound Level Prediction Model | | | | | | | | |
|--|-------------|---------------------------------|---------------|--------------|------------|-----------------|--------------|------------|
| Dwelling ID | Map and Lot | Dwelling Type | Daytime (dBA) | 31.5 Hz (dB) | 63 Hz (dB) | Nighttime (dBA) | 31.5 Hz (dB) | 63 Hz (dB) |
| 27 | 6-5 | First Wind Owned – Camp Removed | 47.5 | 65 | 61 | 46.4 | 64.2 | 60.1 |
| 28 | 6-5-1 | Camp | 47.5 | 65.1 | 61.1 | 46.3 | 64.2 | 60.1 |
| 29 | 6-5-4 | Camp | 46.4 | 64.1 | 60.1 | 45.3 | 63.2 | 59.1 |
| 30 | 6-5-2P1 | Camp | 46.6 | 64.3 | 60.2 | 45.5 | 63.3 | 59.3 |
| 31 | 2-9 | Camp | 46.6 | 64.6 | 60.5 | 46.5 | 64.4 | 60.4 |
| 32 | 2-9-1 | Camp | 45.8 | 63.9 | 59.9 | 45.6 | 63.7 | 59.6 |
| 33 | 4-20 | Camp | 48.1 | 65.7 | 61.7 | 46.8 | 64.6 | 60.6 |

Receptors Located at the Dwelling as Shown on Location Map by Stantec
 Lot No.s and Dwelling Types provided by First Wind

Appendix F

Low Frequency Noise Levels for Non-Participating and Participating Landowners

INITIAL DATA REQUEST

- 31.5 and 63 Hz Sound Levels at Receptor Points

| Rec Pt | Nighttime Sound Level Spectrum (dBA) by Frequency (Hz) | | | | | | | | | | Low Frequency Sound Levels (dB) | | |
|--------|--|------|------|------|------|------|------|------|------|------|---------------------------------|------|--|
| | 31.5 | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | All | 31.5 | 63 | |
| P1 | 22.9 | 32.0 | 35.6 | 35.6 | 39.0 | 38.9 | 31.7 | 6.0 | 0.0 | 44.2 | 62.3 | 58.2 | |
| P2 | 19.5 | 28.6 | 32.9 | 32.9 | 35.7 | 35.2 | 28.3 | 3.7 | 0.0 | 40.9 | 58.9 | 54.8 | |
| P3 | 22.8 | 32.0 | 35.4 | 35.4 | 38.2 | 37.3 | 27.6 | 0.0 | 0.0 | 43.3 | 62.2 | 58.2 | |
| P4 | 23.5 | 32.7 | 36.4 | 36.5 | 39.6 | 39.2 | 32.1 | 7.5 | 0.0 | 44.8 | 62.9 | 58.9 | |
| P5 | 24.1 | 33.2 | 36.5 | 36.1 | 39.3 | 39.1 | 32.9 | 12.8 | 0.0 | 44.7 | 63.5 | 59.4 | |
| P6 | 23.3 | 32.4 | 36.3 | 36.1 | 39.1 | 38.7 | 33.1 | 14.3 | 0.0 | 44.5 | 62.7 | 58.6 | |
| P7 | 23.6 | 32.7 | 35.8 | 35.7 | 39.2 | 39.1 | 32.2 | 6.2 | 0.0 | 44.4 | 63.0 | 58.9 | |
| P8 | 23.9 | 33.0 | 36.2 | 36.0 | 39.3 | 39.1 | 32.1 | 9.8 | 0.0 | 44.6 | 63.3 | 59.2 | |
| P9 | 23.2 | 32.3 | 36.1 | 36.3 | 39.4 | 39.0 | 31.5 | 4.2 | 0.0 | 44.5 | 62.6 | 58.5 | |
| P10 | 23.3 | 32.5 | 36.1 | 36.0 | 39.5 | 39.7 | 33.8 | 12.9 | 0.0 | 44.9 | 62.7 | 58.7 | |
| P11 | 23.8 | 32.9 | 36.3 | 36.2 | 39.7 | 39.7 | 32.9 | 8.6 | 0.0 | 45.0 | 63.2 | 59.1 | |
| P12 | 23.7 | 32.9 | 36.2 | 36.2 | 39.6 | 39.4 | 31.7 | 3.8 | 0.0 | 44.7 | 63.1 | 59.1 | |
| P13 | 23.5 | 32.7 | 36.1 | 36.1 | 39.5 | 39.4 | 32.0 | 5.9 | 0.0 | 44.7 | 62.9 | 58.9 | |

LF Criteria per ANSI S12.2 - 2008 Criteria for Evaluating Room Noise"

| Hz | dB |
|------|----|
| 31.5 | 65 |
| 63 | 70 |

SECOND ROUND OF DATA REQUESTS – INITIAL REPLY 8/26/11

| Oakfield V112 Sound Level Prediction Model | | | | | | | | |
|--|-------------|--|---------------|--------------|------------|-----------------|--------------|------------|
| Dwelling ID | Map and Lot | Dwelling Type | Daytime (dBA) | 31.5 Hz (dB) | 63 Hz (dB) | Nighttime (dBA) | 31.5 Hz (dB) | 63 Hz (dB) |
| 1 | 1-15 | Camp | 47.1 | 65.1 | 61.1 | 45.3 | 63.5 | 59.5 |
| 2 | 1-14 | First Wind Owned – No Dwelling | 47.9 | 65.6 | 61.6 | 46.1 | 64 | 59.9 |
| 3 | 4-36 | First Wind Owned | 47.6 | 65.5 | 61.5 | 45.3 | 63.7 | 59.6 |
| 4 | 1-20b | Camp | 56.8 | 72.5 | 68.5 | 54.8 | 70.7 | 66.6 |
| 5 | 1-20d | First Wind Owned | 53.8 | 70 | 66.1 | 51.9 | 68.3 | 64.3 |
| 6 | 1-21 | Uninhabitable Camp | 50.2 | 67.3 | 63.4 | 46.8 | 65.9 | 61.9 |
| 7 | 1-20a | Camp | 51.2 | 67.9 | 64 | 49.5 | 66.4 | 62.5 |
| 8 | 1-20e | Year Round Dwelling – Occupants have moved | 51.2 | 68.1 | 64.1 | 49.9 | 66.9 | 62.9 |
| 9 | 1-22 | Do not Exist | 50.6 | 67.7 | 63.8 | 49.2 | 66.5 | 62.4 |
| 10 | 1-20 | Do Not Exist | 51.3 | 68.3 | 64.3 | 49.8 | 66.9 | 62.9 |
| 11 | 5-2-15 | Camp | 46 | 63.9 | 59.9 | 45.6 | 63.5 | 59.5 |
| 12 | 4-39 | Camp | 55.8 | 71.5 | 67.6 | 55.8 | 71.5 | 67.6 |
| 13 | 1-20g | Camp | 52.6 | 69.2 | 65.3 | 51.8 | 68.4 | 64.4 |
| 14 | 1-20g | Camp | 51.7 | 68.6 | 64.6 | 50.9 | 67.7 | 63.8 |
| 15 | 5-4 | Camp | 56 | 71.8 | 67.8 | 56 | 71.8 | 67.8 |
| 16 | 4-36 | First Wind Owned - Camp | 53.3 | 69.3 | 65.3 | 51.8 | 67.7 | 63.8 |
| 17 | 4-20-1 | Year Round Dwelling | 46.4 | 64.6 | 60.6 | 45.6 | 63.8 | 59.8 |
| 18 | 7-34-4 | Camp | 46.1 | 64.2 | 60.2 | 45.9 | 64 | 60 |
| 19 | 4-36-1 | Camp | 48.9 | 66.3 | 62.3 | 47.5 | 65.1 | 61.1 |
| 20 | 4-21-1 | Camp | 48.1 | 65.6 | 61.6 | 46.3 | 64.1 | 60.1 |
| 21 | 1-20b | Camp | 55.3 | 71.2 | 67.3 | 53.4 | 69.4 | 65.4 |
| 22 | 1-20b | Trailer – unoccupied | 50.6 | 67.4 | 63.4 | 48.8 | 65.8 | 61.7 |
| 23 | 2-8-2 | Camp | 45.2 | 63.7 | 59.7 | 45 | 63.5 | 59.4 |
| 24 | 2-8-9 | Camp | 45.6 | 63.9 | 59.8 | 45.5 | 63.7 | 59.6 |
| 25 | 2-7-2 | Camp | 46.9 | 64.9 | 60.9 | 46.3 | 64.4 | 60.4 |
| 26 | 2-10 | Camp | 47 | 64.4 | 60.4 | 46.7 | 64.1 | 60.1 |

SECOND ROUND OF DATA REQUESTS – INITIAL REPLY 8/26/11

| Oakfield V112 Sound Level Prediction Model | | | | | | | | |
|--|-------------|---------------------------------|---------------|--------------|------------|-----------------|--------------|------------|
| Dwelling ID | Map and Lot | Dwelling Type | Daytime (dBA) | 31.5 Hz (dB) | 63 Hz (dB) | Nighttime (dBA) | 31.5 Hz (dB) | 63 Hz (dB) |
| 27 | 6-5 | First Wind Owned – Camp Removed | 47.5 | 65 | 61 | 46.4 | 64.2 | 60.1 |
| 28 | 6-5-1 | Camp | 47.5 | 65.1 | 61.1 | 46.3 | 64.2 | 60.1 |
| 29 | 6-5-4 | Camp | 46.4 | 64.1 | 60.1 | 45.3 | 63.2 | 59.1 |
| 30 | 6-5-2P1 | Camp | 46.6 | 64.3 | 60.2 | 45.5 | 63.3 | 59.3 |
| 31 | 2-9 | Camp | 46.6 | 64.6 | 60.5 | 46.5 | 64.4 | 60.4 |
| 32 | 2-9-1 | Camp | 45.8 | 63.9 | 59.9 | 45.6 | 63.7 | 59.6 |
| 33 | 4-20 | Camp | 48.1 | 65.7 | 61.7 | 46.8 | 64.6 | 60.6 |

Receptors Located at the Dwelling as Shown on Location Map by Stantec
 Lot No.s and Dwelling Types provided by First Wind

Appendix G

Oakfield Wind Project Sound Complaint and Resolution Protocol (2009)

Oakfield Wind Project Sound Complaint Response and Resolution Protocol



Evergreen Wind Power II, LLC (herein referred to as Evergreen) submitted a sound level study completed by RSE. The sound level study was conducted to model expected sound levels from the proposed Oakfield Wind Project (the “Project”) and to compare model results to operation standards pursuant to the Site Location of Development Rules, Chapter 375 §10.

In recognition of the rural nature of the site, the applicant elected to apply quiet limits of the 55 dBA during daytime and 45 dBA at night at all nearby protected locations in accordance with Chapter 375 §10 (H) (3) (1). This is a conservative approach, because ambient sound levels under weather conditions suitable for wind turbine operation can exceed thresholds of 45 dBA daytime and 35 dBA nighttime. Conservative assumptions were also incorporated into the modeling of predicted sound levels from the project. Thus it is expected that sound levels from the operating Project will remain within predicted levels.

As an added measure, Evergreen will implement the following procedure for receiving input and responding to the public, in the event there are concerns regarding compliance with applicable sound level standards during operation of the Project. This procedure is in addition to the compliance testing protocol that will be implemented as part of the DEP Site Location Permit.

The intent of the sound complaint resolution protocol is to:

- 1. provide a transparent process for reporting sound complaints to Evergreen;**
- 2. provide a consistent approach to documenting complaints and to inform subsequent monitoring efforts; and**
- 3. provide a process for informing the Town and DEP of sound complaints.**

Evergreen will provide a contact person and 24 hour “hotline” telephone number for complaints regarding sound from the Project. Contact information along with a copy of this protocol and a “Sound Complaint Record Form” will be mailed to all abutters, consistent with the definition of abutters set forth in Chapter 2 of the Maine DEP regulations, and provided to the Town and DEP.

Residents of Oakfield are encouraged to fill out the Sound Complaint Record Form but they are not required to do so in order to make a complaint on the hotline. The purpose of the form is to ensure that a standardized set of basic information is collected for each complaint in order to facilitate analysis. The following information will be required from the complainant in order to process the form:

- Name and address of complainant
- Date, time and duration or periods of sound event
- Description of sound event—relative amplitude, source of annoyance, steady or fluctuating, low/mid/high or mix of frequencies/pitch, noticeable vibration, indoor or outdoor and specific location
- Description of other audible sounds from sources outside and inside the dwelling of the complainant.

Oakfield Wind Project Sound Complaint Response and Resolution Protocol



Evergreen will complete the Sound Complaint Record Form by providing the following:

- Nearest turbine to complaint location
- Date and time call or form processed
- Power output (kW), wind speed and direction of closest turbines during sound event
- Local/surface weather conditions—cloud cover, precipitation, relative wind speed and direction, temperature, and relative humidity
- Ground conditions – field, wooded, snow, foliage, frozen/icing

A log of complaints will be kept and managed by the operational staff at the Project site. Evergreen will provide a copy of the complaint log to the Town and DEP on a quarterly basis or more frequently upon request by the Town or DEP.

The response to each complaint will depend on each situation, but may include, without limitation, a visit to the location of the complaint; inspection of the operating condition of the turbines closest to the complaint location to evaluate potential upset conditions that might increase sound levels; informal sound monitoring by Evergreen; an informal evaluation of the complaint by Evergreen's sound consultant; or formal sound monitoring. In the event that Evergreen conducts formal sound monitoring at a complaint location, it will notify the Town ahead of time, allow the Town Manager the opportunity to observe, and will provide the results to the Town. In addition, if Evergreen conducts a visit to a complainant or conducts informal sound monitoring at a complaint location, it will undertake best efforts to notify the Town Manager and allow him or her the opportunity to observe. In any event, a Sound Complaint Response Form and Follow-up Record will be completed by Evergreen staff.

Evergreen will use the information collected during the first three months of operation to assist in selecting compliance monitoring locations for testing in accordance with the DEP post-construction sound level compliance assessment plan, as well as timing to ensure monitoring is conducted under weather and operating conditions when sound from the project is most noticeable.

If Evergreen or the DEP determines that there is a consistent pattern of complaints that suggest sound levels from the Project may exceed applicable DEP sound level limits, Evergreen will develop and implement an appropriate protocol for ensuring that the Project continues to meet applicable sound level limits. Evergreen shall take reasonable steps to provide a copy of the protocol to the Town and DEP prior to its implementation, and will provide the results of testing undertaken as part of the protocol to the DEP and the Town. If the Project is not in compliance with the DEP standards, and as set forth in the DEP Site Law permit, Evergreen will submit a revised operation protocol to the DEP and provide a copy to the Town that demonstrates the Project will be in compliance at all the protected locations surrounding the Project.

Oakfield Wind Project Sound Complaint Response and Resolution Protocol



Protocol Implementation:

Evergreen Wind will hold an initial public information meeting in conjunction with the Town to explain the complaint response and resolution process, including how to properly file complaints and complete the form(s).

Forms will be mailed to project abutters and will be available at the Town Office and the DEP.

The 24/7 hotline number will be mailed to abutters and posted at the Town Office.

For the first year of operations, Evergreen will hold quarterly meetings in conjunction with the Town to discuss complaints and their resolution. This process can also be used to report the results of compliance testing per the DEP protocol.

Evergreen Wind will develop and schedule in consultation with the DEP compliance testing to occur sometime after commercial operations but during the first year of routine operations so that complainant locations can be incorporated as appropriate.

The proactive and innovative measures identified in this sound complaint response and resolution protocol will facilitate a more complete understanding and evaluation of potential sound complaints and will ensure that those complaints are appropriately addressed. Evergreen invites the public to participate in this process to ensure that the Oakfield Wind Project remains a positive contributor to the community.

Appendix H

Oakfield Wind Project Sound Complaint and Resolution Protocol (2011)

Oakfield Wind Project Sound Complaint Response and Resolution Protocol



Evergreen Wind Power II, LLC (herein referred to as Evergreen) submitted a sound level study completed by [RSE Scott Bodwell](#). The sound level study was conducted to model expected sound levels from the proposed Oakfield Wind Project (the “Project”) and to compare model results to operation standards pursuant to the Site Location of Development Rules, Chapter 375 §10.

In recognition of the rural nature of the site, the applicant elected to apply quiet limits of the 55 dBA during daytime and 45 dBA at night at all nearby protected locations in accordance with Chapter 375 §10 (H) (3) (1). This is a conservative approach, because ambient sound levels under weather conditions suitable for wind turbine operation can exceed thresholds of 45 dBA daytime and 35 dBA nighttime. Conservative assumptions were also incorporated into the modeling of predicted sound levels from the project. Thus it is expected that sound levels from the operating Project will remain within predicted levels.

As an added measure, Evergreen will implement the following procedure for receiving input and responding to the public, in the event there are concerns regarding compliance with applicable sound level standards during operation of the Project. This procedure is in addition to the compliance testing protocol that will be implemented as part of the DEP Site Location Permit.

The intent of the sound complaint resolution protocol is to:

- 1. provide a transparent process for reporting sound complaints to Evergreen;**
- 2. provide a consistent approach to documenting complaints and to inform subsequent monitoring efforts; and**
- 3. provide a process for informing the Town and DEP of sound complaints.**

Evergreen will provide a contact person and 24 hour “hotline” telephone number for complaints regarding sound from the Project. Contact information along with a copy of this protocol and a “Sound Complaint Record Form” will be mailed to all abutters, consistent with the definition of abutters set forth in Chapter 2 of the Maine DEP regulations, and provided to the Town and DEP.

Residents of Oakfield are encouraged to fill out the Sound Complaint Record Form but they are not required to do so in order to make a complaint on the hotline. The purpose of the form is to ensure that a standardized set of basic information is collected for each complaint in order to facilitate analysis. The following information will be required from the complainant in order to process the form:

- Name and address of complainant
- Date, time and duration or periods of sound event
- Description of sound event—relative amplitude, source of annoyance, steady or fluctuating, low/mid/high or mix of frequencies/pitch, noticeable vibration, indoor or outdoor and specific location

Oakfield Wind Project Sound Complaint Response and Resolution Protocol



- Description of other audible sounds from sources outside and inside the dwelling of the complainant.

Evergreen will complete the Sound Complaint Record Form by providing the following:

- Nearest turbine to complaint location
- Date and time call or form processed
- Power output (kW), wind speed and direction of closest turbines during sound event
- Local/surface weather conditions—cloud cover, precipitation, relative wind speed and direction, temperature, and relative humidity
- Ground conditions – field, wooded, snow, foliage, frozen/icing

A log of complaints will be kept and managed by the operational staff at the Project site. Evergreen will provide a copy of the complaint log to the Town and DEP on a quarterly basis or more frequently upon request by the Town or DEP.

The response to each complaint will depend on each situation, but may include, without limitation, a visit to the location of the complaint; inspection of the operating condition of the turbines closest to the complaint location to evaluate potential upset conditions that might increase sound levels; informal sound monitoring by Evergreen; an informal evaluation of the complaint by Evergreen's sound consultant; or formal sound monitoring. In the event that Evergreen conducts formal sound monitoring at a complaint location, it will notify the Town ahead of time, allow the Town Complaint Review Officer and Town Manager the opportunity to observe, and will provide the results to the Town. In addition, if Evergreen conducts a visit to a complainant or conducts informal sound monitoring at a complaint location, it will undertake best efforts to notify the Town Complaint Review Officer and Town Manager and allow allow him or her them the opportunity to observe. In any event, a Sound Complaint Response Form and Follow-up Record will be completed by Evergreen staff.

Evergreen will use the information collected during the first three months of operation to assist in selecting compliance monitoring locations for testing in accordance with the DEP post-construction sound level compliance assessment plan, as well as timing to ensure monitoring is conducted under weather and operating conditions when sound from the project is most noticeable.

If Evergreen or the DEP determines that there is a consistent pattern of complaints that suggest sound levels from the Project may exceed applicable DEP sound level limits, Evergreen will develop and implement an appropriate protocol for ensuring that the Project continues to meet applicable sound level limits. Evergreen shall take reasonable steps to provide a copy of the protocol to the Town and DEP prior to its implementation, and will provide the results of testing undertaken as part of the protocol to the DEP and the Town. If the Project is not in compliance with the DEP standards, and as set forth in the DEP Site Law permit, Evergreen will submit a

Oakfield Wind Project Sound Complaint Response and Resolution Protocol



revised operation protocol to the DEP and provide a copy to the Town that demonstrates the Project will be in compliance at all the protected locations surrounding the Project.

Protocol Implementation:

Evergreen Wind will hold an initial public information meeting in conjunction with the Town to explain the complaint response and resolution process, including how to properly file complaints and complete the form(s). The Town will also explain how this complaint protocol relates to the Town's separate Wind Energy Facility Operations Ordinance.

Forms will be mailed to project abutters and will be available at the Town Office and the DEP.

The 24/7 hotline number will be mailed to abutters and posted at the Town Office.

For the first year of operations, Evergreen will hold quarterly meetings in conjunction with the Town to discuss complaints and their resolution. This process can also be used to report the results of compliance testing per the DEP protocol.

Evergreen Wind will develop and schedule in consultation with the DEP compliance testing to occur sometime after commercial operations but during the first year of routine operations so that complainant locations can be incorporated as appropriate.

The proactive and innovative measures identified in this sound complaint response and resolution protocol will facilitate a more complete understanding and evaluation of potential sound complaints and will ensure that those complaints are appropriately addressed. Evergreen invites the public to participate in this process to ensure that the Oakfield Wind Project remains a positive contributor to the community.

Appendix I

Proposed Oakfield Wind Energy Facility Operations Ordinance

WIND ENERGY FACILITY OPERATIONS ORDINANCE

1. AUTHORITY

The Town of Oakfield hereby adopts a Wind Energy Facility Operations Ordinance [“Ordinance”] consistent with its power to adopt laws for the general welfare of the inhabitants of the Town of Oakfield. 30-A M.R.S. § 3001.

2. APPLICABILITY

This Ordinance applies to any wind energy facility that requires an approval pursuant to the Maine Site Location of Development Act, 38 M.R.S. § *et. seq.* [“Site Law”].

3. AUTHORITY REQUIRED

Operational authority is required before commencement of operations of any wind energy facility covered by this Ordinance. Operation of a wind energy facility that is subject to this Ordinance without operational authority shall be a violation of this Ordinance.

4. SUBMISSION REQUIREMENTS

In order to operate a wind energy facility within the Town of Oakfield, a person intending to operate the wind energy facility [“Operator”] must provide the following information:

- A. Name of Operator. The Operator’s name, address and phone number.
- B. Primary Representative of Operator. The name, address, and phone number of the primary representative of the Operator.
- C. Permits. Copies of all state and/or federal permits obtained by the Operator to operate the wind energy facility. This submission must include the Operator’s Maine Site Law permit [“Site Law Permit”].
- D. Agreements. A list of the name, address, Tax Map and Lot Number(s), and phone numbers for all properties that are the subject of agreements with the Applicant relating to the proposed wind energy facility, including, but not limited to, any noise easements granted to the Applicant that are necessary to comply with 06-096 CMR Ch. 375 § 10 “Control of Noise.”
- E. Compliance. A signed statement from the Operator agreeing to comply with all terms and conditions of its Site Law Permit. In addition, the Operator shall agree to assume all duties and obligations stated in the “Oakfield Wind Project Sound Complaint and Resolution Protocol” [“Sound Complaint Protocol”] a copy of which is attached in Appendix A of this Ordinance.
- F. Fee. A fee in the amount of \$5,000 for administration of this Ordinance.

5. OPERATIONAL AUTHORITY

Upon submission of the items listed above, the Operator may operate the wind energy facility for as long as the Operator maintains a valid Maine Site Law Permit, and subject to the Town's enforcement rights herein.

6. ENFORCEMENT

Ordinance Enforcement. The Complaint Review Officer shall have the authority to enforce the provisions of this Ordinance by issuance of a Notice of Violation ["NOV"] to the Operator and, if necessary, by referring any unresolved NOV to the Oakfield Board of Selectmen for any further action.

Site Law Permit Enforcement. Upon any failure of the Operator to maintain compliance with the Site Law Permit, the Complaint Review Officer may issue a written Notice of Violation to the Operator describing the alleged violation and penalties imposed, if any. With respect to compliance with Site Law Permit conditions governing sound, all sound complaints shall first be processed and administered in accordance with the Sound Complaint Protocol. If the Complaint Review Officer determines that the Sound Complaint Protocol has not satisfactorily resolved a sound complaint and the wind energy facility is not in compliance with the Site Law Permit conditions, the Complaint Review Officer may issue a written NOV to the Operator.

Upon issuance of a written NOV, the Complaint Review Officer may informally meet with the Operator to address any violation. If the violation has not been abated or corrected within the specified time, the Complaint Review Officer shall report same to the Board of Selectmen for enforcement.

Legal Action. When the above actions do not result in the correction or abatement of the violation, the Board of Selectmen may, upon notice from the Complaint Review Officer, institute any and all actions and proceedings, either legal or equitable, that may be appropriate or necessary, in the Board of Selectmen's discretion, to enforce the provisions of this Ordinance in the name of the Town of Oakfield. If it does so, the Board of Selectmen shall hold a hearing within 60 days after receiving a NOV referred by the Complaint Review Officer. The Operator, the Board of Selectmen, and the Complaint Review Officer shall be made automatic parties to a NOV hearing. The Board of Selectmen shall also allow any interested person with a reasonable opportunity to be heard in a NOV hearing.

After a hearing on a NOV, the Board of Selectmen shall either (a) dismiss the NOV, (b) remand the NOV back to the Complaint Review Officer for further action, or (c) issue a final NOV to the Operator. Enforcement of such a NOV shall be pursuant to 30-A M.R.S. § 4452, Rule 80K of the Maine Rules of Civil Procedure, and any other remedy available at law.

Consent Agreement. The Board of Selectmen or its authorized agent are hereby authorized to, and may enter into, administrative consent agreements for the purpose of eliminating violations of this Ordinance and, if appropriate, recovering fines without court action.

7. APPEALS

In the event the Board of Selectmen, after opportunity for hearing as described above, issues a final NOV to an Operator, the Operator may appeal the Board of Selectmen's decision to Superior Court in accordance with Rule 80B of the Maine Rules of Civil Procedure. A decision by the Board of Selectmen to remand a NOV to the Complaint Review Officer or to dismiss a NOV is not judicially reviewable.

No person, other than the Operator, has standing to file an appeal of any final action of the Board of Selectmen under Rule 80B of the Maine Rules of Civil Procedure and this Ordinance (adopted pursuant to 30-A M.R.S. § 3001).

8. SEVERABILITY

The invalidity of any section or provision of this Ordinance shall not be held to invalidate any other section or provision of this Ordinance.

DRAFT

Appendix J

Proposed Noise Rule Changes by the Maine Board of Environmental Protection

The Department of Environmental Protection Rule Chapter 375, Section 10 is amended by adding the following new section, subsection I, Sound Level Standards for Wind Energy Developments:

I. Sound Level Standards for Wind Energy Developments.

(1) Applicability:

This section applies to grid-scale wind energy developments as defined by 35-A M.R.S.A. § 3451.6 and small-scale wind energy developments governed by 35-A M.R.S.A. §3456, hereinafter referred to as “wind energy developments,” and the provisions in Section 10 (C) (1), 10 (D) (2), 10 (F), and 10 (H) of this Rule do not apply to wind energy developments.

(2) Sound Level Limits for Routine Operation of wind energy developments.

The sound levels resulting from routine operation of a wind energy development measured in accordance with the measurement procedures described in subsection I (8) shall not exceed the following limits:

- (a) 75 dBA at any time of day at any property line of the wind energy development or contiguous property owned or controlled by the wind energy developer, whichever is farther from the proposed wind energy development's regulated sound sources; and
- (b) 55 dBA between 7:00 a.m. and 7:00 p.m. (the "daytime limit"), and 42 dBA between 7:00 p.m. and 7:00 a.m. (the "nighttime limit") at any protected location.

(3) Tonal Sounds.

For the purposes of this subsection, a tonal sound exists if, at a protected location, the 10 minute one-third octave band sound pressure level in the band containing the tonal sound exceeds the arithmetic average of the sound pressure levels of the two contiguous one-third octave bands by 5 dB for center frequencies at or between 500 Hz and 10,000 Hz, by 8 dB for center frequencies at or between 160 and 400 Hz, and by 15 dB for center frequencies at or between 25 Hz and 125 Hz. 5 dBA shall be added to any average 10 minute sound level ($Leq_{A 10-min}$), for which a tonal sound occurs that result from routine operation of the wind energy development.

(4) Short Duration Repetitive Sounds (“SDRS”).

For the purpose of this subsection SDRS is defined as a sequence of repetitive sounds that occur within a 10 minute measurement interval, each clearly discernible as an event and causing an increase in the sound level of 5 dBA or greater on the fast meter response above the sound level observed immediately before and after the event, each typically ± 1 second in duration, and which are inherent to the process or operation of the development and are foreseeable.

- (a) When routine operation of a wind energy development produces short duration repetitive sound, a 5 dBA penalty shall be added to each average 10 minute sound level ($Leq_{A 10-min}$) measurement interval in which greater than 5 occurrences of SDRS are present.

(5) Compliance with the Sound Level Limits

A wind energy development shall determine compliance with the sound level limits as set forth in subsection I (2) of this rule in accordance with the following:

1. Sound level data shall be aggregated in 10-minute measurement intervals within a given compliance measurement period (daytime: 7:00 am to 7:00 pm or nighttime: 7:00 pm to 7:00 am) under the conditions set forth in subsection I (8) of this rule.
2. Compliance will be demonstrated when the arithmetic average of the sound level of, at a minimum, twelve, 10-minute measurement intervals in a given compliance measurement period is less than or equal to the sound level limit set forth in subsection I (2).
3. Alternatively, if a given compliance measurement period does not produce a minimum of twelve, 10-minute measurement intervals under the atmospheric and site conditions set forth in subsection I (8) of this rule, the wind energy development may combine six or more, 10-minute measurement intervals from one 12 hour (7:00 am to 7:00 pm daytime) or (7:00 pm to 7:00 am nighttime) compliance measurement period with six or more, 10-minute intervals from another compliance measurement period. Compliance will be demonstrated when the arithmetic average of the combined 10-minute measurement intervals is less than or equal to the sound level limit set forth in subsection I (2).

(6) Variance From Sound Level Limits

A variance may be granted by the Department if (1) a development is deemed necessary in the interest of national defense or public safety and the applicant has shown that the sound level limits cannot practicably be met without unduly limiting the development's intended function, and (2) a finding is made by the Department that the proposed development will not have an unreasonable impact on protected locations. The Department shall consider the request for a variance as part of the review of a completed Site Location of Development Law application or a request for certification for a small-scale wind energy development. In granting a variance, the Department may, as a condition of approval, impose terms and conditions to ensure that no unreasonable sound impacts will occur.

(7) Submissions

Technical information shall be submitted describing the wind energy developer's plan and intent to make provision for the control of sound. The wind energy developer's plan shall contain the following:

- (a) Pre-development ambient sound measurements collected in accordance with the measurement procedures described in subsection I (8);
- (b) A map depicting the location of all proposed sound sources associated with the wind energy development, property boundaries for the proposed wind energy development, property boundaries of all adjacent properties within one mile of the proposed wind energy development, and the location of all protected locations located within one mile of the proposed wind energy development;
- (c) A description of the major sound sources, including tonal sound sources and sources of short duration repetitive sounds, associated with the construction, operation and maintenance of the proposed wind energy development;

- (d) A description of the equivalent noise levels expected to be produced by the sound sources at protected locations located within one mile of the proposed wind energy development. The description shall include a full-page isopleths map depicting the modeled decay rate of the predicted sound pressure levels expected to be produced by the wind energy development at each clearly identified protected location within one mile of the proposed wind energy development. The predictive model used to generate the equivalent noise levels expected to be produced by the sound sources shall be designed to represent the "predictable worst case" impact on adjacent properties and shall include, at a minimum, the following:
 - 1. The maximum rated output of the sound sources operating during nighttime stable atmospheric conditions with high wind shear above the boundary layer and all other conditions that affect the in-flow airstream that can exceed the design limits for normal operation of the turbines. The sound propagation rate shall reflect a point source 6 dB decay rate for each turbine in the proposed arrangement of wind turbines;
 - 2. Attenuation due to geometric spreading;
 - 3. Attenuation due to air absorption;
 - 4. Attenuation due to ground absorption/reflection;
 - 5. Attenuation due to three dimensional terrain;
 - 6. Attenuation due to forestation;
 - 7. Attenuation due to meteorological factors such as but not limited to relative wind speed and direction (wind rose data), temperature/vertical profiles and relative humidity, sky conditions, and atmospheric profiles;
 - 8. Inclusion of an "uncertainty factor" adjustment to the maximum rated output of the sound sources based on the manufacturer's recommendation; and
 - 9. Inclusion, at the discretion of the Department, an addition to the maximum rated output of the sound sources to account for uncertainties in the modeling of sound propagation for wind energy developments. The addition may be up to 3 dBA.
- (e) A description of the protected locations near the proposed wind energy development.
- (f) A description of proposed major sound control measures, including their locations and expected performance.
- (g) A comparison of the expected sound levels from the proposed development with the sound level limits of this regulation.
- (g) A comparison of the expected sound levels from the proposed development with any quantifiable noise standards of the municipality in which the proposed development will be located and of any municipality which may be affected by the noise.
- (h) A description and map identifying one or more compliance testing locations on or near the proposed wind energy development site. The identified compliance testing locations shall be selected to take advantage of prevailing downwind conditions and be able to meet the site selection criteria outlined in subsection I (8)(d)(4).
- (i) A description of the compliance measurement and complaint response protocol proposed by the wind energy development. The complaint response protocol shall adequately provide for, at a minimum:

1. A 24-hour contact for complaints;
2. A complaint log accessible to the Department;
3. Analysis of each complaint in accordance with the approved compliance measurement protocol for the project; and
4. Notification of complaint findings to the Department and the complainant.

(8) Measurement Procedures

These procedures specify measurement criteria and methodology for use with wind energy development applications, compliance and complaint response. They provide methods for measuring the ambient sound and the sound from operation of the wind energy development and set forth the information to be reported.

(a) Measurement Criteria

1. Measurement Personnel

Measurements shall be supervised by personnel who are well qualified by training and experience in measurement and evaluation of environmental sound, or by personnel trained to operate under a specific measurement plan approved by the Department.

(b) Measurement Instrumentation

1. A sound level meter or alternative sound level measurement system used shall meet all of the Type 1 or 2 performance requirements of American National Standard Specifications for Sound Level Meters, ANSI S1.4.
2. An integrating sound level meter (or measurement system) shall also meet the Type 1 or 2 performance requirements for integrating/averaging in the International Electrotechnical Commission Standard on Integrating-Averaging Sound Level Meters, IEC Publication 61672-1 and ANSI 1.43.
3. A filter for determining the existence of tonal sounds shall meet all the requirements of the American National Standard Specification for Octave-Band and Fractional Octave-Band Analog and Digital Filters, ANSI S1.11 and IEC 61260, Type 3-D performance.
4. The acoustical calibrator used shall be of a type recommended by the manufacturer of the sound level meter and one that meets the requirements of American National Standard Specification for Acoustical Calibrators, ANSI S1.40.
5. The microphone windscreen used shall be of a type recommended by the manufacturer of the sound level meter.
6. Anemometer(s) used for surface (10 meter (m)) wind speeds shall have a minimum manufacturer specified accuracy of ± 1 mph providing data in one second integrations and 10 min. average/maximum values for the evaluation of atmospheric stability.
7. Audio recording devices shall be time stamped (hh:mm:ss) and at a minimum 16 bit digital, recording the sound signal output from the measurement microphone at a

minimum sampling rate of 24 thousand (k) samples per second reported in wav. file format.

(c) Equipment Calibration

1. The sound level meter shall have been calibrated by a laboratory within 12 months of the measurement, and the microphone's response shall be traceable to the National Institute of Standards and Technology.
2. Field calibrations shall be recorded before and after each measurement period and at shorter intervals if recommended by the manufacturer.
3. Anemometer(s) and vane(s) shall be calibrated annually by the manufacturer.

(d) Compliance Measurement Location, Configuration, and Environment.

1. Compliance measurement locations shall be at nearby protected locations that are most likely affected by the sound from routine operation of the wind energy development subject to permission from the respective property owner(s).
2. Compliance measurement locations shall be at the center of unobstructed areas that are maintained free of vegetation and other structures or material that is greater than 2 feet in height for a 75-foot radius around the sound and audio monitoring equipment.
3. Meteorological measurement locations shall be at the center of open flat terrain, inclusive of grass and a few isolated obstacles less than 6 feet in height for a 250-foot radius around the anemometer location. The meteorological data measurement location need not be coincident with the sound and audio measurement location provided there is no greater than a 5 mile of separation between the data collection points and the measurement locations have similar characterization, i.e. same side of the mountain ridge, etc.
4. All compliance measurement location(s) sound, audio and meteorological measurement equipment shall remain in place, in good working order, collecting continuous data 24 hours per day, 7 days per week during all periods when the wind energy development's turbines are generating electricity, however when necessary for calibration or maintenance, the equipment may be removed from the compliance measurement location for up to 10 days. Written notification of such short term removal of the equipment and its reinstallation shall be submitted to the Department prior to removal and upon reinstallation.
5. Meteorological measurements of wind speed and direction shall be collected using anemometers at a 10-meter height above the ground. Results shall be reported, based on 1-second integration intervals, and shall be reported synchronously with hub level and sound level measurements at 10-minute measurement intervals. The wind speed average and maximum shall be reported.
6. The sound microphone shall be positioned at a height of approximately 4 to 5 feet above the ground, and oriented in accordance with the manufacturer's recommendations.

7. When possible, measurement locations should be at least 50 feet from any other sound source other than the wind energy development's power generating sources.
- (e) Compliance Data Collection, Measurement and Retention Procedures.
1. Measurements of operational, sound, audio and meteorological data shall occur on a continuous basis 24 hours per day, 7 days per week during all periods when the wind energy development's turbines are generating electricity except as set for in subsection I (8) (d) (4).
 2. All operational, sound and meteorological data collected shall be retained by the wind energy development for a period of 1 year from the date of collection and is subject to inspection by the Department and submission to the Department upon request.
 3. All audio data collected shall be retained by the wind energy development for a period of two weeks from the date of collection unless subject to a complaint filed in accordance with the complaint protocol approved by the Department and is subject to inspection by the Department and submission to the Department upon request. Specific audio data collected that coincides with a complaint filed in accordance with the approved complaint protocol shall be retained by the wind energy developer for a period of 1 year from the date of collection and is subject to inspection by the Department and submission to the Department upon request.
 4. Written notification of the intent to collect compliance data must be received by the Department prior to the collection of any sound level data for compliance purposes. The notification shall state the date and time of the compliance measurement period.

Note: Notice received via electronic mail is sufficient regardless of whether it is received during business hours.

5. Compliance data from the operation of a wind energy development shall be submitted to the Department, at a minimum:
 - (a) Once during the first year of facility operation;
 - (b) Once during each successive fifth year thereafter until the facility is decommissioned;
 - (c) In response to a community complaint regarding operation of the wind energy development and any subsequent enforcement by the Department; and
 - (d) For validation of an applicant's calculated sound levels when requested by the Department.
6. All sound level, audio and meteorological data collected during a compliance measurement period for which the Department has been notified that meets or exceeds the specified wind speed parameters shall be submitted to the Department for review and approval. All data submittals shall be submitted to the Department within 30 days of notification of intent to collect compliance data.
7. Measurement shall be obtained during weather conditions when the wind turbine sound is most clearly noticeable, generally when the measurement location is

downwind of the wind energy development and maximum surface wind speeds ≤ 6 miles per hour (mph) with concurrent turbine hub-elevation wind speeds sufficient to generate the maximum continuous rated sound power from the nearest wind turbines to the measurement location. A downwind location is defined as within 45° of the direction between a specific measurement location and the acoustic center of the five nearest wind turbines.

[Note: These conditions typically occur during inversion periods usually between 11 pm and 5 am.]

8. In some circumstances, it may not be feasible to meet the wind speed and operations criteria due to terrain features or limited elevation change between the wind turbines and monitoring locations. In these cases, measurement periods are acceptable if the following conditions are met:
 - (a) The difference between the L_{A90} and L_{A10} during any 10-minute period is less than 5 dBA; and
 - (b) The surface wind speed (10 meter height) is 6 mph or less for 80% of the measurement period and does not exceed 10 mph at any time, or the turbines are shut down during the monitoring period and the difference in the observed L_{A50} after shut down is equal to or greater than 6 dBA; and
 - (c) Observer logs or recorded sound files clearly indicate the dominance of wind turbine(s).
 9. Measurement intervals affected by increased biological activities, leaf rustling, traffic, high water flow, aircraft flyovers or other extraneous ambient noise sources that affect the ability to demonstrate compliance shall be excluded from all compliance report data. The intent is to obtain 10-minute measurement intervals that entirely meet the specific criteria.
 10. Measurements of the wind energy development sound shall be made so as to exclude the contribution of sound from other development equipment that is exempt from this regulation.
- (f) Reporting of Compliance Measurement Data.

Compliance Reports shall be submitted to the Department within 30 days of notification of intent to collect compliance data or upon request by the Department and shall include, at a minimum, the following:

1. A narrative description of the sound from the wind energy development for the compliance measurement period result;
2. The dates, days of the week and hours of the day when measurements were made;
3. The wind direction and speed, temperature, humidity and sky condition;
4. Identification of all measurement equipment by make, model and serial number;
5. All meteorological, sound, windscreen and audio instrumentation specifications and calibrations;
6. All A-weighted equivalent sound levels for each 10-minute measurement interval;
7. All L_{A10} and L_{A90} percentile levels;
8. All 10 minute 1/3 octave band linear equivalent sound levels (dB);

9. All short duration repetitive events characterized by event amplitude. Amplitude is defined as the peak event amplitude minus the average minima sound level immediately before and after the event, as measured at an interval of 50 milliseconds (“ms”) or less, A-weighted and fast time response, i.e. 125 ms. For each 10-minute measurement interval short duration repetitive sound events shall be reported by number for each observed amplitude integer above 4 dBA.
10. All audio (wav.) data files time stamped to coincide with the sound and meteorological data collection sequence. Should any sound data collection be observed by a trained attendant, the attendant’s notes and observations may be substituted for the audio (wav.) files during the compliance measurement period;
11. All concurrent time stamped turbine operational data including the date, time and duration of any noise reduction operation or other interruptions in operations if present; and
12. All other information determined necessary by the Department.

(g) Measurement of Ambient Sound

All ambient sound measurements shall be conducted in accordance with the compliance measurement location, configuration, and environment standards outlined in subsection I (e) and the compliance reporting standards outlined in subsection I (f) of this rule.

Appendix K

Evergreen II's Shadow Flicker Study

Section 26
Shadow Flicker



Stantec

Memo

To: Brooke Barnes
Stantec Consulting Ltd.
Topsham, ME

From: Theo Kindermans
Stantec Planning and Landscape
Architecture, PC
Boston, MA

File: Oakfield Wind Project

Date: June 9, 2011

**Reference: Shadow-Flicker Modeling
Oakfield Wind Project Amendment, Oakfield, Maine**

Introduction

This memorandum provides a brief explanation of the shadow-flicker phenomenon, the modeling approach employed for the amended site in Oakfield, ME and relevant explanations and results. The site layout was provided by Stantec Consulting Ltd. located in Topsham, ME. The layout shows a total of 50 turbine locations; all turbines will be Vestas V-112 3.0 MW, with an 84 meter high hub and a 112 meter diameter rotor, and a total height of approximately 140 meters.

Shadow-Flicker Background

Shadow-flicker from wind turbines results from brief reductions in light intensities caused by the rotating blades of the turbine casting shadows on receptors on the ground and stationary objects, such as a window at a residence. When the sun is obscured by clouds or storms, or when the turbine is not operating, no shadows will be cast.

Shadow-flicker can occur on project area receptors when the wind turbine is located near the receptor and when the turbine blades interfere with the angle of the sunlight. The most typical effect is the visibility of an intermittent light reduction on the receptor facing the wind turbine and subject to the shadow-flicker. Obstacles such as terrain, trees, or buildings between the wind turbine and a potential shadow-flicker receptor significantly reduce or eliminate shadow-flicker effects. No shadow flicker is present when the rotor of the turbine is perpendicular to the receptor

Shadow flicker intensity is defined as the difference in brightness at a given location in the presence and absence of a shadow. Shadow flicker intensities diminish with increased distance from turbine to receptor and with lower visibility weather or atmospheric conditions such as haze or fog. Closer to a turbine the shadow will appear to be darker and wider as the rotors will block out a larger portion of sunrays. The shadow line will also be more defined. Further from the turbine the shadow will be less intense or lighter, and less distinct.

The spatial relationship between a wind turbine and a receptor, as well as wind direction are key factors related to the amount of time any location might experience shadow-flicker. Shadow-flicker time is most commonly expressed in hours per year. Shadow flicker is most pronounced at distances from the turbine of less than 1000 ft and during sunrise and sunset when the sun's angle is lower and the resulting shadows are longer. Shadow flicker is typically present at a receptor for short periods each day – rarely more than a half-hour at sunrise and at sunset. The phenomenon is more prevalent in the winter than the summer due to the sun's lower position on the horizon in winter months in North America (NAS, 2007).

The analysis provided in this report does not evaluate the flicker intensity, but rather focuses on the total amount of time (hours and minutes per year) that shadow flicker can potentially occur at receptors regardless if the shadow flicker is barely noticeable or clearly distinct. As a result, it is likely that receptors will experience less shadow-flicker impact than modeled and reported,

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Reference: Shadow-Flicker Modeling

especially those that are further away from the turbines. It is likely that marginally affected receptors may not be able to identify shadow-flicker at all as the shadows become more diffuse with increased distance.

The speed of the rotor and the number of blades determine the frequency of the flicker of the shadow. The shadow-flicker results in this memo are based on Vestas 3-blade model V-112 3.0 MW, with a turbine height of 84 meters. The diameter of the rotors is 112 meters. The nominal rotor speed of 16 RPM translates to a blade frequency of .8 Hz (less than 1 alternation per second).

Modeling Approach

For the shadow flicker modeling a module of the WindPRO software was used. The computer model simulates the path of the sun over the course of the year and assesses at regular intervals the potential shadow flicker across a receptor. The color coded map produced by the computer model is a conservative estimate of the number of hours per year that shadows could be cast by the rotation of the turbine blades. This report presents a flicker analysis for both worst case and meteorologically adjusted conditions.

The worst case analysis assumes that:

- the sun is always shining from sunrise to sunset;
- the rotor plane is always perpendicular to the line from the turbine to the sun;
- the turbine is always operating; and
- there is no topographic or vegetative buffer between the receptor and the turbine.

Furthermore, the analysis assumes windows are situated in direct alignment with the turbine-to-sun line of sight. Even when windows are so aligned, the analysis does not account for the difference between windows in rooms with primary use and enjoyment (e.g. living rooms) and other less frequently occupied or un-occupied rooms or garages.

The worst case shadow-flicker model uses the following inputs:

- Turbine locations
- Shadow flicker receptor (residence or camp) locations (coordinates)
- USGS 1:24,000 topographic and USGS DEM (height contours)
- Turbine rotor diameter
- Turbine hub height

The model calculates detailed shadow flicker results at each assessed receptor location and the amount of shadow-flicker (hours and minutes per year) everywhere surrounding the project. A receptor in the model is defined as a 1 square meter area that is 1 meter above ground level, approximating a window. This omni-directional approach produces shadow-flicker results at a receptor regardless of the direction of windows and provides similar results as a model with windows on various sides of the receptor.

The sun's path with respect to each turbine location is calculated by the software to determine the cast shadow paths every minute, daily over one full year.

Output from the model includes the following information:

Reference: Shadow-Flicker Modeling

- Calculated shadow-flicker time at selected receptors,
- Tabulated and plotted time of day with shadow flicker at receptors,
- Tabulated time of impact from each turbine at a receptor, and
- Map showing turbine locations, selected shadow-flicker receptors and color-coded contour lines indicating projected shadow-flicker time (hours per year).

In addition to the models worst case evaluation, we also evaluated the model results using data that is reflective of typical conditions at the Oakfield Wind Project. The data used is local meteorological information on wind speed and direction, and cloud cover. Other model inputs remained the same. The data came from the following sources:

- Wind speeds and direction frequency distributions were acquired from the on-site meteorological towers,
- Sunshine hours, the time between sunrise and sundown for the area, was obtained from monthly reference data for the annual number of sunny or partly sunny days experienced in Caribou (the closest reporting station for the National Oceanic and Atmospheric Administration) in 2008.

The turbine run-time and direction (seen from the receptor) are calculated from the site's long-term wind speed and direction distribution, while the actual sunshine hours add the probability of sunshine during any given period. This calculation more accurately reflects the expected shadow-flicker time.

In both scenarios it is assumed that no trees or other obstacles are placed between the turbine and the receptor. Inclusion of vegetation or obstructions would further minimize the effects of shadow-flicker.

Analysis

As previously stated, the shadow-flicker model assumptions applied to this project are very conservative and as such, both the worst case and meteorologically adjusted results are expected to over-predict the impacts. Additionally, many of the modeled shadow flicker hours are expected to be of very low intensity.

Of the modeled 170 receptors, 63 potentially receive shadow flicker. All other modeled receptors do not show any impact of shadow flicker.

The statistics of the potentially impacted receptors are outlined in Table 1 below:

| Flicker Receptor | Expected total shadow flicker time per year (hours;minutes) weather corrected | Distance to nearest WTG with impact (feet) |
|------------------|---|--|
| J | 2:20 | 3300 (N12) |
| K | 2:09 | 3400 (N12) |
| L | 4:30 | 3100 (N12) |
| S | 3:12 | 3100 (N12) |
| AA | 1:55 | 3150 (N10) |
| AB | 5:12 | 3250 (N10) |
| AH | 6:20 | 3300 (N13) |

Reference: Shadow-Flicker Modeling

| | | |
|----|--------|------------|
| AI | 6:41 | 3000 (N14) |
| AJ | 3:16 | 3200 (N14) |
| AK | 9:35 | 3000 (N14) |
| AL | 8:11 | 3200 (N14) |
| AM | 10:03 | 3200 (N14) |
| AN | 9:25 | 2600 (N15) |
| AO | 13:55 | 2400 (N15) |
| AP | 13:17 | 2500 (N15) |
| AQ | 11:09 | 2000 (N15) |
| AR | 2:53 | 3000 (N16) |
| AS | 6:27 | 2500 (N16) |
| AT | 4:43 | 2600 (N16) |
| AZ | 9:11 | 2900 (S04) |
| BA | 6:56 | 3000 (S04) |
| BB | 7:27 | 2850 (S04) |
| BC | 14:16 | 2600 (S03) |
| BD | 11:16 | 2400 (S03) |
| BE | 20:52 | 2200 (S03) |
| BF | 15:54 | 2000 (S01) |
| BM | 6:04 | 3200 (S04) |
| BP | 45:19 | 800 (S01) |
| BQ | 23:48 | 1250 (S01) |
| BR | 10:41 | 2100 (S01) |
| BS | 26:00 | 1150 (S02) |
| BT | 18:34 | 1800 (S03) |
| BU | 16:06 | 2100 (S02) |
| BV | 27:41 | 1500 (S03) |
| CB | 9:52 | 2200 (E03) |
| CE | 5:05 | 3000 (N05) |
| CL | 109:29 | 700 (N02) |
| CP | 32:28 | 1200 (S06) |
| CQ | 24:30 | 1800 (S04) |
| CR | 0:09 | 2700 (S01) |
| CS | 83:09 | 600 (N06) |
| CT | 31:18 | 1100 (N15) |
| CV | 4:38 | 3300 (N15) |
| CW | 11:03 | 2850 (N01) |
| DX | 2:06 | 3300 (N12) |
| EA | 11:14 | 2600 (N08) |
| EI | 19:15 | 3050 (N01) |
| EJ | 15:47 | 2000 (N16) |
| EK | 17:36 | 1900 (N15) |
| EN | 6:42 | 2900 (N16) |
| EQ | 26:46 | 800 (S01) |
| ES | 2:23 | 3000 (S08) |

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| | | |
|----|-------|------------|
| ET | 66:08 | 800 (N08) |
| FD | 7:39 | 2500 (E10) |
| FE | 10:02 | 2000 (E01) |
| FH | 16:15 | 1900 (E08) |
| FI | 14:24 | 1650 (E03) |
| FJ | 16:22 | 1900 (E03) |
| FK | 13:05 | 2100 (E03) |
| FL | 9:46 | 2400 (E04) |
| FN | 14:49 | 1650 (E03) |
| FO | 13:47 | 2150 (N14) |

Table 1. Potentially impacted receptors.

Standards

There are no regulatory standards in the State of Maine, or federal limits, for acceptable shadow flicker impacts. In previous regulatory decisions, including the original Oakfield Wind Project approval, a general standard of 30 hours of expected shadow flicker per year has been cited (see also the Rollins Wind Project; Record Hill Wind Project).

Discussion

The statistics of the potentially impacted receptors that have calculated shadow flicker effects over 30 hours per year are outlined in Table 1 below, illustrating the worst case prediction of the model, and an expected actual outcome.

Table 2. Locations with the potential for greater than 30 hours per year of shadow flicker

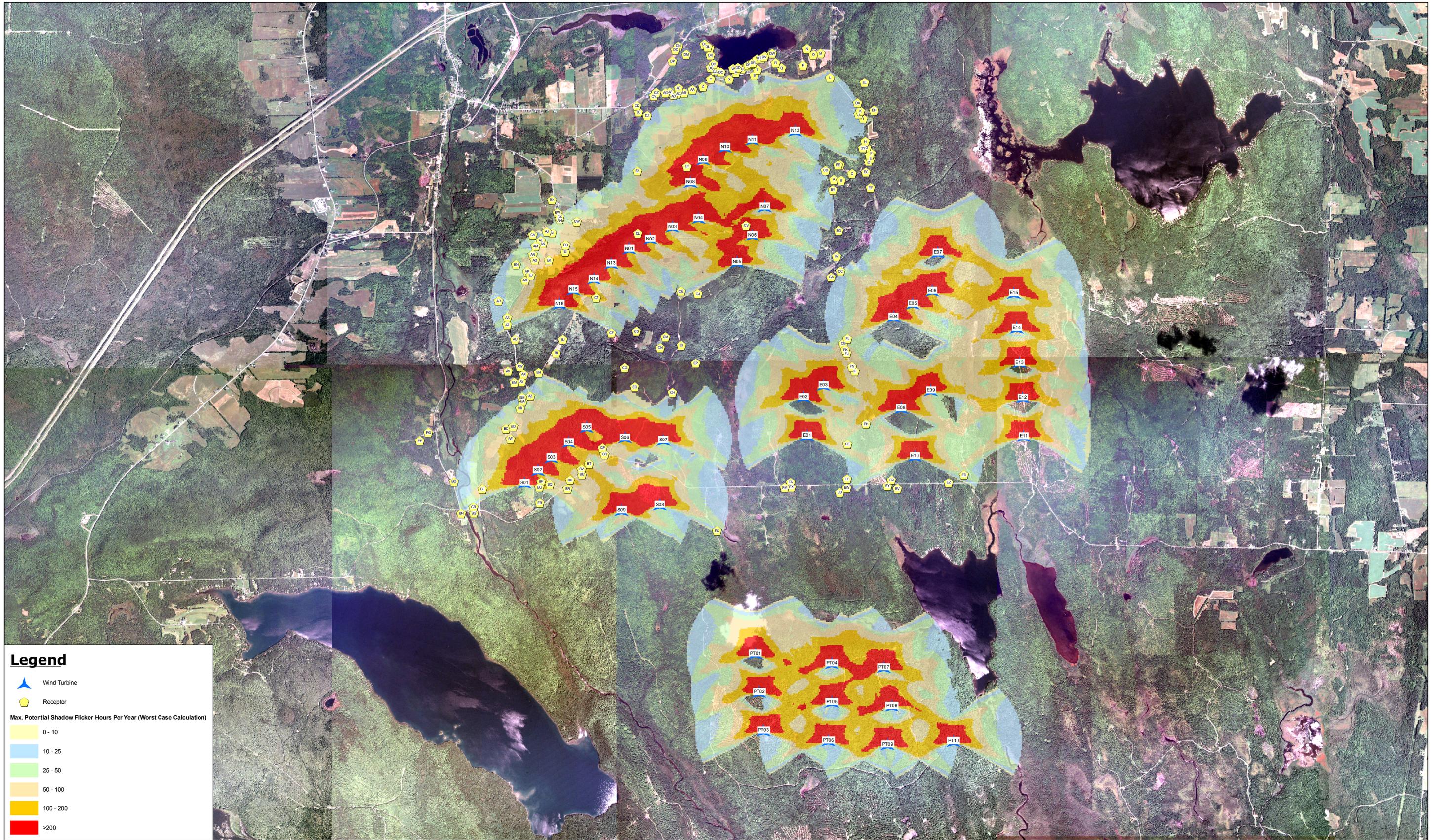
| LOCATION | UNADJUSTED POTENTIAL IMPACT | EXPECTED POTENTIAL IMPACT | PROPERTY STATUS |
|----------|-----------------------------|---------------------------|-------------------|
| BP | 228:46 | 45:19 | Lease |
| CL | 580.56 | 109.29 | Lease |
| CS | 401.33 | 83.09 | Lease |
| CT | 152:56 | 31:18 | Purchase and Sale |
| ET | 371:26 | 66:08 | Purchase and Sale |

The five properties expected to have flicker impact above 30 hours per year are all part of the project through purchase, lease or easement. Based on the WindPRO analysis, adjusted for actual wind and sun conditions, no other property that is not part of the project, is calculated to receive flicker in excess of 30 hours per year.

Reference: Shadow-Flicker Modeling

Conclusion

The actual flicker effect on the 63 listed receptors is expected to be below the range of Maine's accepted standards, and will not pose an unreasonable adverse shadow flicker impact on the receptors identified in this report. For clarifications and more detailed analysis of expected influence at selected receptors, please do not hesitate to contact me.



Legend

-  Wind Turbine
-  Receptor

Max. Potential Shadow Flicker Hours Per Year (Worst Case Calculation)

| | |
|--|-----------|
|  | 0 - 10 |
|  | 10 - 25 |
|  | 25 - 50 |
|  | 50 - 100 |
|  | 100 - 200 |
|  | >200 |

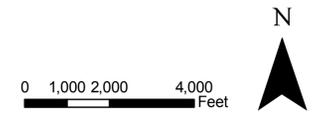
**Oakfield Wind Project
Oakfield, Maine**

Created by: ZYY
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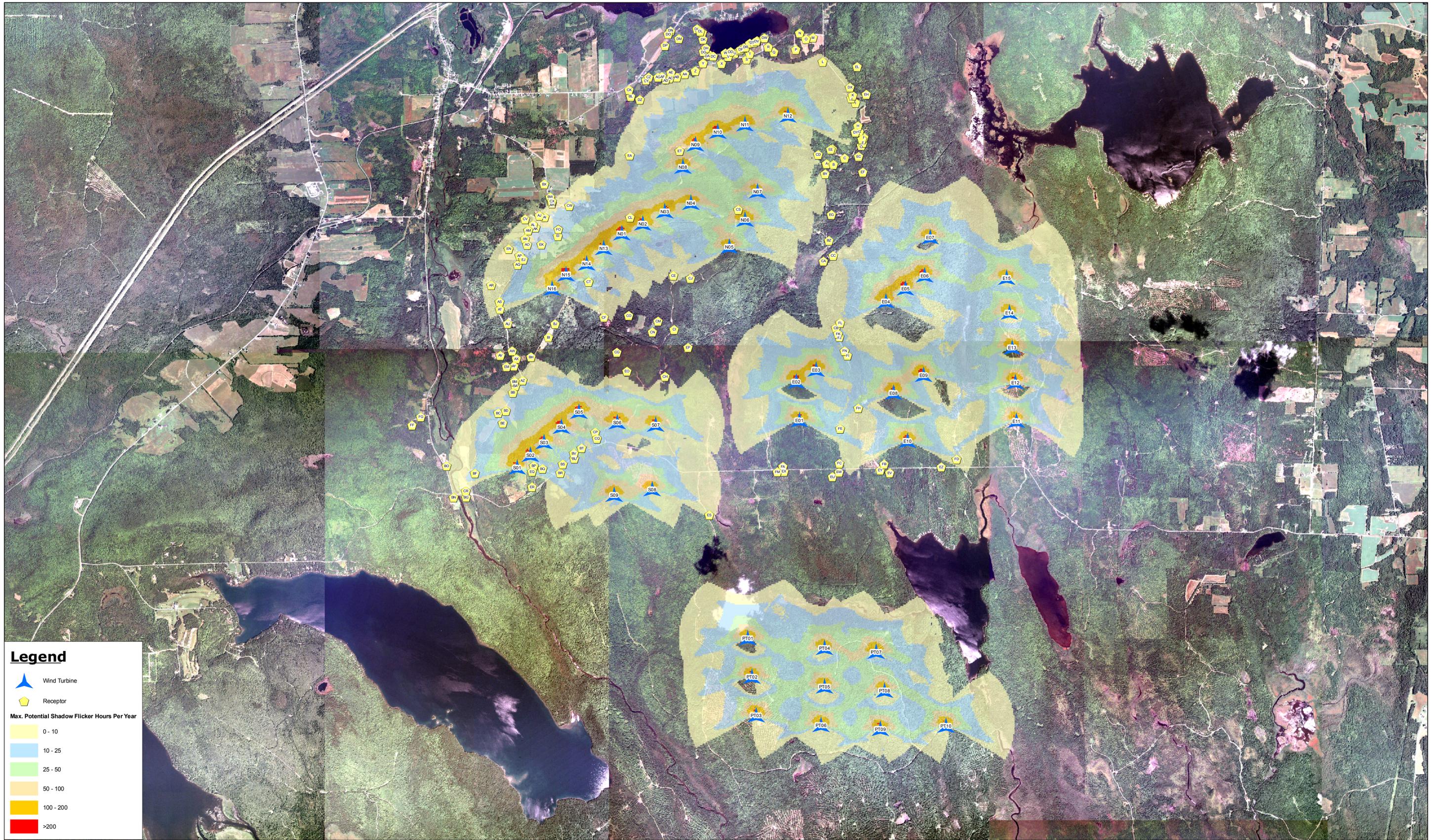


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**Shadow Flicker Study
May, 2011**



0 1,000 2,000 4,000
 Feet



Legend

-  Wind Turbine
-  Receptor

Max. Potential Shadow Flicker Hours Per Year

-  0 - 10
-  10 - 25
-  25 - 50
-  50 - 100
-  100 - 200
-  >200

**Oakfield Wind Project
Oakfield, Maine**

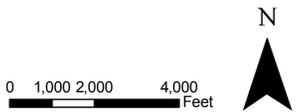
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Meteorologically Adjusted Shadow Flicker Study

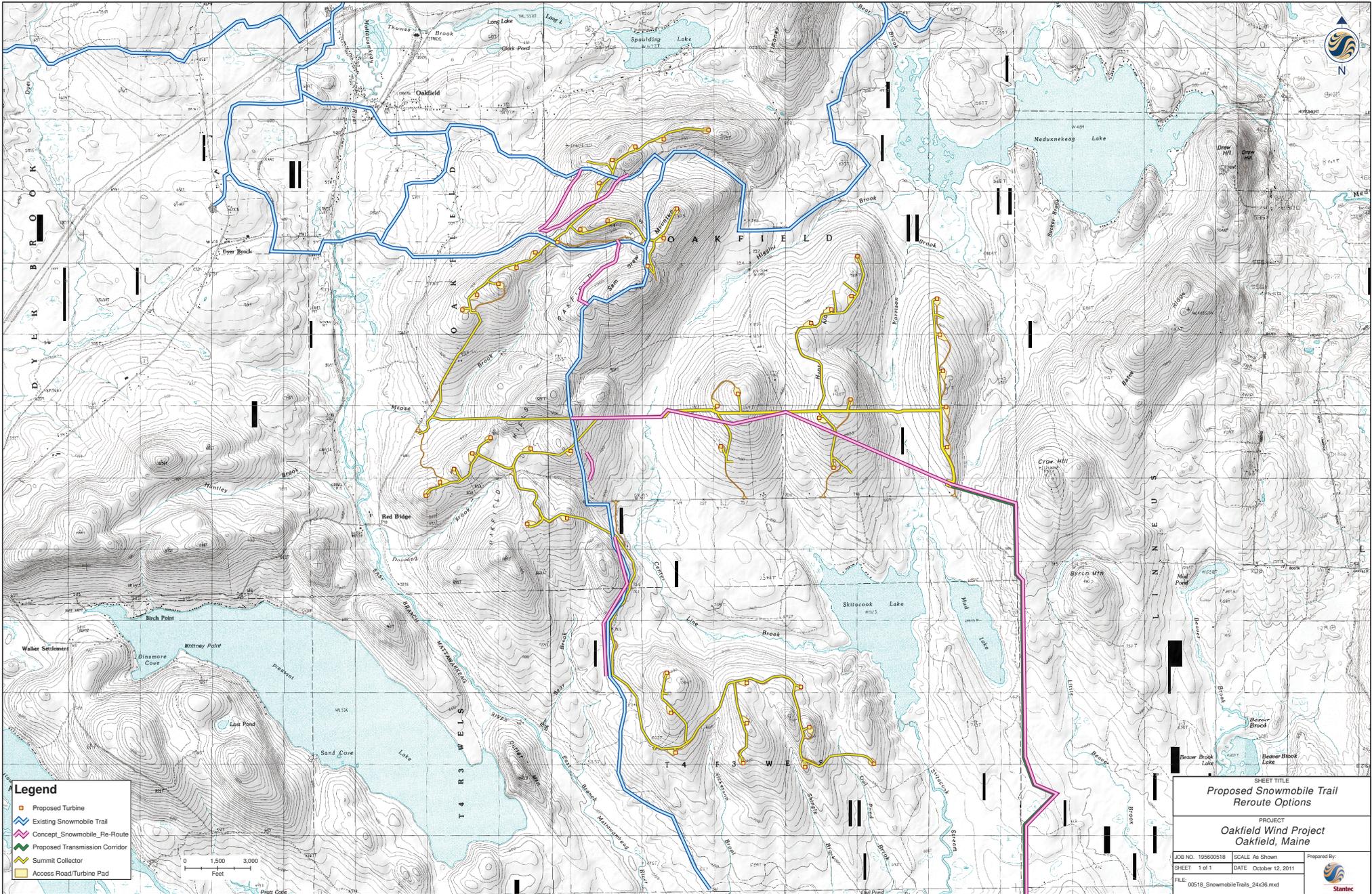
May 2011



0 1,000 2,000 4,000
 Feet

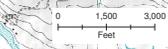
Appendix L

Alternative ITS Snowmobile Trail Routes



Legend

- Proposed Turbine
- Existing Snowmobile Trail
- Concept Snowmobile Re-Route
- Proposed Transmission Corridor
- Summit Collector
- Access Road/Turbine Pad



SHEET TITLE
Proposed Snowmobile Trail Reroute Options

PROJECT
**Oakfield Wind Project
Oakfield, Maine**

JOB NO. 195609518 SCALE As Shown Prepared By:
SHEET 1 of 1 DATE October 12, 2011
FILE: 00518_SnowmobileTrails_24x36.mxd

