5.0 NOISE

5.1 SOUND ASSESSMENT

Bodwell EnviroAcoustics LLC conducted an analysis of the likely sound impacts of the Bingham Wind Project (project) in accordance with the recently adopted Maine Department of Environmental Protection (MDEP) noise control regulations that apply to wind energy developments (Chapter 375.10, 2012).

The assessment determines sound levels from the project and compares them to the MDEP sound level limit of 42 dBA nighttime at protected locations (Exhibit 5A). The analysis evaluates sound impacts for the two types of turbines proposed for this project: Vestas and Siemens.

The closest residence or camp subject to the 42 dBA nighttime sound limit is located more than 4,600 feet from a turbine and there are only three such camps or residences within one mile of turbines. Sound easements have been obtained at 3 protected locations and 1 purchase and sale agreement has been obtained at the fourth protected location (Exhibit 5B).

The report conservatively estimates wind turbine sound levels and outdoor sound propagation by assuming:

- candidate turbines have the maximum full rated sound power level;
- all turbines are operating simultaneously at continuous full rated sound output;
- receptor points are simultaneously located downwind of all turbines;
- there is no intervening vegetation between the sources and receptors;
- sound propagation over water as an acoustically reflective surface; and
- an uncertainty factor of 2.5 to 3 dBA added to the maximum rated sound power level to reflect uncertainty in the performance specification provided by the manufacturer and in the model.

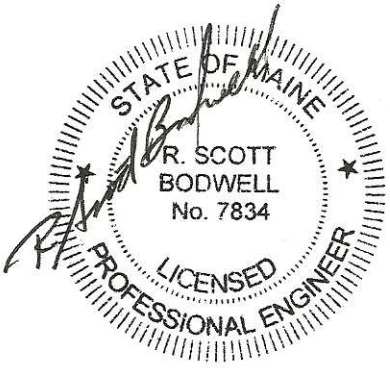
The sound model has been demonstrated to accurately estimate wind turbine sound levels under predictable worst-case operations during nighttime stable atmospheric conditions with high wind shear. The report demonstrates that the project will comply with all current sound level requirements applicable to wind energy developments. The applicant, Blue Sky West, LLC (Applicant),[1] has a sound easement for three parcels outside of the Applicant's land control (Exhibit 5B), and the applicable sound limits will be met at the project boundary and all regulated protected locations.

[1] Blue Sky West, LLC is the wind energy project entity.

Exhibit 5A: Sound Assessment

Sound Level Assessment
Bingham Wind Project
Somerset and Piscataquis Counties, Maine

April 2013



Prepared for:
Blue Sky West, LLC and Blue Sky West II, LLC

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

Bodwell EnviroAcoustics LLC

1.0 Introduction

Blue Sky West, LLC and Blue Sky West II, LLC (Applicants), subsidiaries of First Wind Energy, LLC, have proposed construction of the Bingham Wind Project ("Bingham Wind"), a wind energy facility in Somerset and Piscataquis Counties, Maine. Bingham Wind will consist of 62 Siemens SWT-113 or Vestas V112 wind turbines to be located in Mayfield TWP, Kingsbury PLT, and Bingham, Maine, resulting in a total generating capacity up to 191 megawatts (MW) of electricity.

Bodwell EnviroAcoustics LLC (BEA) assessed sound levels expected to result from construction and operation of the Bingham Wind Project. The main objective of this Sound Level Assessment is to evaluate sound levels from simultaneous operation of all proposed wind turbines at maximum rated sound power output during nighttime stable atmospheric conditions. Predicted sound levels are calculated at noise sensitive land uses in the vicinity of the Bingham Wind Project based on turbine sound power levels and sound propagation determined in accordance with proven international standards and verified by sound level testing of operating turbines at numerous wind energy projects in Maine. Predicted sound levels 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).

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 (Standard)

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 than 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 scales 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 2-1 provides a graph that shows the reduction by frequency for A- and C-weighting scales.

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.

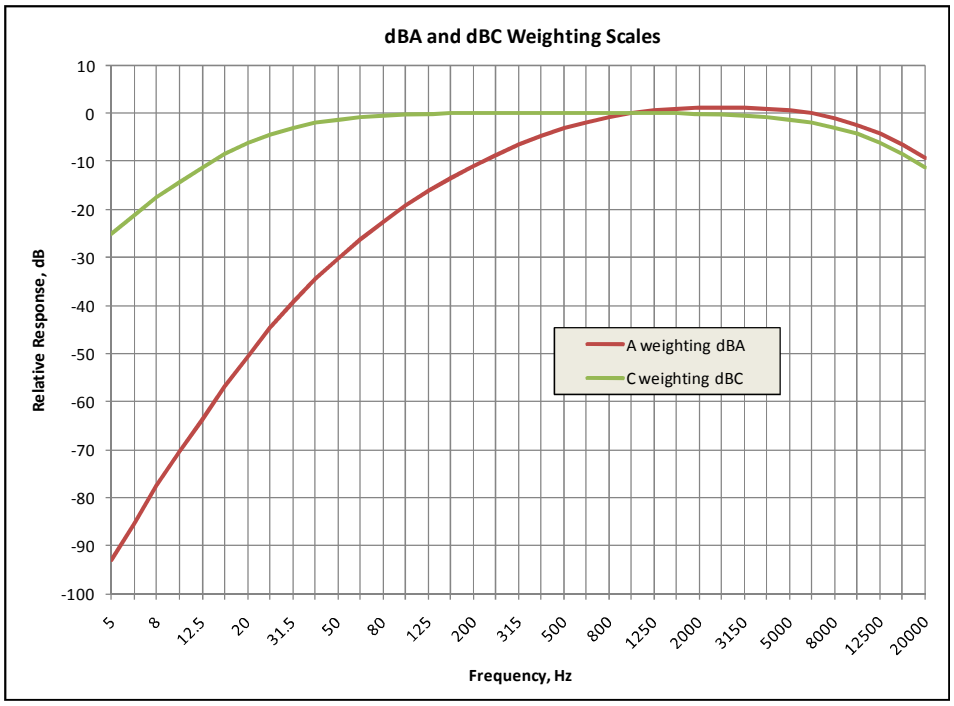


Figure 2-1. Weighting Curves for dBA and dBC Sound Levels

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 2-2 presents a graph that shows the measured sound pressure levels and the resulting equivalent (LAeq), LA10 and LA90 sound level parameters.

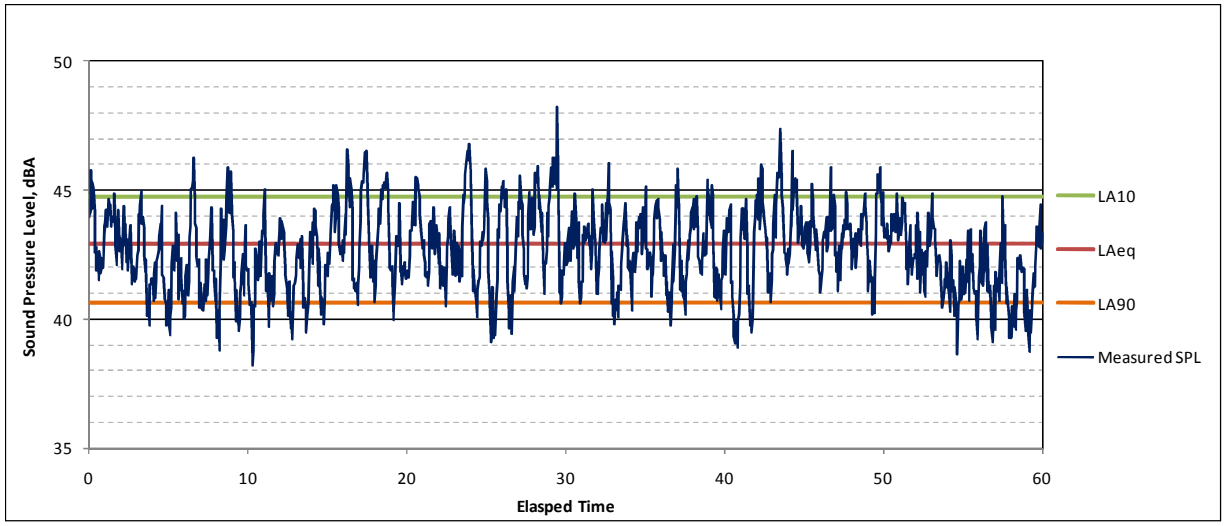


Figure 2-2. Measured Sound Pressure Levels and Statistical Parameters

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 2-1.

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 2-1. 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.

2.2 Outdoor Sound Propagation

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 2-2 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 2-3. The sound level reduction shown in Table 2-2 and Figure 2-3 is due only to distance attenuation and does not include attenuation from atmospheric absorption, terrain and foliage, or reflection from hard surfaces.

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

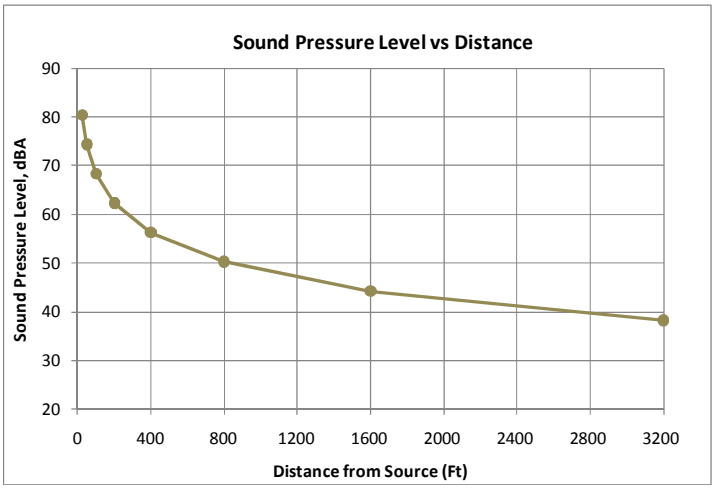


Table 2-2 & Figure 2-3. Attenuation of Sound Levels over Distance

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 results 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 yields 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 sound level prediction programs that allow calculation of outdoor sound propagation using 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 from operation of wind turbines and is the standard applied in this analysis. Further details concerning the sound level prediction model developed for Bingham 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 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 from the passage of each blade under certain operating and weather conditions. A short-term increase in sound levels that can occur on the down-stroke motion of the blade 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 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 limited basis for this claim that can be found in impartial technical studies and literature. The general 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 is 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.

[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.

[2] G.P. van den Berg, The Sounds of High Winds.
Danish Electronics, Light and Acoustics (DELTA), Low Frequency Noise from Large Wind Turbines.

In 2012, the Maine Board of Environmental Protection adopted noise control regulations that are specific to wind energy developments. Chapter 375.10(I) of Maine DEP regulations specifies sound level limits for wind energy facilities as 55 dBA daytime and 42 dBA nighttime for hourly equivalent sound levels (LAeq) at protected locations. Maine DEP nighttime limits apply within 500 feet of a residence on a protected location or at the property line if closer to the dwelling. The resulting sound levels at a residence itself are usually lower than at 500 feet from the dwelling or at the property line where the 42 dBA nighttime limit applies. Beyond 500 feet, the daytime limit of 55 dBA applies 24 hours per day. The Maine DEP Chapter 375.10 noise rules establish sound level limits on an hourly basis although compliance for wind energy facilities is evaluated by averaging sound levels over twelve or more ten-minute measurement intervals with turbines operating at full-rated sound output. There are also special provisions and "penalties" that apply when the sound generated by a wind project 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

Bingham Wind includes 62 turbines in Bingham, Kingsbury PLT, and Mayfield TWP capable of generating up to 191 megawatts (MW) of electricity. For purposes of permitting and sound level assessment, 63 potential turbine locations are being proposed, but a maximum of 62 turbines are proposed to be constructed. Other project features include: upgrades to existing roads, and new roads, to access the turbines and crane paths; up to five permanent and up to five temporary meteorological (met) towers; an Operations and Maintenance (O&M) building in Mayfield; above and below ground 34.5 kilovolt (kV) electrical collector lines among the turbines (the majority of which will be buried alongside project roads) and connecting to a new collector substation in Mayfield; and an approximately 17-mile 115 kV electrical generator lead transmission line connecting to an existing Central Maine Power (CMP) substation in Parkman, Maine.

The project will be constructed on ridges and hills in the vicinity of Route 16, including Johnson Mountain and unnamed hills north and northeast of Johnson Mountain, and an unnamed ridge north of Route 16. Existing roads will provide construction and maintenance access from Route 16 to the project area; new and existing access roads and crane paths will connect turbine locations. Road construction will include improvements to 5.3 miles of existing 24-foot access roads, as well as building 17 miles of crane path, all of which will be maintained by the Applicants. The electrical collector will connect each turbine location and run mainly underground along project roads, ultimately connecting to a proposed project substation located in Mayfield, near the center of the northern turbine strings. The O&M building will be up to 5,880 square feet (70' x 84'), located off Route 16 in Bingham near the center of the project.

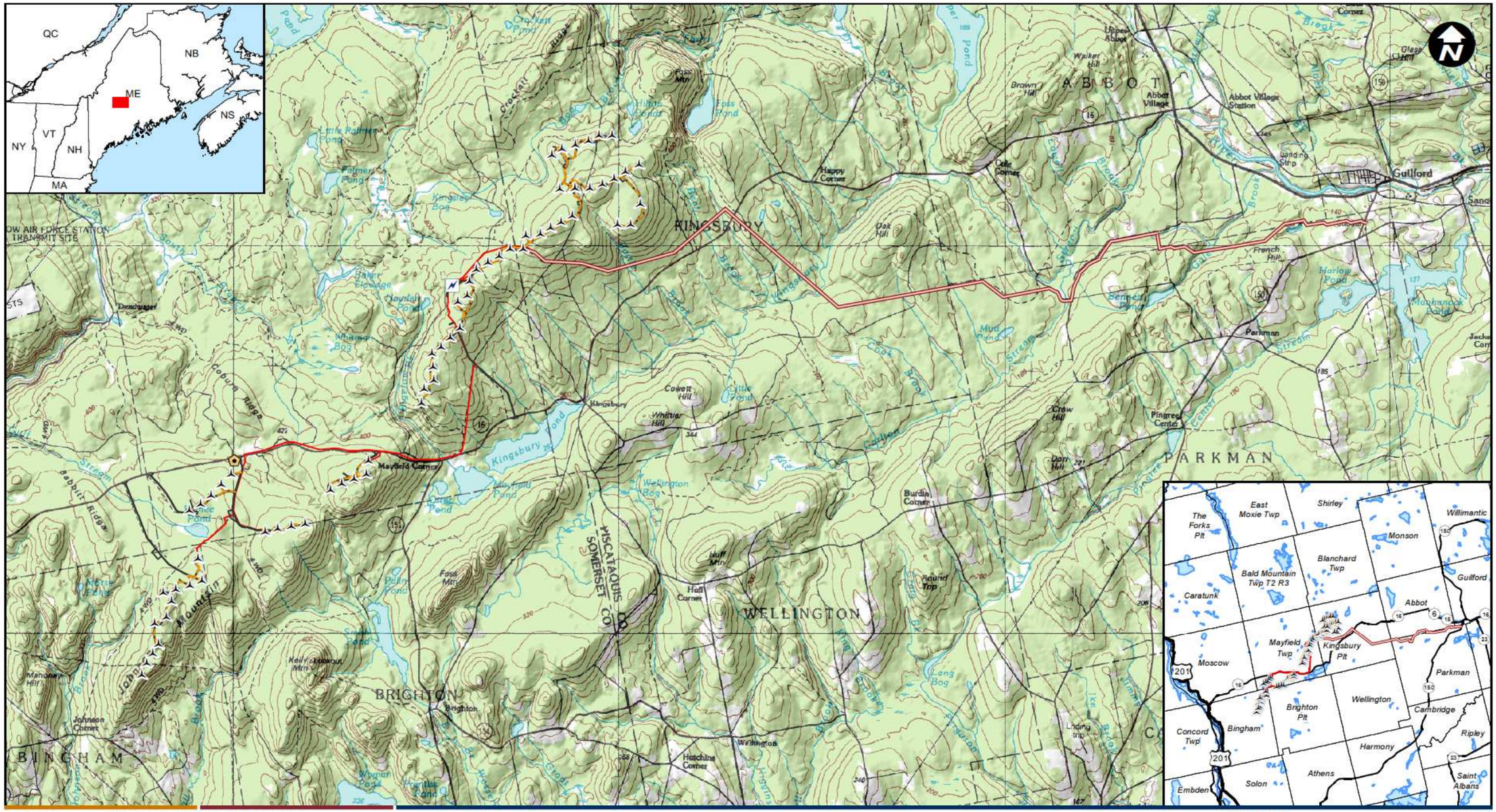
The turbines will be constructed in three jurisdictions: 11 turbines (12 proposed turbine sites) in the Town of Bingham, 29 turbines in Mayfield Township, and 22 turbines in Kingsbury Plantation. Two turbine models are being evaluated for project design and sound emissions. The Siemens SWT-3.0-113 turbines have a hub height of 92.5 meters, rotor diameter of 113 meters, and maximum height of 149

meters (489 feet) with the blade fully extended. Vestas V112-3.0 turbines have a hub height of 94 meters, rotor diameter of 112 meters, and maximum height of 150 meters (492 feet).

Bingham Wind has lease agreements which allow construction and operation of the project including proposed turbines and met towers, O&M Building, collection substation and electrical transmission and/or collection lines.

Surrounding land uses consist mostly of undeveloped forestry land, with limited rural residential and seasonal properties such as hunting and lakeside camps. The majority of residential and seasonal properties in the vicinity of the project are located along the shores of several ponds (e.g. Kingsbury, Mayfield and Smith Ponds) to the south and east of the proposed turbines. There are also a few seasonal/hunting camps located in the vicinity of north turbines in Kingsbury PLT and south turbines in Bingham. The Foss Pond Conservation Management District is located northeast of the northern most wind turbines. Figure 3-1 provides a Project Location Map that shows proposed wind turbines in relation to surrounding land uses.

The Applicants have acquired fee, lease, or easement interests from local landowners to install and operate wind turbines at the proposed locations. Figure 3-2 provides a map of the proposed wind turbine locations along with parcel and land use information including topographic contours of the study area and dwellings within the study area. Figure 3-2 depicts parcels within the study area that are subject to sound easements or similar agreements with the Applicants. Additional details concerning sound easements in relation to potentially applicable noise standards can be found in Section 5.0.



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www.stantec.com

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Client/Project
Bingham Wind Project

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Figure 3-1

Bingham Wind Project Location

3/6/2013

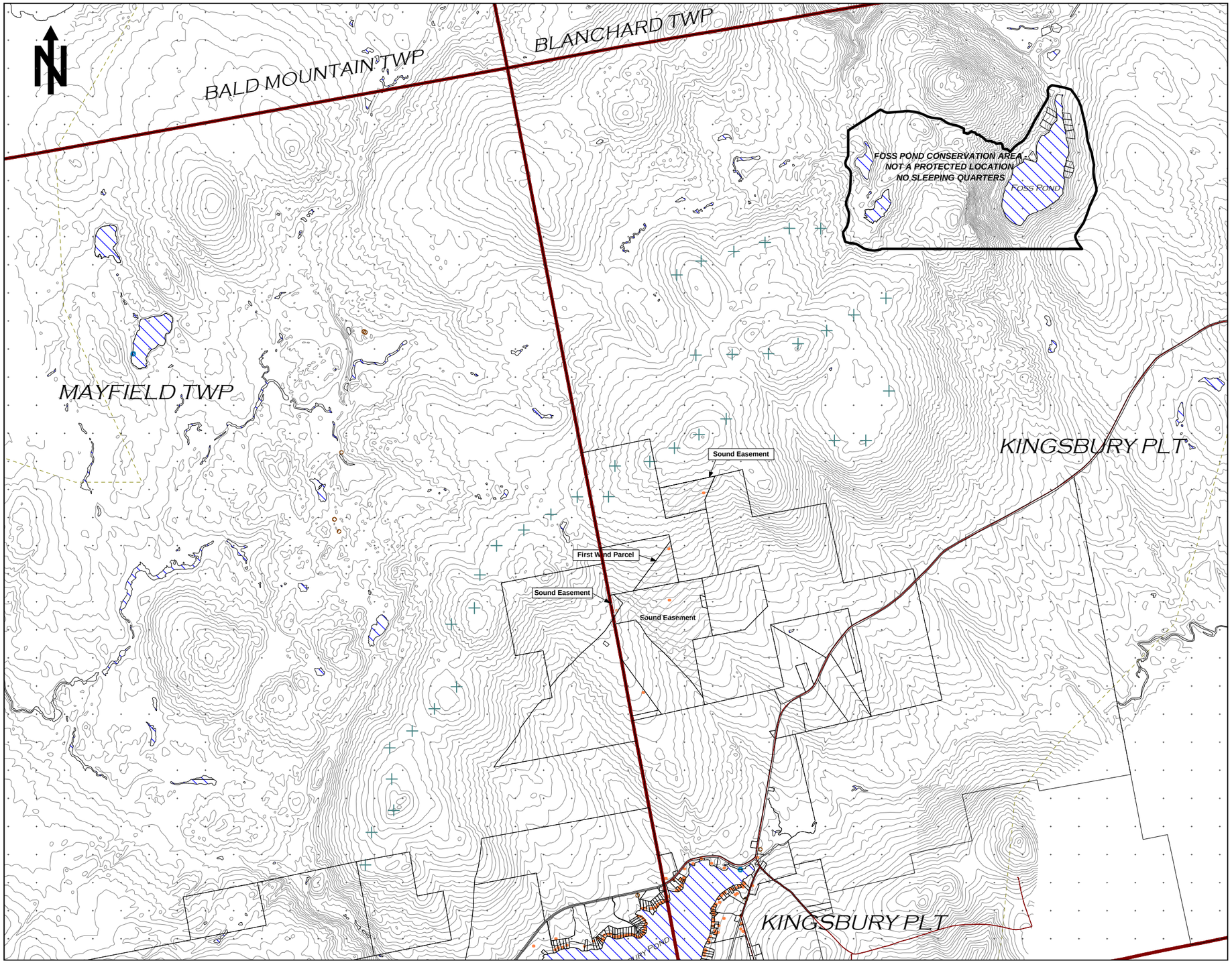


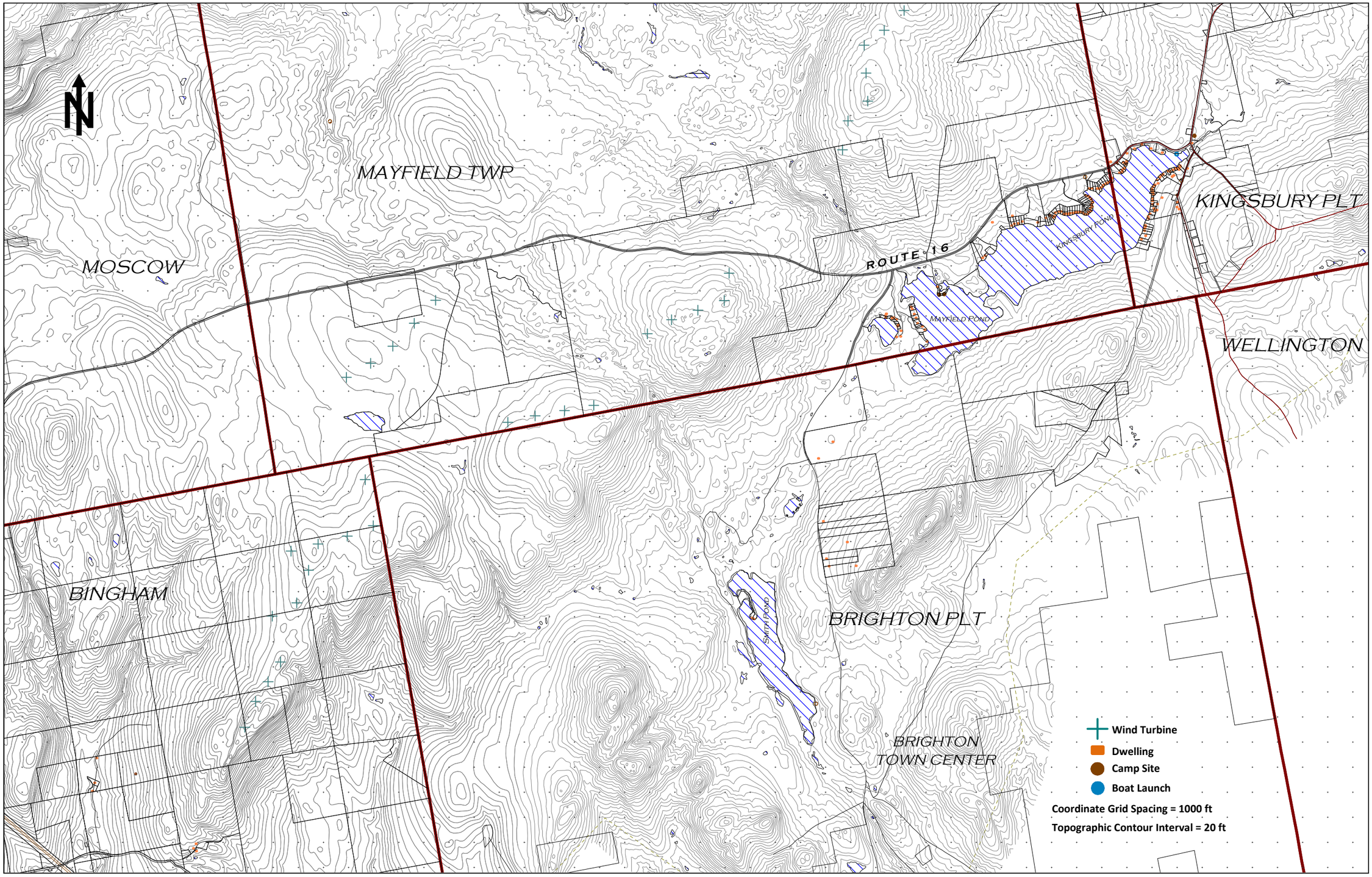
Figure 3-2 (1 of 2)

Land Uses, Topography and Proposed Wind Turbines - NORTH

Coordinate Grid Spacing = 1000 ft

Topographic Contour Interval = 20 ft

Figure 3-2 (2 of 2). Land Uses, Topography and Proposed Wind Turbines -SOUTH



4.0 Wind Turbine Sound Levels

The Applicants propose to erect either Vestas V112 or Siemens SWT-113 wind turbines to generate electric power for Bingham Wind. IEC 61400-11 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. The following provides a brief description of each turbine and its sound performance.

4.1 Vestas Wind Turbine Sound Levels

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 V112 would be mounted on a tower that would put the hub height at 94 meters above the ground. 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. At full rated output, the nominal rotor speed over is 13.6 rpm.

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 97.5 dBA at low rpm to 106.5 dBA at full rpm. Table 4-1 provides octave band sound levels at various wind speeds by octave bands ranging from 16 to 8,000 Hz.

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: **94 m**
Maximum turbulence intensity at 10 meters above ground level: 16%
Inflow angle (vertical): 0 ± 2°
Air density:1.225 kg/m^3

Noise Mode 0 Wind Shear 0.16 Hub Height 94 m	**Wind Speed @10m [m/s]**											
Frequency	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
16Hz [dB(A)]	NaN	50	52.8	59	58.1	60.6	61.1	63.2	63.2	63.2	63.2	63.2
31.5Hz [dB(A)]	NaN	68.3	72.1	78.4	77.6	78.3	78.9	79.1	79.1	79.1	79.1	79.1
63Hz [dB(A)]	NaN	78	81.5	87.9	87.2	87.7	88.2	88.2	88.2	88.2	88.2	88.2
125Hz [dB(A)]	NaN	85.7	90.5	90.4	96	95.5	95.7	95.3	95.3	95.3	95.3	95.3
250Hz [dB(A)]	NaN	87.8	91.5	92.5	96.9	97	97.5	97	97	97	97	97
500Hz [dB(A)]	NaN	91.8	95.4	97.1	101	100.8	101	100.8	100.8	100.8	100.8	100.8
1000Hz [dB(A)]	NaN	91.9	95.7	97.7	101	100.9	100.7	100.7	100.7	100.7	100.7	100.7
2000Hz [dB(A)]	NaN	90.9	94.2	98.7	99.1	99.3	99	99.6	99.6	99.6	99.6	99.6
4000Hz [dB(A)]	NaN	84.4	87.8	97.9	92.9	94.1	93.5	93.9	93.9	93.9	93.9	93.9
8000Hz [dB(A)]	NaN	69.3	72.9	79.3	76.8	81	80.2	81.1	81.1	81.1	81.1	81.1
Spectra Value [dB(A)]	**NaN**	**97.5**	**101.2**	**104.5**	**106.5**	**106.5**	**106.5**	**106.5**	**106.5**	**106.5**	**106.5**	**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 4-1. Sound Power Levels for Vestas V112 Wind Turbine 94 m Hub Height– Unrestricted Operation (Mode 0).

The sound power levels were derived from acoustic testing in accordance with IEC 61400-11 and proprietary computer models developed by Vestas 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 has issued a Sound Level Performance Standard and warranty for the V112, which is attached to this report as Appendix I.

Sound power levels for unrestricted Mode 0 in relation to wind speed at a height of 10 meters and wind shear of 0.16, are shown graphically in Figure 4-1.

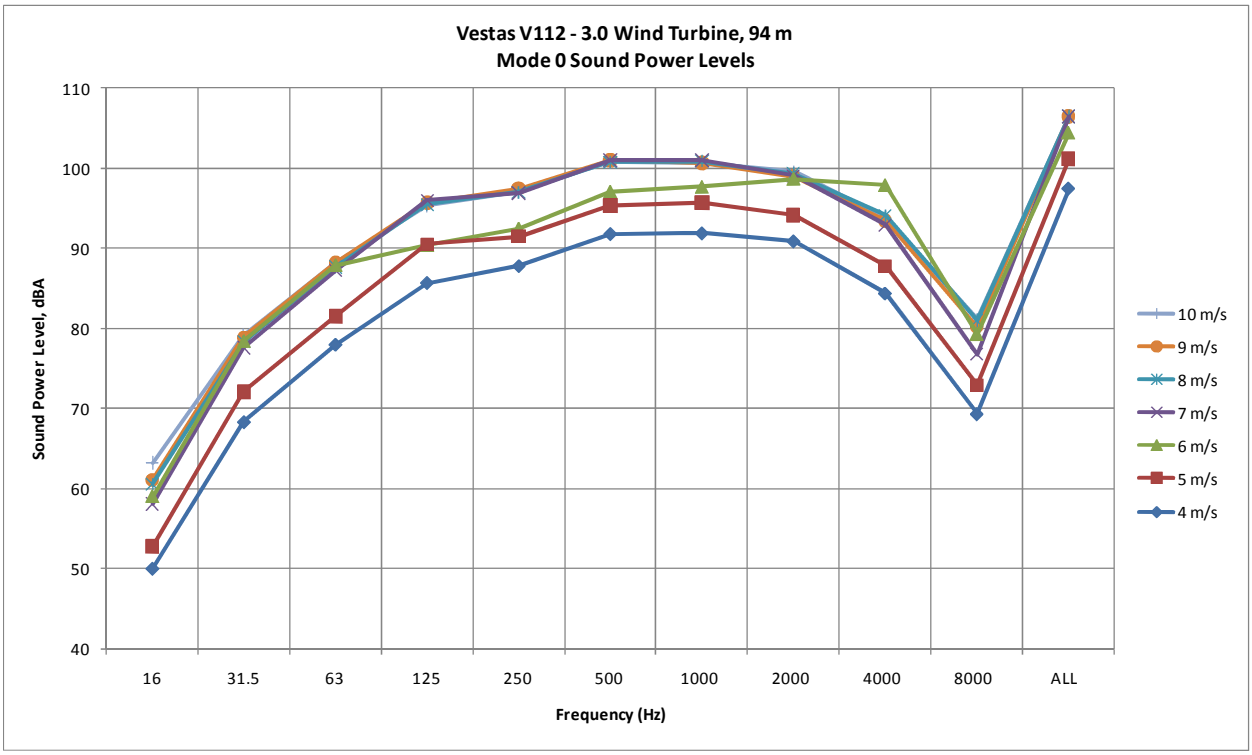


Figure 4-1. Sound Power Levels for Vestas V112 Wind Turbine Mode 0 and Wind Speeds of 4 to 10 meters/second

4.2 Siemens SWT-113 Wind Turbine Sound Levels

The Siemens SWT-113 is a pitch-regulated upwind turbine with a rotor diameter of 113 meters and a rated capacity of 3.0 MW. The SWT-113 would be mounted on a tower that would put the hub height at 95 meters above grade. The turbine operates at variable rotational speeds ranging from 6 to 15.5 rpm depending on the wind speed acting on the turbine rotor and operational settings. At full rated output, the nominal rotor speed over is 14.5 rpm.

Siemens Wind Power A/S has provided sound level performance specifications for the proposed SWT-113 wind turbine with a 92.5 meter hub height. In its unrestricted operating mode, the overall sound power levels produced by the SWT-113 range from approximately 93 dBA at low rpm and up to 107 dBA at full rpm. As part of its supply agreement, Siemens guarantees the SWT-113 will produce a maximum

rated sound output of 107.0 dBA with an uncertainty of 1.5 dBA. This guarantee can be found in Appendix II. Siemens also provided sound levels at various wind speeds by octave bands ranging from 63 to 8,000 Hz. This information was conveyed confidentially as a trade secret to First Wind and Bodwell EnviroAcoustics. Both the sound guarantee and octave band sound levels were provided by Siemens for purposes of modeling sound outputs at community points in the vicinity of the wind project.

4.3 Meteorological Conditions

Meteorological conditions have the potential to contribute to higher turbine sound levels and sound level fluctuations (i.e. amplitude modulation) from the passage of turbine blades. The primary meteorological factors are generally considered to be wind shear and turbulence intensity. These factors have been analyzed from long-term measurements of wind data at other wind projects in Maine and at operating wind projects where sound testing has been conducted under high wind shear conditions in accordance with the Maine DEP testing protocol. Wind measurement data indicates that wind speeds are lowest during the summer months and highest during the winter months. Wind shear is typically higher during nighttime hours and turbulence intensity is higher during daytime hours.

The majority of available wind and sound level measurement data indicates that extremes in turbulence intensity and wind shear are unlikely to occur at wind projects in Maine operating at sites with characteristics similar to Bingham Wind.[3] In addition, the sound level assessment uses a widely recognized sound level prediction methodology and modeling assumptions that have been demonstrated by testing to reliable for accuracy. See Section 6.3 of this report for further detail on verification of sound level prediction methodology.

5.0 Noise Standards and Guidelines

The following provides a description of State of Maine noise regulations including applicable sound level limits, model uncertainty, compliance determination and consideration of noise standards enacted by a local municipality.

5.1 Sound Level Limits

Maine DEP Chapter 375.10, *Control of Noise*, establishes hourly sound level limits for wind energy facilities based on time of day, land uses, and physical location. These limits are described in Section I, *Sound Level Standards for Wind Energy Developments* and apply to sound levels resulting from routine operation of a wind energy development measured in accordance with the measurement procedures described in subsection I(8).

[3] Town of Oakfield Wind Energy Review Committee, 2011 Review of Evergreen Wind Power II, LLC's Proposed Wind Energy Facility, Final Report, October 2011.
Stetson II Operations Sound Testing Peer Review, Warren L. Brown, EnRad Consulting, June 2011.
Pre-Filed Direct Testimony of R. Scott Bodwell, P.E., Bodwell EnviroAcoustics LLC, July 2011.

Bingham Wind is required to meet the following sound level limits (ref. Maine DEP 375.10.I(2)):

(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; 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.

In contrast to other developments, sound level limits for wind projects do not depend on 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 that meet the definition of a "protected location". 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. Maine DEP 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 375.10 G(14))

The nighttime limit of 42 dBA applies on portions of a protected location within 500 feet of a residence or other sleeping quarters, or at the property boundary line of the protected location, whichever is closer to the dwelling. At locations greater than 500 feet from the residence or sleeping quarters, the

55 dBA daytime limit applies 24 hours a day. Sound from regular and routine maintenance of the wind project is subject to the same sound level limits as routine operation.

Construction during daytime or daylight hours, whichever is longer, is exempt from the Maine DEP sound limits by Maine statute (ref. 38 MRSA 484(3)(A)). 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 Bingham Wind is presented in Section 6.1 of this report.

Sound associated with certain equipment and activities is exempt from the 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

The Maine DEP limits do not apply to noise received within the project boundary or where Blue Sky West, LLC has obtained a sound easement. As set forth by Maine DEP 375.10, Section C.5.s, a landowner may grant a noise (sound) easement that exempts the project from Maine DEP noise limits for the specific development, parcel of land and term covered by the agreement. In addition, dwellings located on lease lots are subject to the terms of the lease agreement whereby the landowner can grant an easement from Maine DEP noise limits.

5.2 Tonal and Short Duration Repetitive Sounds

Maine DEP Chapter 375.10 Section I requires that a 5 dBA penalty be added for certain occurrences of 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 Bingham Wind are presented in Section 6.3 of this report.

5.2.1 Tonal Sounds

For wind energy facilities, a tonal sound exists if, at a protected location, the 10-minute equivalent 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. When a tonal sound occurs from routine operation of the wind energy development, 5 dBA is added to the 10-minute equivalent sound level (LeqA 10-min) for purposes of demonstrating compliance with the applicable daytime and nighttime sound level limits (ref. Maine DEP 375.10.I(3)).

5.2.2 Short Duration Repetitive ("SDR") Sounds

An SDR sound is a sequence of repetitive sounds clearly discernible as an event resulting from the development 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. An SDR sound event for wind turbines is typically ±1 second in duration and can potentially result from the down-stroke of wind turbine blade.

When routine operation of a wind energy development produces short duration repetitive sounds, a 5 dBA penalty is arithmetically added to each 10-minute LAeq (LeqA 10-min) measurement interval in which greater than five SDR sound events are present (ref. Maine DEP 375.10.I(4)).

5.3 Compliance with the Sound Level Limits

Compliance with the applicable sound level limits for wind energy developments is demonstrated in accordance with the following:

(a) Sound level data shall be aggregated in 10-minute measurement intervals within a given compliance measurement period under the atmospheric and site test conditions set forth in subsection I(8) of Maine DEP 375.10.

(b) Compliance will be demonstrated when the arithmetic average of the sound level of twelve or more 10-minute measurement intervals (i.e. average of twelve 10-min measurement intervals) in a given compliance measurement period is less than or equal to the applicable sound level limits.

(c) 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), the wind energy development may combine six or more contiguous 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 contiguous 10-minute intervals from another compliance measurement period.

Compliance is demonstrated when the arithmetic average of the combined 10-minute measurement intervals is less than or equal to the applicable sound level limits. The 10-minute intervals are measured under required atmospheric and site conditions and include any applicable adjustments for the presence of tonal and SDR sounds (ref. Maine DEP 375.10.I(5)).

5.4 Local Standards

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 5 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).

Proposed wind turbines for Bingham Wind are located in the unorganized areas of Mayfield TWP and Kingsbury PLT, which have no local land use ordinances, and in the town of Bingham, which has not enacted local quantifiable noise standards.

The proposed turbines for Bingham Wind are located near Brighton PLT and the Town of Moscow. Brighton PLT has enacted a local land use ordinance but it does not contain a quantifiable noise standard. The Town of Moscow has not enacted a quantifiable noise standard.

The proposed turbines in Kingsbury Plantation are located in the Whetstone, Foss, & Hilton Pond Lake Concept Plan ("Concept Plan") approved by the Land Use Regulation Commission in 2005. The Concept Plan contains sound limits that apply at property boundary lines. However the Concept Plan does not constitute a duly enacted municipal ordinance that must be applied by MDEP under Chapter 375.10. Some of the proposed turbines are near the Foss Pond Permanent Conservation Area (FPPCA), which is an element of the Concept Plan. The FPPCA is not a designated federal, state or local wilderness area or within consolidated public reserve lands, and is not a locally designated passive recreation area because it is not accessible by a public easement (ref. MDEP 375.10(G)(11); 23 MRSA 3021). As such, the FPPCA is not a regulated protected location. In any case, the FPPCA contains no living or sleeping quarters near the proposed turbines, and therefore, even if it was a protected location, the sound limit would be 55 dBA during both daytime and nighttime hours. As depicted below in Figure 6-1 for informational purposes, the highest predicted sound level at the boundary of the FPPCA is 50.5 dBA, which is 4.5 dBA below the limit that would apply if the FPPCA was a protected location.

5.5 Sound Model Factors and Uncertainty

Maine DEP noise rules require the predictive model used to calculate sound levels produced by wind turbines to be designed to represent the "predictable worst case" impact on adjacent properties. In particular, the predictive model is required to include the following (ref. Maine DEP 375.10.I(7)):

a. The maximum rated sound power output (IEC 61400-11) of the sound sources operating during nighttime stable atmospheric conditions with high wind shear above the boundary layer and consideration of other conditions that may affect in-flow airstream turbulence;
b. Attenuation due to geometric spreading, assuming that each turbine is modeled as a point source at hub height;
c. Attenuation due to air absorption, ground absorption and reflection, three dimensional terrain and forestation;
d. 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;
e. Inclusion of an "uncertainty factor" adjustment to the maximum rated output of the sound sources based on the manufacturer's recommendation; and
f. Inclusion, at the discretion of the Maine DEP, of 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. This discretionary uncertainty factor of up to 3 dBA may be required by Maine DEP based on the following conditions: inland or coastal location, the extent and specificity of credible evidence of meteorological operating conditions, and the extent of evaluation and/or prior specific experience for the proposed wind turbines. Subject to the Maine DEP's discretion based on the information available, there is a rebuttable presumption of an uncertainty factor of 2 to 3 dBA for coastal developments and of 0 to 2 dBA for inland developments.

6.0 Sound Emissions

The following provides an assessment of sound levels associated with construction and operation of Bingham Wind.

6.1 Construction Sound Levels

Construction of Bingham Wind will involve the use of earth-moving machinery to clear and grade roads and turbine pad sites, and cranes to erect wind turbine towers and to assemble the nacelle and turbine blades. In addition to specialty cranes, 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(3)(A)). 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 Wind Turbine Sound Power Levels

As described in Section 4.0, wind turbine sound power levels were provided by Vestas Wind Systems A/S and Siemens Wind Power A/S based on sound testing per IEC 61400-11 and proprietary computer models.

Vestas reports and warrants that the full rated sound power of the Vestas V112 is 106.5 dBA with an uncertainty of $\pm$2.0 dBA. 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 94 meters (308.4 ft) above ground, the resulting elevations of the turbine hubs (modeled point sources) range from 1694 to 2088 feet above msl.

Siemens reports and warrants that the full rated sound power of the Siemens SWT-113 is 107.0 dBA with an uncertainty of $\pm$1.5 dBA. 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 92.5 meters (303.5 ft) above ground, the resulting elevations of the turbine hubs (modeled point sources) range from 1690 to 2084 feet above msl. Both Vestas and Siemens provided octave band sound levels for maximum

rated turbine sound power for use in the sound level prediction model. The octave band sound levels yielding the highest sound level predictions were used for both turbines.

6.3 Predictive Sound Model

A predictive sound model was prepared to calculate the sound levels from daytime and nighttime operation of Bingham Wind. The sound model 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 was imported to 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, low height and large distances from regulated protected locations.

Predictive sound levels are calculated in accordance with ISO 9613-2, an international standard for calculating outdoor sound propagation. This method calculates sound levels as though all receiver points were located downwind simultaneously 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 $\pm$3 dBA for a source and receiver mean height of 5 to 30 meters and a distance of 100 to 1000 meters. Although the mean source height between wind turbines (92.5 to 94 meters) and receivers (1.5 meters) is closer to 50 meters, use of Cadna/A and ISO 9613-2 has been found to be accurate for prediction of wind turbine sound levels at distances in the range of the regulated protected locations.[4]

The surface model terrain was digitally mapped from USGS topographic contours at 6 meter intervals (20 ft) provided to BEA by First Wind with turbine base elevations ranging from approximately 1,400 feet to 1,800 feet above mean sea level. The parcel boundaries and dwelling locations for the model were prepared by mapping consultants to First Wind and provided to BEA. Dwelling 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 researched by review of state and municipal records, and interviews with local officials.

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 have been used to ensure that the model is "calibrated" to actual sound levels for reliable sound model predictions. As the

[4] 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.
Rollins Wind Project, Operations Sound Testing.

following describes, model settings have been applied to predict the high range (i.e. predictable worst case scenario) of wind turbine sound levels as measured under a wide variety of site and weather conditions at other projects in Maine.

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 an equal 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 for 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 protected locations, especially during leaf-on conditions.

Sound power levels for the proposed Vestas and Siemens wind turbines are determined by the same international specification for wind turbine testing (IEC 61400-11) used to determine sound power levels for the turbines operating at existing wind power projects in Maine. 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 manufacturer's sound power level uncertainty and 1 dBA for the demonstrated accuracy of ISO 9613-2 in accordance with Section I of Maine DEP 375.10.

6.4 Tonal and Short Duration Repetitive Sounds

The Maine DEP regulation requires adding 5 dBA to the measured 10-minute equivalent sound level at a protected location if sound from a development generates either 1) a tonal sound or 2) more than five SDR sound events over a ten-minute measurement interval.

6.4.1 Tonal Sounds

The Vestas V112 Sound Level Performance Standard (Appendix I) warranties the overall sound power level of the V112 and further warranties that the V112 will not produce a tonal sound as defined by Maine DEP 375.10. A measurement report for the V112 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 V112 Sound Level Performance Standard, the proposed V112 wind turbines are not expected to generate regulated tonal sounds during routine operation. [5]

Similarly, the confidential information provided by Siemens (referenced above in Section 4.2) indicates that the SWT-113 is not expected to generate a tonal sound.

6.4.2 Short Duration Repetitive Sounds

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

[5] Delta, Measurement of Noise Emission from a Vestas V112 3.0 MW Wind Turbine, AV 161/11, Revised September 2011. GL Garrad Hassan, Results of acoustic measurements according to IEC 61400-11 on a Vestas V112 Near Niebull/Germany, May 2012.

occur on the down stroke of each rotor blade which occurs at a rate of approximately once per 1.4 seconds (0.7 Hz) at full rotational speed (nominal 13.6 to 14.5 rpm). The measurement test reports (ref. footnote 5) of sound measurements for the Vestas V112 turbine 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. Further, testing for Rollins Wind Project indicates that SDR sounds are a function of meteorological and topographic site conditions, turbine characteristics, and performance of turbine blades. Overall, sound testing at operational wind projects including Stetson I, Stetson II, and Rollins indicates that SDR sound events are relatively uncommon even under stable atmospheric conditions, high wind shear and other factors identified in technical studies as having the potential to increase amplitude modulation.[6]

Operations sound testing at Rollins Wind conducted by Bodwell EnviroAcoustics, LLC in late 2011 indicated that amplitude modulation was generally in the 2 to 6 dBA range at all test locations. The results also indicated increased occurrences of SDR sounds that would invoke the 5 dBA penalty for approximately 27% of the test intervals at one location with conditions meeting the operations sound testing protocol under stable atmospheric conditions and full turbine rotational speed.

The extent of amplitude modulation and resulting SDR sound events was more prevalent at Rollins compared to Stetson II Wind. As a result, First Wind and the turbine manufacturer undertook additional analysis of the cause of amplitude modulation at Rollins. Analysis of sound test data, additional sound monitoring, and evaluation of turbine operating parameters demonstrated a relationship between blade type and angle and the extent of amplitude modulation. Subsequent testing by the turbine manufacturer confirmed that the extent and degree of amplitude modulation (and resulting SDR sound events) could be effectively reduced by modifying blade angle settings. First Wind, the operator of the Rollins Project, voluntarily modified the blade angle settings to reduce the SDR sound events even though the Project was in compliance without these modifications.

Based on available technical literature and extensive operations sound testing results in Maine, it is realistic to assume that even if it occurs, amplitude modulation that invokes the 5 dBA penalty would not likely occur more than one-third of the measurement intervals meeting the “worst-case” test protocol criteria. With demonstrated potential for operational adjustments, the percentage of intervals could be controlled to occur less often, and it may occur less due to the site specific features present here as well as the blade type and other turbine specific considerations.[7]

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[6] In addition, preliminary results of Operations Sound Testing at nearby Bull Hill Wind indicate that turbine sound levels are below sound model predictions using these model assumptions. Further, occurrences of SDRS events as defined by Section I of MDEP 375.10 were low. The Operations Sound Test report for Bull Hill and submittal to LUPC is pending.

[7] Operations Sound Testing, Rollins Wind Project, Bodwell EnviroAcoustics LLC, July, 2012.
Lee, Seunghoon, Lee, Seungmin, & Lee, Soogab, Time domain modeling of aerodynamic noise from wind turbines, 2011.
Oerlemans, S. & Schepers, G., Prediction of wind turbine noise directivity and swish, 2009.

As specified in Section I(5)(b) of MDEP 375.10, compliance is determined based on the arithmetic average of the equivalent sound levels of, at a minimum, twelve, 10-minute measurement intervals in a given compliance measurement period. Conservative assessment of the 5 dBA penalty to one third of the compliance measurement intervals would result in an adding 1.7 dBA to the measured average 10-minute LAeq to evaluate compliance. Because as shown in Section 6.5 below, the predicted sound levels are more than 1.7 dBA below the applicable limits, the Bingham Wind Project is predicted to meet all applicable limits even if SDR sounds are present. If operations sound testing indicates that occurrence of SDR sounds results in sound levels exceeding applicable limits, Bingham Wind will be required to modify turbine settings or operations to meet applicable limits including appropriate penalties for SDR sounds.

6.5 Predicted Sound Levels

Wind turbine sound level predictions for the study area were calculated at 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 to evaluate compliance with relevant or applicable limits. "Receptor points" are the protected locations in each direction from the project with the greatest potential to exceed the Maine DEP sound level limits. The receptor points are generally at the nearest protected locations to proposed wind turbines, which are primarily parcels with seasonal dwellings. Sound level isopleths as 1 dBA contour lines were also calculated for the entire study area using a grid spacing of 20 meters by 20 meters.

Initial sound levels were calculated with all proposed wind turbines operating at full rated sound power output plus 3.0 dBA for modeling V112 turbines and 2.5 dBA for SWT-113 turbines to account for turbine manufacturer and model uncertainty. Calculations at the receptor points yielded slightly higher sound levels from SWT-113 turbines than the V112turbines. As the higher sound option, the sound level isopleths were calculated for the SWT-113 turbines as presented in Figure 6-1 along with predicted SWT-113 sound levels at the receptor points. Sound level contours corresponding to Maine DEP daytime limit of 55 dBA and the nighttime limit of 42 dBA are shown as bold lines. Figure 6-1 also shows the proposed turbine locations, parcel boundaries, dwelling locations, public and private roads, water bodies, and parcels within the study area that have granted a sound easement for Bingham Wind.

A summary of predicted sound levels at the receptor points for full daytime and nighttime operation of Bingham Wind is provided in Table 6-1 for both Vestas V112 and Siemens SWT-113 turbines. Distances from each receptor point to the nearest proposed turbine and the applicable or typical nighttime sound level limit are also shown for each receptor point.

Palmer, K.G.,A New Explanation for Wind Turbine Whoosh – Wind Shear, 2009.
Richarz, W. & Richarz, H., Wind Turbine Noise Diagnostics, 2009.
Siponen, D., The assessment of low frequency noise and amplitude modulation of wind turbines, 2011.

Receptor Point	Description and Approximate Distance to Nearest Wind Turbine		Predicted Hourly Sound Level and Nighttime Limit, dBA		
	Description	Distance (ft)	V112	SWT-113	Sound Limit
B1	Protected Location with Easement Limit - Kingsbury PLT	1,410	49.1	49.1	51
B2	Protected Location – Kingsbury PLT	6,250	39.1	39.6	42
B3	Protected Location – Mayfield TWP	6,860	34.8	35.4	42
B4	Protected Location – Mayfield TWP	6,640	37.2	37.3	42
B5	Protected Location – Mayfield TWP	6,975	37.6	37.8	42
B6	Protected Location – Bingham	4,675	34.6	34.8	42

Table 6-1. Predicted Sound Levels from Wind Turbine Operations at Receptor Points

The receptor points listed in Table 6-1 are protected locations in the vicinity of Bingham Wind. Receptor B1 is a protected location where the landowner has granted a sound easement to Blue Sky West LLC for Bingham Wind that imposes a sound level limit of 51 dBA within 500 feet of the dwelling during all hours of operation. As noted in Section 5.2 of this report, the Maine DEP limits do not apply for protected locations where a sound easement has been obtained. Bingham Wind is required to comply with terms and conditions established by the sound easement. Sound easements associated with Bingham Wind can be found in Appendix III of this report.

At all protected locations in the vicinity of the project where no easements are required or have been obtained, the predicted sound levels, with specified model settings and uncertainty (i.e. 2.5 or 3.0 dBA added to sound power level), are below the Maine DEP nighttime limit of 42 dBA. In addition, the sound level predictions indicate that Bingham Wind meet the applicable 51 dBA limit at receptor B1. In all cases, the predicted sound levels indicate that when operating at full sound output, Bingham Wind will comply with the applicable Maine DEP sound level limits.

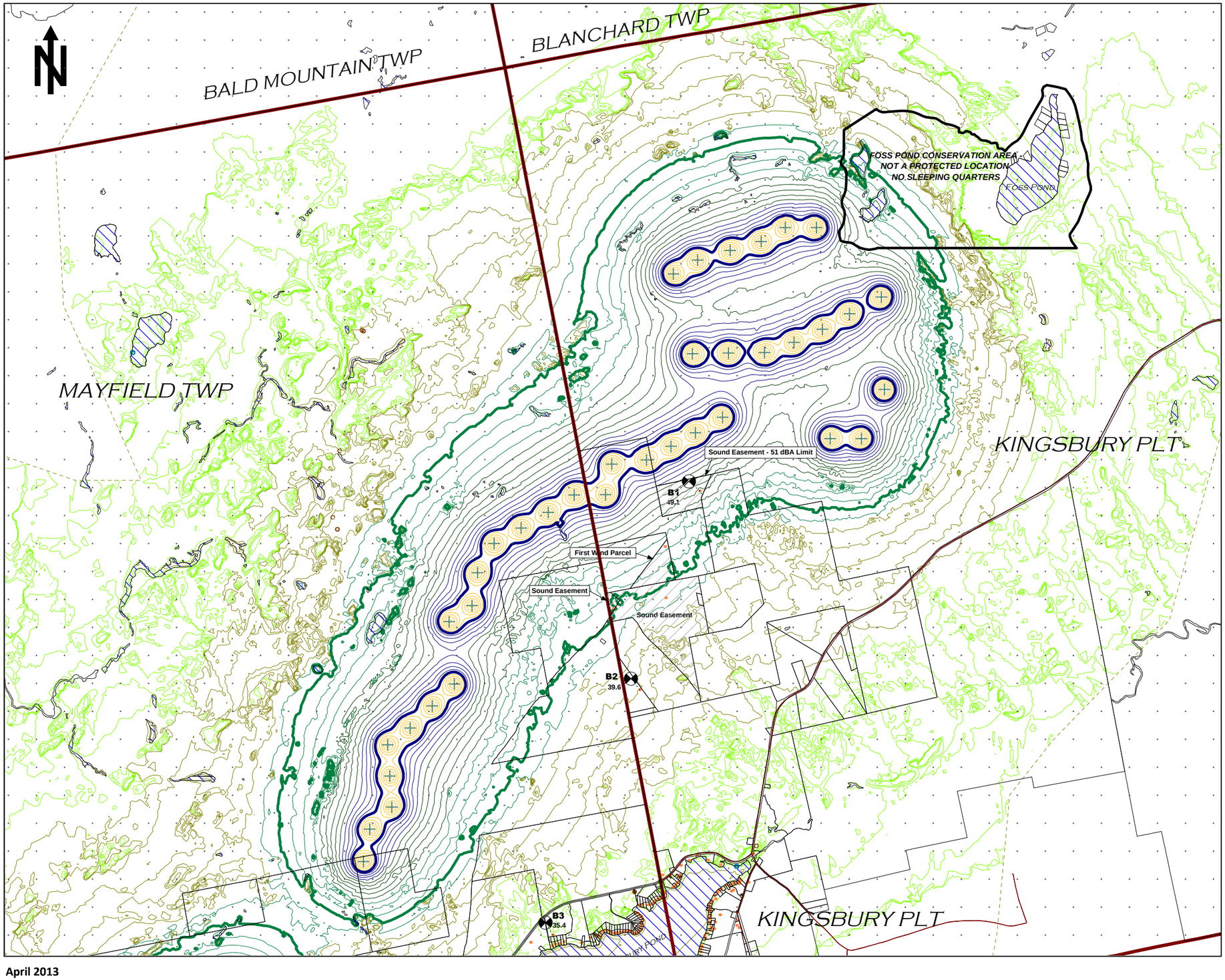


Figure 6-1 (1 of 2).

Predicted Sound Levels from Full Routine Operation of Bingham Wind - NORTH

55 dBA (Daytime Limit)

42 dBA (Nighttime Limit)

37.2 ------- 500 ft — **Receptor Point & Predicted Sound Level**

Coordinate Grid Spacing = 1000 ft

Sound Level Contour Interval = 1 dBA

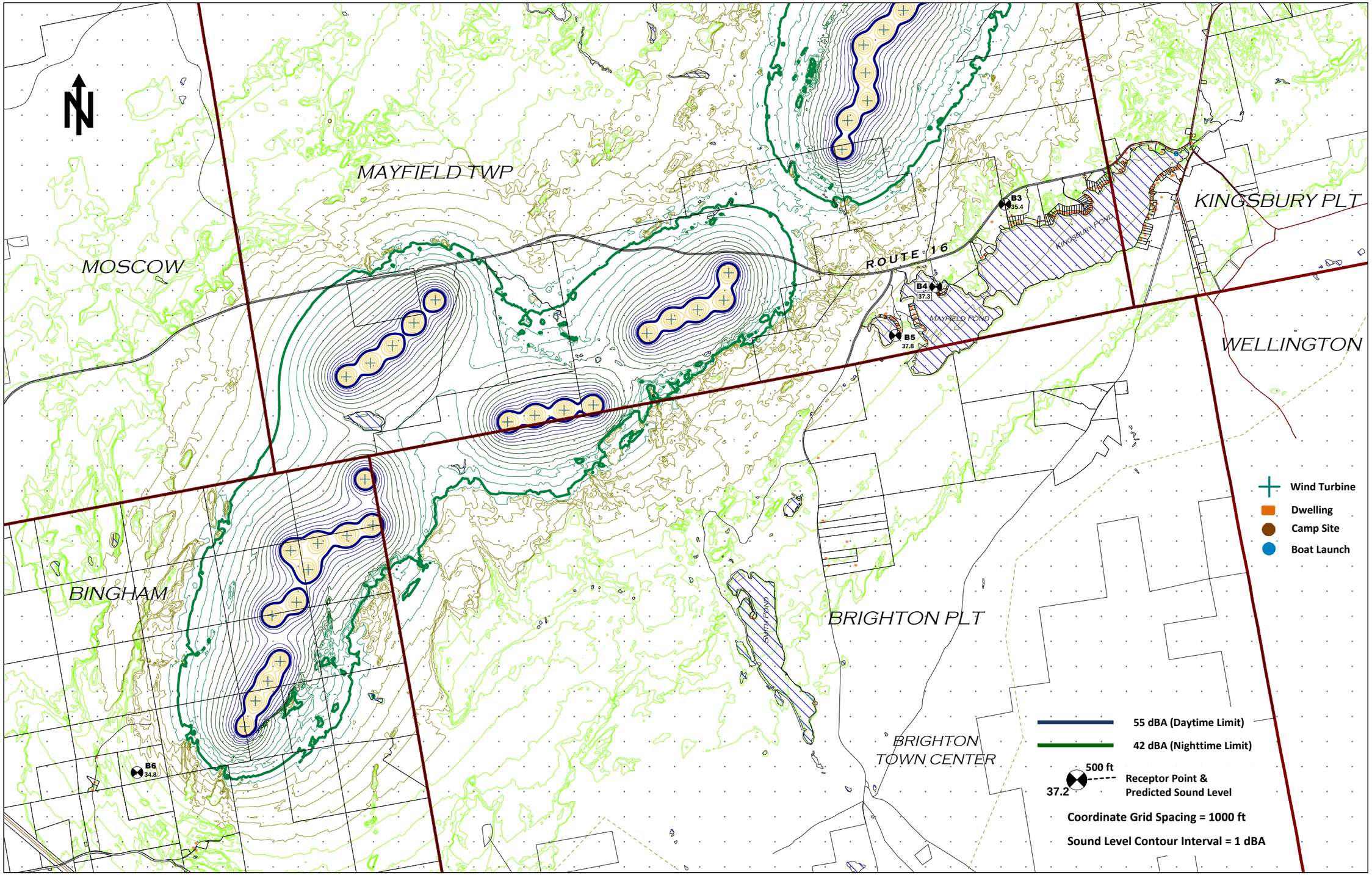
Wind Turbine

Dwelling

Camp Site

Boat Launch

Figure 6-1 (2 of 2). Predicted Sound Levels from Full Routine Operation of Bingham Wind - SOUTH



7.0 Sound Level Testing

The purpose of sound level testing is to confirm by measurement that sound levels emitted by Bingham Wind are at or below the sound level limits applicable to the project.

7.1 Project Construction

Construction of Bingham Wind 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. Consequently, 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 sounds mask noise from turbines and make it difficult to isolate and quantify sound emissions from the wind power project.

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 diminish 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 lower 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 (and resulting potential for SDR sounds) increases with wind shear, which is more pronounced under stable atmospheric conditions. Therefore, full sound output under stable atmospheric conditions is preferable for measuring sound levels for the presence of SDR 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. This testing protocol was refined and adopted as Subsection I(8) of Maine DEP 375.10 noise regulations for wind energy developments. The purpose of this protocol is to facilitate measurement of wind turbine sound levels under worst-case conditions to evaluate compliance with Maine DEP sound level limits, including appropriate adjustments for tonal and SDR sounds.

Prior to operation of Bingham Wind, an operations sound testing plan will be prepared to identify sound test locations and other testing details. Test locations will represent receptor points B1 and B2 as the protected locations with the highest potential to exceed sound limits applicable to Bingham Wind. If these receptor points are not suitable for sound testing due to accessibility or extraneous noise sources such as traffic, proxy test locations will be selected to represent the receptor points.

If tonal sounds occur or amplitude modulation reaches the Maine DEP threshold for SDR sounds of 5 dBA for more than 5 events in a 10-minute test interval, a 5 dBA "penalty" will be added to the measured 10-minute equivalent sound level. Compliance will be demonstrated based on the arithmetic average of the sound levels for a minimum of twelve, 10-minute measurement intervals in a given compliance measurement period. In the unlikely event that SDR sounds occur more frequently than anticipated, adjustments could be made to ensure that turbines are operating within the applicable limits, including any penalties for SDR sound events.

8.0 Complaint Response Protocol

Bingham Wind will develop and implement a formal protocol for addressing sound complaints from local residents during wind turbine operations. The purpose of this protocol will be 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. Similar to complaint response protocols approved by Maine DEP for other wind power projects, Bingham Wind will establish guidelines for reporting, documenting, investigating, reporting and responding to sound complaints.

9.0 Summary of Findings

This Sound Level Assessment establishes sound level limits to be applied to the Bingham Wind Project and provides sound level predictions for daytime and nighttime turbine operations using a terrain-based computer sound model. Model settings adhere to Section I of Maine DEP 375.10 and turbine sound level testing results at similar wind energy facilities in Maine. Maine DEP hourly sound level limits of 55 dBA daytime and 42 dBA nighttime apply at all regulated protected locations except receptor B1, where Bingham Wind has obtained a sound easement permitting sound levels up to a 51 dBA. Sound level predictions indicate that with all wind turbines operating simultaneously at full sound output, Bingham Wind will meet the Maine DEP daytime sound level limit of 55 dBA and nighttime limit of 42 dBA at all protected locations where those limits apply. In addition, Bingham Wind will meet the applicable 51 dBA limit at receptor B1.

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 SDR sounds. A formal protocol for response and resolution of sound complaints will be established to reduce the potential for noise problems associated with long-term operation of Bingham Wind.

10.0 References

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K. Kaliski and E. Duncan, Propagation Modeling Parameters for Wind Power Projects, Sound & Vibration, December 2008.

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Maine DEP, Site Location of Development Act Order, Oakfield Wind Project, January 2010.

Maine Revised Statutes, Standards for Development, 38 MRSA 484, Subsection 3, 1993.

Mills, D.A., MD, MPH, Wind Turbine Neuro-Acoustical Issues, Maine CDC/DHHS, June 2009.

Oerlemans, S. and Schepers, G., Prediction of wind turbine noise directivity and swish, 2009.

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Resource Systems Engineering, Stetson Wind, Operations Compliance Sound Level Study, 2009.

Richarz, W. and Richarz, H., Wind Turbine Noise Diagnostics, 2009.

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APPENDIX I: VESTAS SOUND LEVEL PERFORMANCE STANDARD

Sound Level Performance Standard and Testing Procedure

Warranted Sound Power Level V112 – 3.075 MW WTG

When measured in accordance with these testing procedures the **V112 – 3.075MW WTG IEC Class II** warranted maximum Sound Level Performance Standard is as follows;

Mode 0 Operation: Lwa = 106.5 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) ± 2dB(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.

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

Vestas Confidential Exhibit D.2 1 of 1

APPENDIX II: SIEMENS SOUND OUTPUT GUARANTEE

SIEMENS

Feb 25, 2013

Bingham Wind, LLC

129 Middle Street, 3rd Floor

Portland, ME 04101

RE: Sound Output Guarantee

To Bingham Wind, LLC:

This letter certifies that Siemens Energy, Inc. intends to provide in accordance with the terms of a supply agreement to be entered into between the parties, a guarantee to Bingham Wind, LLC that the Siemens SWT-3.0-113 MW wind turbine generator to be used at the Bingham Wind Project and operated by Bingham Wind, LLC will produce a maximum sound output of 107.0 dbA with an uncertainty factor of 1.5 dbA. This guarantee should be used for the purposes of modeling sound outputs at selected receiver points to meet state standards.

Please feel free to contact me with any questions.

Sincerely yours,

Vishal Arole

Technical Sales Manager

Siemens Energy Inc.

Siemens Energy, Inc.
4400 Alafaya Trail, MC UCC 301E
Orlando, FL 32826-2399

APPENDIX III: SOUND EASEMENTS

Exhibit 5B: Sound Easements

Herrick Easement

Ward Easement

Wilderness Sportsman Club Easement

Beauford Purchase and Sale Agreement

MEMORANDUM OF PURCHASE AND SALE AGREEMENT

Seller: Gerald W. Beauford and Sheila A. Beauford

Purchaser: Blue Sky West, LLC, c/o First Wind Energy LLC, 179 Lincoln Street, Suite 500, Boston, MA 02111

I. **Description of Premises subject to Purchase and Sale Agreement**: Certain real property in Kingsbury Plantation, County of Piscataquis, State of Maine, described in the following deed to Seller recorded at the Piscataquis County Registry of Deeds in Book 884, Page 217; and being the land generally depicted on the Kingsbury Plantation Tax Map 5, Lot 1-1.

II. **Effective Date of Purchase and Sale Agreement**: March 5, 2013

III. **Date of Closing**: The closing (the "Closing") shall take place at 10:00 a.m. on the earlier of: (i) the first business day that is thirty (30) days after the Construction Date (as hereinafter defined), or (ii) such date as Purchaser may request upon thirty days written notice to Seller. Such Closing date (the "Closing Date") shall not be later than December 31, 2016, which latter date shall be deemed the Closing Date if the Closing has not earlier occurred. The place for Closing shall be located at the office of Monument Title Company, 100 Middle Street, Portland, Maine, or at such other location agreed upon by the parties. "Construction Date" means the first (1st) day of month following the date of Commencement of Construction. "Commencement of Construction", as used in this definition, shall mean the date Purchaser has obtained all project permits necessary to develop and construct Purchaser's wind power project in the Town of Bingham and the Township of Mayfield. Somerset County, Maine, and in Kingsbury Plantation, Piscataquis County, Maine (hereinafter, the "Project") and Purchaser has entered the portion of the Project premises located in Kingsbury Plantation for the purpose of commencing site work in connection with the installation of Project turbines.

IV. **Counterparts:** This Memorandum may be executed in multiple counterparts, which together shall constitute a single instrument.

In witness whereof, the parties to the Purchase and Sale Agreement have caused this Memorandum to of Purchase and Sale Agreement to be executed as of the 5 day of March 2013, 2013.

WITNESS:

DONALD C. YOUNG JR
Print Name of Witness:

DONALD C. YOUNG JR
Print Name of Witness:

SELLER:

Gerald W. Beauford
Gerald W. Beauford

Sheila A. Beauford
Sheila A. Beauford

– Bernstein Shur
PO Box 9729
Portland 04104

STATE OF Maine
COUNTY OF Somerset

3-5, 2013

Personally appeared the above-named Gerald W. Beauford and Sheila A. Beauford and acknowledged the foregoing instrument to be his/her free act and deed.

Before me,

N.P. SEAL

Notary Public/~~Attorney at Law~~
Print Name of Notary: KRISTY R. BEAUFORD
My commission expires: Notary Public, Maine
My Commission Expires August 9, 2018

K0213055

STATE OF _____
COUNTY OF _____ _____, 201___

Personally appeared the above-named Gerald W. Beauford and Sheila A. Beauford and acknowledged the foregoing instrument to be his/her free act and deed.

Before me,

_____
Notary Public/Attorney at Law

Print Name of Notary: _____
My commission expires: _____

WITNESS:

BLUE SKY WEST, LLC
By: Maine Wind Holdings, LLC
Its: Member

Maribeth C. Hughes
Print Name of Witness:

By: _____
Name: MACQUEEN
Its: ASST. SECRETARY

Commonwealth of Massachusetts
County of Suffolk

February 28, 2013

Then personally appeared the above-named Aaron P. MacQueen in his/~~her~~ capacity as Ass't Sec'y of Maine Wind Holdings, LLC, Member of Blue Sky West, LLC acknowledged the foregoing instrument to be his/her free act and deed in said capacity and the free act and deed of said limited liability companies.

N.P. SEAL

Before me,

_____
Notary Public

LINNE M. TAYLOR
Notary Public
COMMONWEALTH OF MASSACHUSETTS
My Commission Expires
December 2, 2016

Piscataquis County
Recorded
Mar 28,2013 10:18:05A
Linda M. Smith
Register of Deeds

EASEMENT

THIS EASEMENT is made by Jeffrey Ward Sr. and Virginia Ward, a married couple residing in the Town of Alfred, County of York and State of Maine (jointly and severally, "Grantor"), the said Jeffrey Ward Sr. being the owner of a certain lot or parcel of land situated in Kingsbury Plantation, County of Piscataquis and State of Maine, more particularly described in the deed dated December 13, 1994 and recorded at the Piscataquis County Registry of Deeds in Book 967, Page 187 (hereinafter referred to as the "Servient Land").

WHEREAS, Blue Sky West, LLC, a Delaware limited liability company having a mailing address at c/o First Wind Energy, LLC, 179 Lincoln Street, Suite 500, Boston, MA 02111 ("Grantee"), plans to construct and operate a wind power project, including wind turbine generators and towers and related equipment, facilities, infrastructure and substructures, which may be built in one or more phases (hereinafter referred to as the "Wind Power Project"), on lands near the Servient Land, including (without limitation) the lands described on the attached Exhibit A; and

WHEREAS, the Wind Power Project will emit sound, including at levels that may potentially exceed applicable state, local or other maximum allowable sound level limits for the Servient Land, and may cast shadows onto or produce a shadow flicker effect at the Servient Land;

NOW, THEREFORE, for good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Grantor hereby consents to and grants, with warranty covenants and subject to the all of the terms hereof, a perpetual easement, right and entitlement to Grantee for: (a) the right to have sound generated from the Wind Power Project impact the Servient Land and exceed otherwise applicable federal, state, local or other maximum sound level limits applicable to locations on the Servient Land up to a maximum nighttime limit of 51.1 dba as measured not less than 500 feet from the dwelling on the Servient Land in the direction from which the sound is emanated (b) the right to have any audio (subject to the aforesaid nighttime limit of 51.1 dba), visual, light, vibration, electromagnetic, ice or weather hazard resulting from Wind Power Project operations or activities impact the Servient Land; and (c) the right to cast shadows or shadow flicker from the Wind Power Project onto the Servient Land. Further, as of the date hereof, Grantor, his successors and assigns do hereby release and forever discharge Grantee (and Grantee's officers, directors, affiliates, consultants, advisors and owners) from any action, claim, suit or proceeding in equity, law and/or administrative proceeding that Grantor may now have or may have in the future against Grantee with respect to the emanation of such sound, shadow or shadow flicker, including any such actions, claims, suits or proceedings arising from or relating to (i) sound, shadow or shadow flicker impacts that otherwise may be enforceable under applicable zoning, planning or other federal, state or local permitting requirements or other authorizations, and (ii) sound, shadow, shadow flicker, construction, or operational impacts to or upon the Servient Land or to Grantor and/or his successors and assigns (other than such impacts as may be caused by or arise from the gross negligence of Grantee); *provided further*, that Grantee shall be liable to Grantor for the actual cost to repair any damage to any buildings or structures caused by ice or weather hazard from one or more turbines at the Wind Power Project. Grantor, his successors and assigns, further agrees that he shall not publicly oppose or report the Wind Power Project associated with the rights granted hereunder.

This Easement shall extend to, be binding upon and shall inure to the benefit of heirs, personal representatives, successors and assigns of the parties hereto. The burden of the easement hereby granted shall run with the Servient Land and shall be binding on and a burden upon the Servient Land. The benefit of the Easement hereby granted is not appurtenant to any particular property, but shall be transferable in whole or in part, and may be sold, leased, assigned, pledged, and mortgaged by Grantee, it being the intent of the parties that such benefit may be transferred to any successors or assignees of Grantee that own or operate the Wind Power Project, as it may be modified, divided or expanded. If, at any time after twenty (20) years from the date this Easement is recorded with the Registry of Deeds, the Wind Power Project is decommissioned in its entirety, then this Easement shall automatically expire upon the completion of such decommissioning, and at Grantor's request, Grantee shall record a document evidencing termination of the Easement in the Registry of Deeds.

Grantor hereby agrees that (i) no use of or improvement to the Servient Land which is permitted by this Easement and (ii) no apportionment, assignment or granting of a subeasement thereof shall, separately or in the aggregate, constitute an overburdening of this Easement.

The benefit of the Easement hereby granted may be enforced by Grantee, its successors and assigns, by any appropriate legal or equitable remedy. In the event that Grantee, its successors or assigns, shall bring an action against Grantor, his successors or assigns, by reason of a breach or violation of this Easement by Grantor or his successors and assigns, to enforce its rights hereunder, each party shall be responsible for their own attorneys' fees and court costs incurred in such action.

Each party agrees that each party shall execute such additional documents or instruments, and shall undertake such actions as are necessary and appropriate to effectuate the intent of this Easement, including but not limited to, executing and delivering such additional documents as may be reasonably required by any lenders or assignees.

If Grantee violates the terms or conditions of this Easement or an Agreement for Sound Easement of current date between the parties hereto, Grantor shall be entitled to any remedy available under applicable law or equity, including, but not limited to, injunctive relief and recovery of reasonable attorney's fees incurred in enforcing the terms or conditions of this Easement; *provided, however* that no such violation by Grantee shall result in a termination of the Easements granted by this Easement if cured as permitted under said Agreement. The easement rights granted herein shall not be terminable solely by Grantor under any circumstances.

[Signatures and acknowledgment follow on next page.]

WITNESS our hands and seals this 8th day of April, 2013.

In the presence of:

GRANTOR

Jeffrey Ward

Virginia Ward

STATE OF

COUNTY OF York, ss. April 8, 2013

PERSONALLY APPEARED the above-named Jeffrey Ward and acknowledged the foregoing instrument to be his free act and deed.

Before me,

Diane D. Rivard

Paralegal

Name:
Title:
My commission expires:

DIANE D. RIVARD
Notary Public, Maine
My Commission Expires October 17, 2019

STATE OF

COUNTY OF York, ss. April 8, 2013

PERSONALLY APPEARED the above-named Virginia Ward and acknowledged the foregoing instrument to be her free act and deed.

Before me,

Diane D. Rivard

Paralegal

Name:
Title:
My commission expires:

DIANE D. RIVARD
Notary Public, Maine
My Commission Expires October 17, 2019

EXHIBIT A
Proposed Wind Power Project Lands
(not intended to be exhaustive)

Kingsbury Plantation Tax map 1 Lot 1
Kingsbury Plantation Tax Map 5 Lot 2
Mayfield Township Tax Map 1 lot 1

EASEMENT

THIS EASEMENT is made by Wilderness Sportsman Club c/o Conrad H. Samsoucie, Sec./Treas. residing at 116 Ball Farm Rd, Oakville, CT, 06779 ("Grantor"), the owner of a certain lot or parcel of land situated in the Town of Kingsbury, County of Piscataquis and State of Maine, more particularly described in the deed dated 4-18-69 and recorded at the Piscataquis Registry of Deeds in Book 360, Page 370 (hereinafter referred to as the "Servient Land").

WHEREAS, Blue Sky West, LLC, a Delaware limited liability company having a mailing address at c/o First Wind Energy, LLC, 179 Lincoln Street, Suite 500, Boston, MA 02111 ("Grantee"), plans to construct and operate a wind power project, including wind turbine generators and towers and related equipment, facilities, infrastructure and substructures, which may be built in one or more phases (hereinafter referred to as the "Wind Power Project"), on lands near the Servient Land, including (without limitation) the lands described on the attached Exhibit A; and

WHEREAS, the Wind Power Project will emit sound, including at levels that may potentially exceed applicable state, local or other maximum allowable sound level limits for the Servient Land, and may cast shadows onto or produce a shadow flicker effect at the Servient Land;

NOW, THEREFORE, for good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Grantor hereby consents to and grants, with warranty covenants, a perpetual easement, right and entitlement to Grantee for: (a) the right to have sound generated from the Wind Power Project impact the Servient Land and exceed otherwise applicable federal, state, local or other maximum sound level limits applicable to locations on the Servient Land; (b) the right to have any audio, visual, light, vibration, electromagnetic, ice or weather hazard resulting from Wind Power Project operations or activities impact the Servient Land; and (c) the right to cast shadows or shadow flicker from the Wind Power Project onto the Servient Land. Further, as of the date hereof, Grantor, his successors and assigns do hereby release and forever discharge Grantee (and Grantee's officers, directors, affiliates, consultants, advisors and owners) from any action, claim, suit or proceeding in equity, law and/or administrative proceeding that Grantor may now have or may have in the future against Grantee with respect to the emanation of such sound, shadow or shadow flicker, including any such actions, claims, suits or proceedings arising from or relating to (i) sound, shadow or shadow flicker impacts that otherwise may be enforceable under applicable zoning, planning or other federal, state or local permitting requirements or other authorizations, and (ii) sound, shadow, shadow flicker, construction, or operational impacts to or upon the Servient Land or to Grantor and/or his successors and assigns (other than such impacts as may be caused by or arise from the gross negligence of Grantee). Grantor, his successors and assigns, further agrees that he shall not publicly oppose or report the Wind Power Project associated with the rights granted hereunder.

This Easement shall extend to, be binding upon and shall inure to the benefit of heirs, personal representatives, successors and assigns of the parties hereto. The burden of the easement hereby granted shall run with the Servient Land and shall be binding on and a burden upon the Servient Land. The benefit of the Easement hereby granted is not appurtenant to any

particular property, but shall be transferable in whole or in part, and may be sold, leased, assigned, pledged, and mortgaged by Grantee, it being the intent of the parties that such benefit may be transferred to any successors or assignees of Grantee that own or operate the Wind Power Project, as it may be modified, divided or expanded.

Grantor hereby agrees that (i) no use of or improvement to the Servient Land which is permitted by this Easement and (ii) no apportionment, assignment or granting of a subeasement thereof shall, separately or in the aggregate, constitute an overburdening of this Easement.

The benefit of the Easement hereby granted may be enforced by Grantee, its successors and assigns, by any appropriate legal or equitable remedy. In the event that Grantee, its successors or assigns, shall bring an action against Grantor, his successors or assigns, by reason of a breach or violation of this Easement by Grantor or his successors and assigns, to enforce its rights hereunder, each party shall be responsible for their own attorneys' fees and court costs incurred in such action.

Each party agrees that each party shall execute such additional documents or instruments, and shall undertake such actions as are necessary and appropriate to effectuate the intent of this Easement, including but not limited to, executing and delivering such additional documents as may be reasonably required by any lenders or assignees.

If Grantee violates the terms or conditions of this Easement, Grantor shall be entitled to any remedy available under applicable law or equity, provided, however that no such violation by Grantee shall result in a termination of the Easements granted by this Easement. The easement rights granted herein shall not be terminable by Grantor under any circumstances.

[Signatures and acknowledgment follow on next page.]

WITNESS our hands and seals this 22nd day of January 2013

In the presence of:

JANET S. TURNER

GRANTOR

Conrad H. Sansoucie Seal/Trea

STATE OF Connecticut

COUNTY OF Litchfield, ss. Bethlehem Jan. 22, 2013

PERSONALLY APPEARED the above-named Conrad H. Sansoucie and acknowledged the foregoing instrument to be his free act and deed.

Before me,

Kathleen Gallo

Name: KATHLEEN GALLO
Title: NOTARY PUBLIC
My commission expires: MY COMMISSION EXPIRES FEB. 28, 2017

EXHIBIT A
Proposed Wind Power Project Lands
(not intended to be exhaustive)

EASEMENT

THIS EASEMENT is made by Wynne E. Herrick and Leslyn L. Herrick, individuals residing at 116 West Abbot Road, Abbot, Maine 04406 (collectively, "Grantor"), owners of a certain lot or parcel of land situated in Kingsbury Plantation, County of Piscataquis and State of Maine, more particularly described as Parcels I, II and III in the deed dated December 29th, 2009 and recorded at the Piscataquis Registry of Deeds in Book 2029, Page 181 (hereinafter referred to as the "Servient Land").

WHEREAS, Blue Sky West, LLC, a Delaware limited liability company having a mailing address at c/o First Wind Energy, LLC, 179 Lincoln Street, Suite 500, Boston, MA 02111 ("Grantee"), plans to construct and operate a wind power project, including wind turbine generators and towers and related equipment, facilities, infrastructure and substructures, which may be built in one or more phases (hereinafter referred to as the "Wind Power Project"), on lands near the Servient Land, including (without limitation) the lands described on the attached Exhibit A; and

WHEREAS, the Wind Power Project will emit sound, including at levels that may potentially exceed applicable state, local or other maximum allowable sound level limits for the Servient Land, and may cast shadows onto or produce a shadow flicker effect at the Servient Land;

NOW, THEREFORE, for good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Grantor hereby consents to and grants, with warranty covenants, a perpetual easement, right and entitlement to Grantee for: (a) the right to have sound generated from the Wind Power Project impact the Servient Land and exceed otherwise applicable federal, state, local or other maximum sound level limits applicable to locations on the Servient Land; (b) the right to have any audio, visual, light, vibration, electromagnetic, ice or weather hazard resulting from Wind Power Project operations or activities impact the Servient Land; and (c) the right to cast shadows or shadow flicker from the Wind Power Project onto the Servient Land. Further, as of the date hereof, Grantor, his successors and assigns do hereby release and forever discharge Grantee (and Grantee's officers, directors, affiliates, consultants, advisors and owners) from any action, claim, suit or proceeding in equity, law and/or administrative proceeding that Grantor may now have or may have in the future against Grantee with respect to the emanation of such sound, shadow or shadow flicker, including any such actions, claims, suits or proceedings arising from or relating to (i) sound, shadow or shadow flicker impacts that otherwise may be enforceable under applicable zoning, planning or other federal, state or local permitting requirements or other authorizations, and (ii) sound, shadow, shadow flicker, construction, or operational impacts to or upon the Servient Land or to Grantor and/or his successors and assigns (other than such impacts as may be caused by or arise from the gross negligence of Grantee). Grantor, his successors and assigns, further agrees that he shall not publicly oppose or report the Wind Power Project associated with the rights granted hereunder.

This Easement shall extend to, be binding upon and shall inure to the benefit of heirs, personal representatives, successors and assigns of the parties hereto. The burden of the easement hereby granted shall run with the Servient Land and shall be binding on and a burden upon the Servient Land. The benefit of the Easement hereby granted is not appurtenant to any

particular property, but shall be transferable in whole or in part, and may be sold, leased, assigned, pledged, and mortgaged by Grantee, it being the intent of the parties that such benefit may be transferred to any successors or assignees of Grantee that own or operate the Wind Power Project, as it may be modified, divided or expanded.

Grantor hereby agrees that (i) no use of or improvement to the Servient Land which is permitted by this Easement and (ii) no apportionment, assignment or granting of a subeasement thereof shall, separately or in the aggregate, constitute an overburdening of this Easement.

The benefit of the Easement hereby granted may be enforced by Grantee, its successors and assigns, by any appropriate legal or equitable remedy. In the event that Grantee, its successors or assigns, shall bring an action against Grantor, his successors or assigns, by reason of a breach or violation of this Easement by Grantor or his successors and assigns, to enforce its rights hereunder, each party shall be responsible for their own attorneys' fees and court costs incurred in such action.

Each party agrees that each party shall execute such additional documents or instruments, and shall undertake such actions as are necessary and appropriate to effectuate the intent of this Easement, including but not limited to, executing and delivering such additional documents as may be reasonably required by any lenders or assignees.

If Grantee violates the terms or conditions of this Easement, Grantor shall be entitled to any remedy available under applicable law or equity, provided, however that no such violation by Grantee shall result in a termination of the Easements granted by this Easement. The easement rights granted herein shall not be terminable by Grantor under any circumstances.

[Signatures and acknowledgment follow on next page.]

WITNESS our hands and seals this 31 day of January, 2013.

In the presence of:

GRANTOR

Wynne E. Herrick

Leslyn L. Herrick

STATE OF

COUNTY OF PISCATAQUIS ss. JAN. 31, 2013

PERSONALLY APPEARED the above-named Wynne Herrick and acknowledged the foregoing instrument to be his/her free act and deed.

Before me,

Name:
Title:
My commission expires:

THOMAS P. GOULETTE
Notary Public, State of Maine
My Comm. Expires Aug. 15, 2016

EXHIBIT A
Proposed Wind Power Project Lands
(not intended to be exhaustive)

Kingsbury Plantation	Map 1 lot 1
Mayfield Township	SO 025 – Plan 01 Lot 1