STATE OF MAINE
LAND USE REGULATION COMMISSION

IN THE MATTER OF DEVELOPMENT PERMIT APPLICATION DP 4889 CHAMPLAIN WIND, LLC	)))	Pre-Filed Direct Testimony of John Walker, Ph.D. on Behalf of Champlain Wind, LLC

On behalf of Champlain Wind, LLC, John Walker is submitting this pre-filed direct testimony in support of DP 4889.

I. QUALIFICATIONS AND BACKGROUND

My name is John Walker I am employed by Stantec Consulting Ltd. ("Stantec") as a Senior Project Manager. I am a Senior Associate of the firm and am the Practice Lead for the Acoustic Services of Stantec. I earned my Bachelor of Science in Geography, and Master of Science, specializing in Micrometeorology and Climatology, from Queen's University at Kingston. I earned my Doctorate in Air Pollution Meteorology from the University of Guelph. Since 1980, I have been employed in the environmental consulting industry specializing in atmospheric sciences, including air quality and environmental noise. I have participated in over 11 wind turbine noise studies with roles ranging from Senior Technical Advisor to Principal Investigator involving baseline studies, impact assessment, and complaint investigation. I am experienced in Environmental Impact Assessments for all types of projects in Canada, the United States, and for World Bank Projects in China, Syria, Iran and Kazakhstan. A copy of my resume is attached as Exhibit A.

The purpose of my testimony is to describe the scope and findings of the sound analysis completed for the proposed Bowers Wind Project (the "Project), and to summarize the Project's compliance with applicable regulatory sound standards.

II. INVOLVEMENT WITH THE BOWERS WIND PROJECT

Champlain Wind, LLC ("Champlain") proposes to construct and operate the Bowers Wind Project, which is located on three ridges in the project area: Bowers Mountain and an unnamed ridge to the south ("South Peak") in Carroll Plantation, and Dill Hill in Kossuth Township. The primary objective of the sound analysis was to determine the expected sound levels from full operation of the Project and compare them with relevant sound standards set forth by the Maine DEP and implemented by LURC.[1] The sound analysis is included as Exhibit 16 of the Application. Additionally, we provided follow-up information requested by Warren Brown, the Land Use Regulation Commission's outside peer reviewer, on April 19, 2011, and May 2, 2011. That information supplements and in some instances replaces the information included in Exhibit 16 of the Application.

A summary of the results and information concerning sound levels from the proposed wind turbine operations is provided below.

III. SUMMARY OF SOUND LEVEL ASSESSMENT

The proposed Bowers Wind Project is located in a rural area of Penobscot and Washington counties. The Project consists of up to 27 turbines. There are two turbine models that may be used: Siemens 2.3 MW turbines and Siemens 3.0 MW turbines. The maximum sound power output associated with the Siemens 3.0 is slightly higher than the maximum sound power output associated with the Siemens 2.3 model and therefore the analysis assumed the maximum number of Siemens 3.0 turbines that might be used (up to ten). In addition to the turbines, the project includes up to four permanent meteorological towers, an operations and

[1] The Bowers Wind Project is located within an "expedited permitting area" in the jurisdiction of the Maine Land Use Regulation Commission ("LURC"). As such, LURC requires that the Project meet the provisions of the Department of Environmental Protection's noise control regulations, which are set forth in Chapter 375.10 of the Maine DEP Regulations, in lieu of the noise standards set forth in Section F.1 Noise in LURC's Chapter 10 Land Use Districts and Standards.

maintenance building located to the north of Route 6, an electrical collector system, and an electrical substation located approximately 5.2 miles from the turbines at the interconnection with the existing generator lead line (Line 56). Exhibit B is a Project Location Map that shows the locations of the proposed wind turbines and other facilities in relation to surrounding topography and land uses.

Wind turbine generators produce sound through a number of different mechanisms that can be categorized as either mechanical or aerodynamic sound sources. The major mechanical components, including the gearbox, generator and yaw motors, each produce their own characteristic sounds. In some of these turbines, sounds included tonal components, but manufacturers have focused on reduction of these sounds. Other mechanical systems such as fans and hydraulic motors can also contribute to the overall sound emissions. The interaction of air and the turbine blades produces aerodynamic sound through a variety of processes as air passes over and past the blades. The sound produced by air interacting with the turbine blades tends to be broadband sound, but is amplitude modulated as the blades passes the tower, resulting in a characteristic “swoosh.” Generally, wind turbines emit more sound as the wind speed increases eventually reaching a plateau of sound output. When operating at or near full sound output, the primary noise source from a wind turbine results from the interaction of air and the turbine blades, and not from the mechanical components.

The Project area has been managed for commercial timber production, and the surrounding uses consist mostly of undeveloped land with sparsely located seasonal properties. The area is considered a quiet area and therefore the Project was evaluated for compliance with the quiet limits of Chapter 375.10. The majority of residential and seasonal properties nearest to the Project are located to the south of the South Peak turbines and the closest dwelling is a seasonal camp located approximately 2,500 feet to the south of the nearest proposed turbine. There are four year-round residences on Route 6 that are more than 0.5 miles from the nearest proposed turbine. Exhibit C highlights the Project area and closest residences.

APPLICABLE SOUND LIMITS

A complete discussion of the applicable sound limits is included in Sections 4.0 and 5.0 of the sound analysis included as Exhibit 16. In recognition of the quiet rural area, Champlain has elected to apply the more stringent "quiet" area limits of 45 dBA during the nighttime and 55 dBA during the daytime. As a result, the relevant limits include the following:

- Maximum hourly sound levels of 75 dBA at the Project boundary;
- Maximum hourly sound levels of 55 dBA during the daytime at protected locations;
- Maximum hourly sound levels of 45 dBA during the nighttime at locations within 500 feet of a residence on a protected location.

Protected locations include parcels of land that include a residence, seasonal camps, and conservation land. These limits are depicted visually in Figure 1 below:

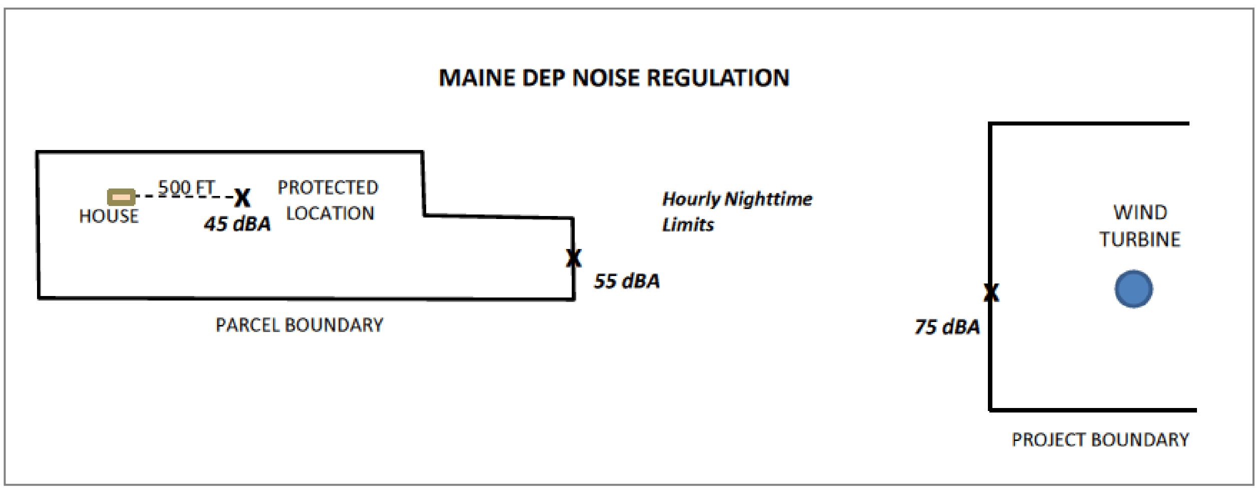


Figure 1. Maine DEP Hourly Sound Level Limits

PREDICTED SOUND LEVELS

Sound modeling for operation of the Project was done to predict the sound levels of the Project on surrounding uses in the study area. The model is capable of predicting sound levels at specified receiver positions originating from a variety of sound sources, and takes into account wind turbine specifications, topographic mapping of the project area, and other input variables. The model is described in Section 6.0 of the sound level analysis, and was initially run utilizing the following conservative assumptions:

- The manufacturer maximum sound power output plus an additional manufacturer uncertainty factor.
- An additional 3 dBA to take into account potential uncertainty in the modeling calculation method.
- Sound levels calculated as if the receiver locations were all simultaneously downwind from the sound sources, which is not a physical possibility.
- A receiver height of 4 meters, which represents the height of a second floor bedroom, a conservative assumption that yields higher predicted levels than first floor receivers.
- Although foliage has the effect of reducing sound levels at receiver points, no attenuation due to trees or other foliage.
- Ground attenuation based on a ground absorption factor of 0.8, a default used in some jurisdictions to allow for soft, porous ground in summer, or winter snow cover.
- No adjustment for masking that often occurs when turbines are operating at full sound power output.

The results of this initial modeling demonstrated that the Project would comply with the quiet nighttime limits.

In response to a request by Warren Brown from EnRad Consulting, LURC's outside peer reviewer on sound, we ran an additional model analysis with slightly modified assumptions. In particular, the ground attenuation was assumed to be zero, which has the effect of assuming a hard reflective surface such as concrete between all turbines and receivers, and the 3 dBA for modeling uncertainty was removed. The subsequent model runs also included updated information on the maximum sound power output and manufacturer uncertainty factors for the Siemens 2.3 and 3.0 turbines being used in the Project. The assumptions and results of this additional modeling were provided to EnRad Consulting and are attached as Exhibit D hereto. This additional modeling also demonstrates that the Project complies with the quiet nighttime limits.

The Chapter 375.10 regulations require an adjustment to the measured sound level at a protected location if the development generates certain types of sound that are considered to be more annoying than relatively steady sound with no prominent tones or frequencies. These regulated types of sound include tonal and short duration repetitive sounds and, if they occur, a 5 dBA penalty is applied. Tonal sounds are those with a peak in the sound spectrum that can be readily identified by the listener; a sound that has a tonal component has been described as one that the listener can hum with in tune. Tonal sounds, such as dentist drills, are more annoying than broadband sounds, such as wind in the trees. Based on review of octave band data for the proposed turbines, no tonal sounds are expected. Short duration repetitive sounds are those that are caused by periodic elevated sounds that may result from synchronization of sounds from individual sources. If all turbines emit a “swish” at the same time, at the same distance from the receiver, and at high levels, the resulting sound can be noticeable, but the occurrence is rare and very site specific. Based on measurements of operating wind projects in Maine, as well as published literature concerning amplitude modulation from wind turbines, the occurrence of these fluctuations are not expected to materially affect measured sound levels from the Project.

Nonetheless, post-construction monitoring will be conducted to verify that they do not occur or if they occur, to evaluate resulting sound levels and compliance.

EnRad Consulting, acoustical consultant to LURC and the Maine DEP, reviewed the sound analysis and concluded that it was "reasonable and technically correct according to standard engineering practices required by LURC under 12 MRSA §685-B(4-B)(A) Regulations on Control of Noise (06-096 CMR 375.10)." Bowers Wind Project Sound Level Assessment – Peer Review ("Peer Review") at Section 8.0, p.6 (a copy of the Peer Review is attached as Exhibit E). As noted, at the request of Warren Brown, Stantec Consulting conducted additional modeling assuming a ground absorption factor of zero and removing the modeling uncertainty factor of 3 dBA. Enrad Consulting concluded that the analysis provided reasonable estimates of "worst-case" wind turbine noise that comply with MDEP Chapter 375.10 noise. Id. at 6.

Finally, it is important to note that recent post-construction monitoring data from operating projects in Maine has demonstrated the conservatism that is inherent in the pre-construction modeling conducted to date, and therefore actual operating levels are likely to be less than the maximum predicted levels reflected in the analyses done here. Additionally, the predictions here are worst-case, representing emissions at the highest wind speed; in normal conditions, the average wind speeds will result in lower sound levels.

POST CONSTRUCTION MONITORING PROTOCOL

Sound level testing of wind turbine operations is a complex and critical component of the proper and responsible operation of a wind energy facility. Champlain is proposing to conduct post-construction sound monitoring to demonstrate compliance with the applicable sound level limits. The monitoring will be done in specific conditions when wind turbine sound is prominent and sound impacts on nearby residents are greatest. The specific conditions for conducting such monitoring are described in the Peer Review and will be finalized and submitted to LURC for review and approval prior to implantation.

CONCLUSION

In conclusion, the results of the sound level analysis indicate that with all wind turbines operating simultaneously at full capacity, sound levels from operation of the Bowers Wind Project will meet the applicable Maine DEP noise standards during both daytime and nighttime periods.

Date: May 27, 2011

John Walker

Sworn before me at Dartmouth, in the County of Halifax, in the Province of Nova Scotia
CANADA Date: May 27/2011

Personally appeared before me the above named John Walker, who, being duly sworn, did testify that the foregoing testimony was true and correct to the best of his knowledge and belief.

Before me,

Notary Public
My commission expires: Aug 25/2015

Sharon L. Roche
"A Commissioner of the Supreme Court of Nova Scotia"

Exhibit A: Resume

Exhibit B: Project Location Map

Exhibit C: Residences in Project Vicinity

Exhibit D: May 2, 2011 Updated Assumptions and Modeling Results

Exhibit E: Bowers Wind Project Sound Level Assessment – Peer Review

3378646_1.DOC

John I. Walker Ph.D.

Practice Lead, Acoustics

Senior Associate and Project Manager

Stantec

Dr. John Walker, Stantec Practice Lead in Acoustics, is a Senior Associate and Senior Project Manager in the Stantec Dartmouth office with 30 years of experience in the environmental consulting industry. He earned his doctorate in air pollution meteorology and environmental physics from the University of Guelph in 1980. John has worked on air quality, noise, hazardous waste, environmental management and other studies for such diverse clients as Michelin (Canada), Nova Scotia Power, INCO, El Paso Corporation, Shell Brunei, Harvard School of Public Health, El Paso Corporation, Petro-Canada, and Environment Canada. He has assisted many of these organizations in Environmental Assessments, in permitting facilities, solving problems and adapting to changes in the policy and regulatory environments. His international work has included World Bank and private sector clients in China, Kazakstan, Iran, Syria, Brunei, Brazil, Chile, and Argentina.

EDUCATION

Doctor of Philosophy, Air Pollution Meteorology, University of Guelph, Guelph, Ontario, 1980

Master of Science, Geography (Climatology), Queen's University, Kingston, Ontario, 1976

Bachelor of Science, Geography (Honors), Queen's University, Kingston, Ontario, 1975

PROFESSIONAL ASSOCIATIONS

Past Chair, Atlantic Section, Air & Waste Management Association

PROJECT EXPERIENCE

Sound Assessments

Amherst Wind Farm, Accione: Director of noise impact assessment and baseline noise measurements.

Digby Wind Farm, SkyPower: Director of noise impact assessment.

Digby Wind Farm, Nova Scotia Power: *Director of study to examine revised locations of wind farm sold to provincial utility.*

East Kings Wind Farm, PEI Energy Corporation: *Project manager in a two phase study of allegations of excessive noise impacts due to 20 MW wind energy development.*

Harrington Wind Turbine Study, Agriculture Canada:
Project Manager of study to determine acoustic impact acceptablilty and cost/benefit of relocation or disposition of wind turbine at a research station.

Lameque Wind farm: *Directed noise baseline studies and impact assessment for a wind farm in northern New Brunswick.*

Sunset Creek Compressor Station, Spectra Energy:
Conducted noise impact analysis for gas compressor stations at two locations in northern British Columbia.

Canpotex Environmental Assessment, Canpotex, Port of Prince Rupert Authority:
Directed noise impact assessment for potash export terminal in northern British Columbia.

Petro-Canada Sturgeon Upgrader, Petro-Canada, Fort Saskatchewan, Alberta (Principal Scientist and Task Manager)
Conducted an assessment of noise impacts for the Petro-Canada Sturgeon Upgrader Project, Fort Saskatchewan, Alberta.

ConocoPhillips Surmont Project, ConocoPhillips, Fort McMurray, Alberta (Project Manager and Principal Scientist)
Conducted an assessment of noise impacts for the ConocoPhillips Noise Impact Assessment, Fort McMurray, Alberta.

Highway 104, Nova Scotia Transportation and Public Works, Salt Springs Provincial Park, Nova Scotia (Project Manager)
John conducted an assessment of noise and noise barrier design for Highway 104 at Salt Springs Provincial Park, Nova Scotia.

John I. Walker Ph.D.

Senior Associate and Project Manager

Third-Lane Project for the Macdonald Bridge, Halifax-Dartmouth Bridge Commission, Halifax-Dartmouth, Nova Scotia (Project Manager)
John conducted an assessment of potential construction noise impacts of the Third-Lane Project for the Macdonald Bridge, Halifax-Dartmouth, Nova Scotia.

Total Upgrader, Fort Saskatchewan, Alberta (Task Leader - Noise Impact Assessment)
Directed the baseline noise survey and preliminary modeling, performed Senior Review on final modeling and backup to Energy Resources Conservation Board Hearings.

Fort Hills Upgrader, Fort Saskatchwan, Alberta (Task Leader - Noise Impact Assessment)
Directed the baseline noise survey and noise attenuation modeling, prepared the noise impact assessment document, and provided testimony at regulator hearings.

Surmont SAGD, Fort MacMurray, Alberta (Acoustic Consultant)
Conducted baseline sound measurements at the project site and a pilot plant, prepared a noise impact assessment in fulfillment of requirements under the Energy Utilities Board.

Fort Nelson Gas Plant, Fort Nelson, British Columbia (Task Leader - Noise Impact Assessment)
Conducted noise impact assessment for a gas plant, including inventory of equipment and modeling using Cadna.

EnCana Cabin Gas Plant, Remote northern British Columbia (Task Leader - Noise Impact Assessment)
Prepared an inventory of equipment and led team conductiong noise modeling, impact assessment, and mitigation design for a gas plant in northern British Columbia.

Assessments, Permitting, and Compliance

Maritime Steel, New Glasgow, Nova Scotia (Manger and Consultant)
John was the manger of source testing, dispersion modelling and consultation for the repermitting of the facility in New Glasgow, Nova Scotia.

NPRI and Greenhouse Gas Studies, Neenah Paper, Pictou, Nova Scotia (Project Manager)
John managed the update of the NPRI reporting and greenhouse gas inventory for Neenah Paper, Pictou, Nova Scotia.

Sydney Tar Ponds Environmental Assessment, Sydney Tar Ponds Agency, Sydney, Nova Scotia (Principal Scientist)
John conducted noise and air quality for the environmental assessment of the Sydney Tar Ponds Cleanup.

Whites Point Quarry Environmental Assessment, Bilicon Nova Scotia, Digby, Nova Scotia (Task Manager)
John conducted noise and air quality impact assessment for the Whites Point Quarry, Nova Scotia.

Blue Atlantic Transmission System, El Paso Corporation, Halifax, Nova Scotia (Project Manager)
John set up air quality programs including modelling and monitoring for the Blue Atlantic Transmission System and the Sable Offshore Energy Program.

Michelin (Canada), Waterville, Granton, and Bridgewater, Nova Scotia (Project Manager)
John was the project manager for a series of projects for Michelin, including training programs in air quality regulations and compliance for environmental staff of all Michelin (Canada) facilities; source testing at Waterville facility; dispersion modelling and permitting assistance at Waterville, Granton, and Bridgewater plants.

Air Quality Assessment, Voisey's Bay Mine and Mill, Labrador, Newfoundland (Task Manager)
John performed air quality assessment at the Voisey's Bay mine and mill project in Labrador.

Environmental Assessment of Urban Transport Projects, World Bank, The Municipality of Shijiazhuang, China (Scientist)
John was retained by the World Bank to assist the Municipality of Shijiazhuang, China in the conduct of urban airshed modelling and other components of the Environmental Assessment of urban transport projects.

* *denotes projects completed with other firms*

John I. Walker Ph.D.

Senior Associate and Project Manager

Turbine Generator Project, Maritime Electric Company Limited, Charlottetown, Prince Edward Island (Project Manager and Principal Scientist)
John conducted a study of baseline noise during operation and shutdown modes of the Maritime Electric Company Limited plant in Charlottetown, Prince Edward Island, and Principal Scientist for acceptance testing and verification.

Dispersion Modelling for the Peaking Power Turbines, Nova Scotia Power Corporation, Burnside, Victoria Junction, and Tusket, Nova Scotia (Project Manager)
John was the project manager, and conducted dispersion modelling for the peaking power turbines at Burnside, Victoria Junction, and Tusket, Nova Scotia.

Voisey's Bay Mine Environmental Assessment, Voisey's Bay Nickel (INCO), Labrador, Newfoundland (Project Manager)
John designed two meteorological and air quality stations for installation in northern Labrador during the Voisey's Bay Environmental Assessment.

Air Quality Modelling, Voisey's Bay Smelter/Refinery, Labrador, Newfoundland (Task Manager)
John performed air quality modelling for the Voisey's Bay smelter/refinery complex at Argentia.

Project Identification Mission, World Bank, Almati, Republic of Kazakstan (Scientist)
John participated in World Bank project identification mission to the Republic of Kazakstan, CIS, to develop strategies to improve urban air quality. This involved meeting with the Ministry of Environment and agencies in Almaty to review air quality monitoring activities and data.

Urumqi Urban Transport Improvement Program, World Bank and Xinjiang Environmental Technology Assessment Center, Urumqi, Xinjiang (Technical Assistant)
John provided technical assistance and review to the World Bank and Xinjiang Environmental Technology Assessment Center.

Environmental Assessment of Urban Transport Projects, World Bank, Shenyang, Fushun, and Anshan, China (Scientist)
John assisted World Bank in the direction of the environmental assessment of urban transport projects in three cities, Shenyang, Fushun, and Anshan in Liaoning province of People's Republic China.

Air Quality Issues, Department of Energy, Charlottetown,, Prince Edward Island (Project Manager)
John conducted study of the air quality issues with respect to the Prince Edward Home wood-fired system, Charlottetown, Prince Edward Island.

Shanghai Inner Ring Road Environmental Assessment, People's Municipality of Shanghai, Shanghai, China (Technical Director)
John was the technical director of the project for the People's Municipality of Shanghai to investigate the air quality and noise impacts of the Inner Ring Road.

Sydney Tar Ponds Cleanup, Province of Nova Scotia*, Sydney, Nova Scotia (Project Manager)
John designed (in conjunction with Environment Canada and the Nova Scotia Department of Environment) and managed the implementation of the air quality monitoring program for the Sydney Tar Ponds Cleanup.

Environmental Management

Air Quality Strategy, Halifax Regional Municipality, Halifax, Nova Scotia (Project Manager & Technical Director)
John has study to develop an air quality strategy for the Halifax Regional Municipality.

Iran Environment Capacity Building, World Bank, Tehran, Masshad, Arak, and Isfohan, Iran (Expert Consultant)
John was retained by the World Bank in 2002 as an expert consultant to design an approximately $10 million (capital cost), air quality monitoring program for major cities in Iran, including Tehran, Masshad, Arak, and Isfohan.

* *denotes projects completed with other firms*

John I. Walker Ph.D.

Senior Associate and Project Manager

Energy Management and Climate Change
Project Appraisal Mission of the World Bank to the Syrian Arab Republic, World Bank, Damascus, Syrian Arab Republic (Scientist)
John was a member of the Project Appraisal Mission of the World Bank to the Syrian Arab Republic to develop a project to test alternate vehicle technologies in Syria as a Global Environment Facility project.

** denotes projects completed with other firms*

PUBLICATIONS

On-Road Vehicle Emissions in Santiago de Chile, Sao Paulo and Buenos Aires. *Presented at the 5th Conference on Urban Air Quality, Valencia Spain*, 2005.

Comparison of AERMOD, ISC3 and CALPUFF in the Environmental Assessment of a Sour Gas Plant. *Presented at the Guideline on Air Quality Mondels Conference (US EPA/AWMA) Mystic, Connecticut*, 2003.

Competition and Compromise - Environmental Factors in Waste Management. *Presented at the 22nd Canadian Waste Management Conference, Halifax*, 2000.

Air Quality Monitoring Programs at the Onshore Facilities of Sable Offshore Energy Inc. *Presented at the Offshore Technology Association of Nova Scotia*, 2000.

Urban Air Quality and Vehicle Emissions. *Presented at the First Sino-Canadian Workshop on Climate Change, Beijing*, 1999.

Motor Vehicle Control Strategies for Urban Air Quality Management. *Presented at the International Conference on Urban Pollution Control Technology, Hong Kong*, 1999.

Urban Air Quality, Greenhouse Gases, and Motor Vehicle Emissions. *Proceedings Sino-Canadian Workshop on Climate Change, Beijing*, 1999.

PAH in the Air of Sydney, Nova Scotia. *Presented at the Conference of Chemical Institute of Canada, Atlantic Chapter*, 1993.

Pollution Prevention in Action: Green Industry Analysis of a Guelph Industry. *40th Ontario Conference on the Environment*, 1993.

Software Design for the Development of Marine Weather Forecast Techniques. *Presented at the 18th Annual Congress of the Canadian Meteorological and Oceanographic Society, Halifax*, 1984.

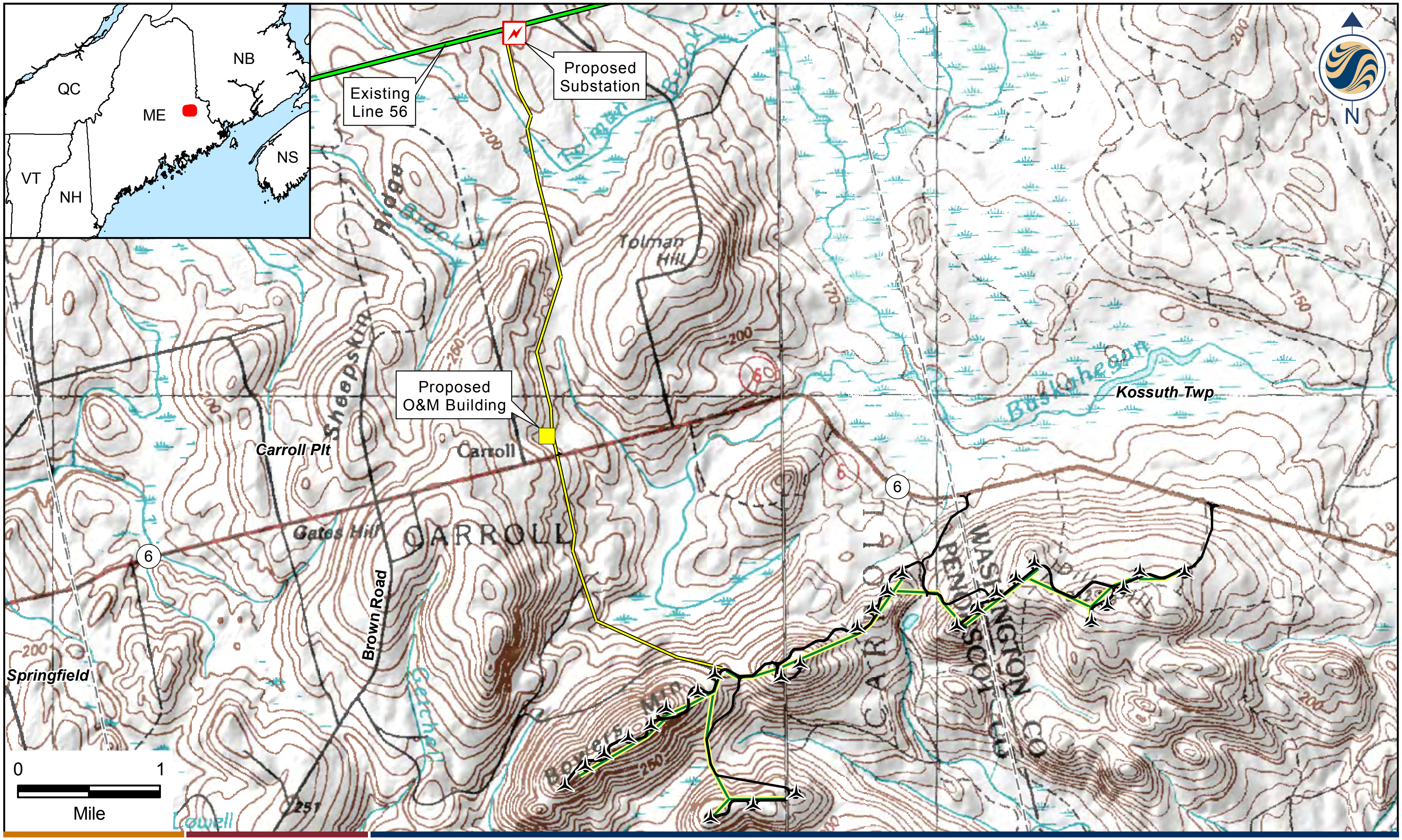
Experiments in the Development of Marine Weather Forecasting Techniques off the East Coast. *Presented at the 18th Annual Congress of the Canadian Meteorological and Oceanographic Society, Halifax*, 1984.

Ozone Uptake by Corn. *Presented at the 75th Annual Meeting of the Air Pollution Control Association, New Orleans*, 1982.

Ozone Uptake and its Relationship to Damage in Corn. *Final Report to A.E.S. for D.S.S. Contract KM601-7-19045, p. 52*, 1979.

A Note on Temperature and Humidity Profile Measurement Over Forests Using Diodes. *J. App. Meteor - 16, 106-109*, 1977.

Role of Agrometeorology in Predicting Crop Injury by Air Pollution. *Presented at the O.A.C. Agriculture Conference, University of Guelph, Guelph, Ontario*, 1977.



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00522-F001-USGS-Project-Map.mxd

Legend

- Proposed Turbine Layout
- Express Collector Corridor
- Mountain Top Collector Corridor
- Proposed Access Road

Client/Project

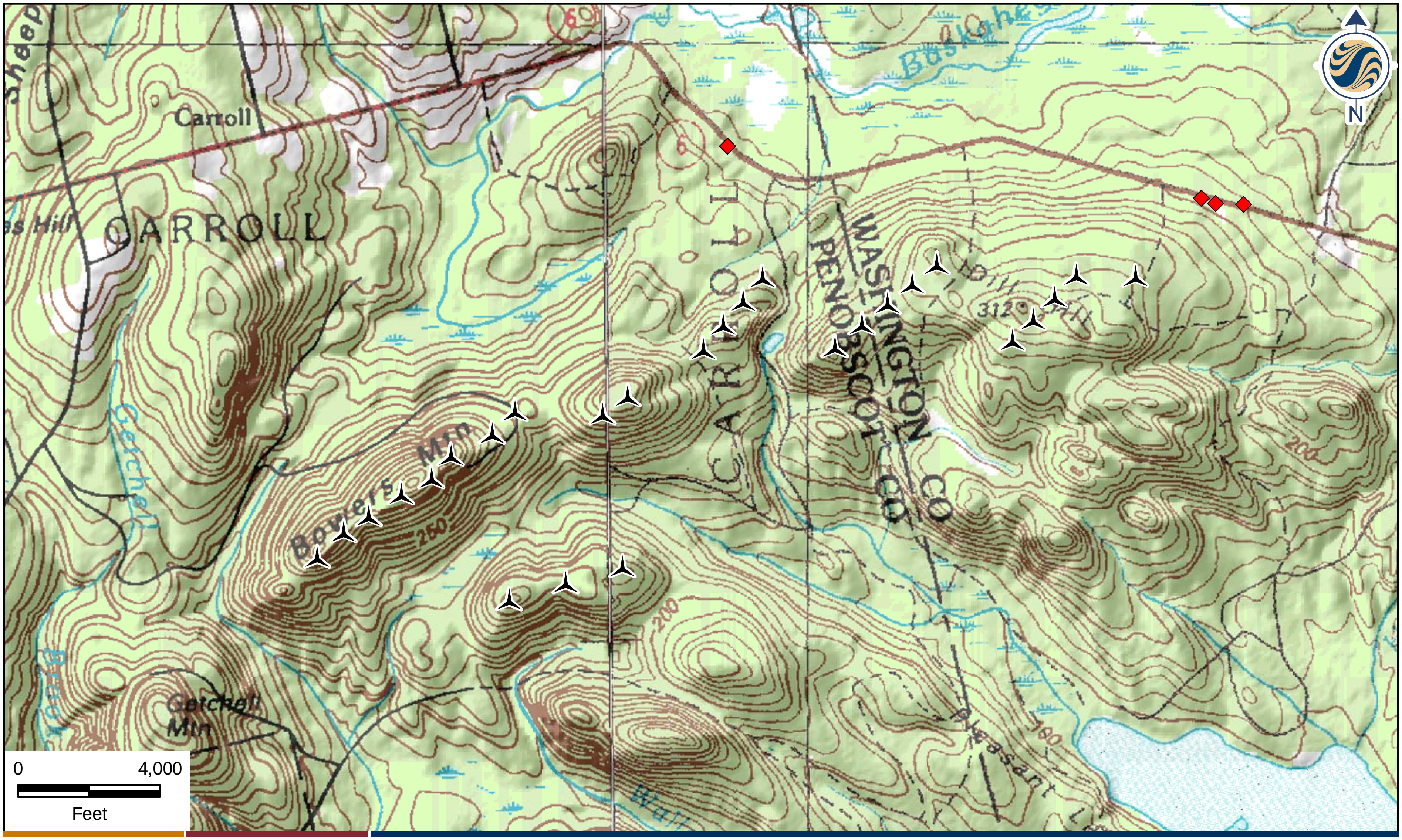
Bowers Mountain Wind Project
Carroll Plt. and Kossuth TWP, Maine

Figure No.
1

Title

Site Location Map

January 10, 2011



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00522-F01-YearRound.mxd

Legend
- Year-round Residence
- Turbine Layout

Client/Project
Bowers Wind Project
Carroll Plt, Maine

Figure No.
1

Title
Year-round Residences
6/8/2011

Memo

To:	Joy Prescott	From:	John Walker
File:	195600522	Date:	May 2, 2011
Reference:	Bowers Modelling Scenario 042911		

As requested by Warren Brown in his email of April 21, 2011, we have provided an additional modeling scenario. This document describes the modeling parameters and provides a revised Table 6.2 and a revised Figure 6.1 as part of Exhibit 16.

Modeling the sound generated from the operation of the wind turbine generators was conducted by first obtaining the manufacturer's sound power level specifications and then including the manufacturer's uncertainty. A ground absorption of 0.0 was assumed. These input parameters are summarized in Table 1 below.

Table 1 – Input parameters used in Modeling Scenario

Input Parameters	Siemens 3.0	Siemens 2.3
Number of Turbines	10	17
Sound Power Level used in Model	108.5	107.06
Maximum Sound Power Level	107.0	106.0
Manufacturer Uncertainty	1.5	1.06
Ground Absorption	0.0	0.0

The predicted sound levels at 500 feet from the receptors resulting from this scenario are shown in Revised Table 6.2. A contour map of predicted sound levels is also attached in Revised Figure 6.1.

Revised Table 6.2 – Receptor Locations Predicted Sound Levels and Criteria

Receptor ID	Distance to Nearest Turbine m (feet)	Modeled Results (dBA)	Sound Level Criteria	
			Day	Night
R1	700 (2297')	44.5	55	45
R2	650 (2133')	45.0	55	45
R3	725 (2379')	41.8	55	45

STANTEC INC.

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Senior Associate
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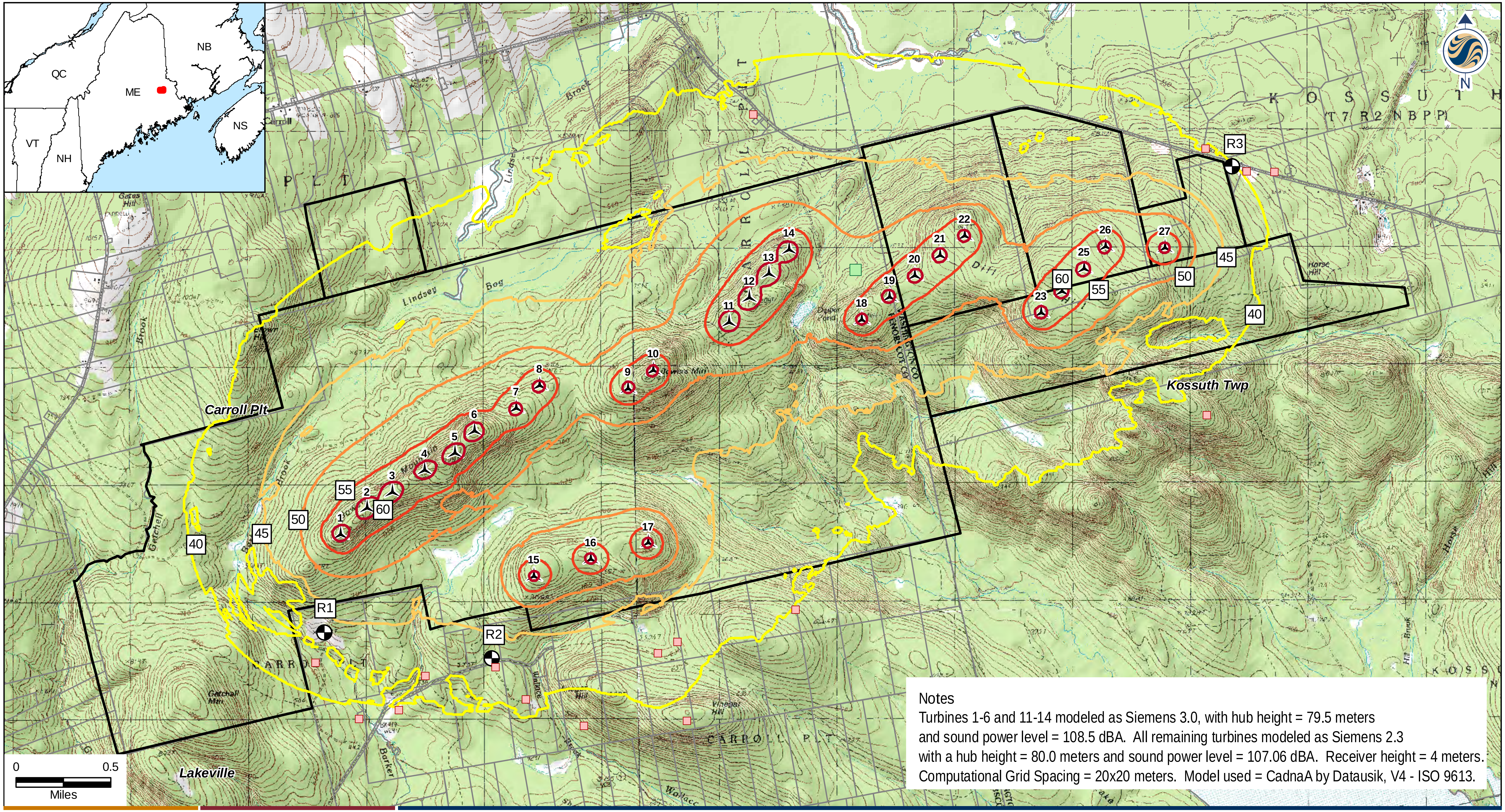
Attachment: Additional Modeling Scenario 042911



Stantec

00522-F6.1-USGS-SoundMap-11x17.mxd

Legend

- **Proposed Turbine Layout (7/25/10)**
- Project Parcels (Participating Landowners)
- Tax Parcels (Approximate)
- Receptor Location
- Protected Location Within 1 Mile
- Camp Owned By Participating Landowner

Sound Contour (dBA)

- 40
- 45
- 50
- 55
- 60

195600522

Client/Project
Bowers Mountain Wind Project
Carroll Plt. & Kossuth TWP, Maine

Figure No.
6.1

Title
Sound Contour Map

January 11, 2011 (revised 4/29/2011)

Bowers Wind Project

Sound Level Assessment - Peer Review

CARROLL PLANTATION AND KOSSUTH TOWNSHIP, MAINE

Warren L. Brown
John L. Adams

6 May 2011

Submitted by:

EnRad Consulting
516 Main Street
Old Town, Maine 04468

Submitted To:

Frederick W Todd, Project Planner
Land Use Regulation Commission
22 State House Station
Augusta, ME 04333

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Executive Summary

Champlain Wind, LLC proposes to construct, operate and maintain a 27 turbine utility scale wind energy facility in Carroll Plantation and Kossuth Township. Turbines will be located on Bowers Mountain, an unnamed ridge to the south in Carroll Plantation and Dill Hill in Kossuth Township.

Multiple turbine models are being evaluated for this project. The applicant submits a combination of greatest impact turbine selections to aid in an impact evaluation at receiver points with the greatest potential to exceed MDEP 375.10 regulations.

Review Basis

At the request of the Land Use Regulation Commission (LURC) a peer review is undertaken to determine if the applicant's noise impact assessment is reasonable and technically correct according to standard engineering practices and the Commission Regulations on Control of Noise (12 MRSA §685-B(4-B)(A)).

This review includes the Sound Level Assessment dated January 2011, correspondence from the applicant or their consultant and associated telephone calls.

1.0 Introduction

Stantec Consulting Ltd. submits a sound level assessment for the proposed Bowers Wind Project (up to 27 turbines) identifying pertinent noise control regulations, land uses in the project vicinity and sound estimates for the project operation. Greatest impact potential sound estimates are based on a combination of Siemens 2.3 and 3.0 wind turbine generators. Three receiver points are selected to demonstrate greatest potential to exceed the Maine DEP sound level limits.

2.0 Sound Terminology

Informational

3.0 Project Overview

3.1 Study Area

A description of the project and site including characteristics of ground cover are detailed.

3.2 Construction

A standard discussion of construction sounds is presented with the stated intention of complying with 06-096 CMR 375.10 nighttime noise limits and federal requirements.

3.3 Operation

Mechanisms of wind turbine noise production are discussed. The definition of routine operation sound is appropriate.

4.0 Sound Level Criteria

This project will be subject to the sound level standards described in the Department of Environmental Protection's noise control regulations, 06-096 C.M.R. 375.10. (55 dBA daytime and 45 dBA nighttime).

4.1 Existing Sound Levels

The project is located in a "quiet" area making it subject to the 55 dBA daytime and 45 dBA nighttime limits at protected locations, which may include distances up to 500 feet from the living or sleeping quarters.

5.0 Sound from Wind Turbines

5.1 Meteorology

A general discussion of atmospheric stability and turbulence, as related to wind turbine sound analysis methodology IEC 61 400-11 is briefly outlined.

5.2 Masking

Stantec notes that masking noise from surface winds may often be a factor. However, for modeling purposes masking was not considered since stable atmospheric conditions make wind turbine sounds more noticeable.

5.3 Tonal Sound

Applicant explains tonal sound definition and states "Based on a review of octave band data for these turbines, no tonal sounds are expected.

5.4 Short Duration Repetitive Sound

Stantec expects that no SDRS events (defined by 06-096 C.M.R. 375.10.G.19) will occur. It is the reviewer's opinion that SDRS events will occur, but the frequency of events and associated penalties are unlikely to be a significant factor.

6.0 Predicted Sound Levels

6.1 Model Description

Computer modeling for the project was done with Cadna software employing ISO 9613-2 algorithms. Protected location predicted sound levels were evaluated at a height of 4m.

6.1.1 Meteorological Factors

The meteorological conditions assumed in the model are:

Downwind conditions for all receivers from each wind turbine
Temperature = 10° C (50° F)
Relative Humidity = 70 %
Wind Conditions = variable

6.1.2 Terrain and Vegetation

The modeling assumed no intervening vegetation and a ground absorption factor of G = 0.0 was used. At the reviewer's request the ground absorption factor was adjusted to G = 0.0 (formerly G = 0.8) with an adjustment factor of manufacturer's turbine sound power level uncertainty only for evaluation of "worst-case" results.

6.1.3 Summary of Model Assumptions

The following input variables conclude the assumptions used in the project modeling:

- Receiver height of 4 meters
- Source height equal to hub height of turbine
- Additional uncertainty factor added for each turbine using manufacturers specifications.

The modeling uncertainty factor of 3 dBA was removed in deference to the reviewer's recommendation of using a ground absorption factor of G = 0.0.

6.2 Construction

Standard discussion of construction noise. Construction noise must meet 45 dBA nighttime standards at protected locations.

6.3 Operation

Operating sound levels were evaluated for 10 Siemens 3.0 MW turbines at locations 1-6 and 11- 14 and the remaining 17 locations turbines 7-10 and 15-27 to be Siemens 2.3 MW. Stantec evaluated and modeled three receptor points that are most likely to exceed Maine DEP sound level limits.

The reviewer requested the applicant remodel the project assuming an adjusted ground absorption factor (see Section 6.1.2).

7.0 Sound Compliance Assessment Plan

The applicant states that a detailed plan will be in place prior to operation. This plan will be submitted to LURC for approval. The plan will include compliance testing methods including methods for the collection of one-third octave data, fast-response measurement data and audio recordings. Sample calculations of each type of compliance analysis will be provided.

The reviewer will provide sound compliance assessment plan details in the conclusion to this review.

8.0 Summary and Conclusions

Sound levels were predicted for three receptor locations. These receptors represented protected areas of the project most likely to exceed nighttime noise limits for quiet areas. The modeling demonstrated compliance at these locations.

Reviewer required changes to the ground absorption factor and subsequent adjustment factors applied to the predictive model resulted in no significant changes to predicted sound levels or proposed project design.

Conclusion – (Peer Review)

In my opinion the Bowers Wind Project noise assessment is reasonable and technically correct according to standard engineering practices required by LURC under 12 MRSA §685-B(4-B)(A) Regulations on Control of Noise (06-096 CMR 375.10).

Stantec estimated the operational sounds of the project using Cadna A software. Cadna utilizing ISO 9613-2 (1996) is widely used in the international community. Estimated accuracies for greater than 30 m mean source height and 1000 m source to receiver distances are not provided in ISO 9613-2, but numerous authors have presented simple corrections for wind turbine predictive modeling. It is this reviewer's experience and opinion that appropriately corrected ISO 9613-2 algorithms provide reasonable estimates of "worst-case" wind turbine noise that comply with MDEP Chapter 375.10 noise regulations.

The wind project prediction model based on CADNA/A software, based on the following prediction assumptions:

- individual wind turbine spherical wave fronts,
- moderately soft ground cover modeled as G = 0.0,
- atmospheric attenuation based on 10°C, 70% RH,
- no attenuation due to foliage or barriers,

- all wind turbines operating at maximum sound power output,
- incorporation of the manufacturer specified uncertainty levels,
- all turbines operating under moderate downwind conditions simultaneously and
- a receiver height of 4 m.

Incorporation of the manufacturer uncertainty factor and reflective ground modeling result in a reasonable prediction model for "worst-case" stable atmospheric conditions.

I recommend required routine operation noise compliance measurements at a minimum of three protected locations designated in the application noise assessment as "Receptor Locations" R1, R2 and R3 . R1 and R2 are not 500 feet from the residence, but rather in the immediate vicinity of the residences where there are sufficient openings to allow sound level measurements without overwhelming extraneous sounds from tree leaves, etc. S5 would be an adequate proxy for R2, if the open area is less than 50-75 feet in radius.

In the event that R3, adjacent Route 6 has insufficient (50-75' radius) open area to provide a suitable site for compliance measurements, a potential proxy location would exist on the Dill Hill Road, should it be improved for project access.

Receptor locations R1-R3 will serve as model confirmation measurement locations rather than actual compliance confirmation (45 dBA nighttime). R1-R2 locations represent the 2.3 and 3.0 Siemens turbines from a southwesterly direction. R3 location represents the 2.3 Siemens turbine from the North East direction. Please note - measurement location recommendations are subject to landowner agreement. Other perimeter protected locations are at greater distances and lower predicted project sound levels.

S-1 would be well-suited for meteorological measurements representing the R1-R2 locations..

Compliance should be demonstrated, based on following outlined conditions for 12, 10-minute measurement intervals per monitoring location meeting 06-096 CMR 375.10 requirements. All data submittals must be accompanied by concurrent time stamped audio recordings.

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

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

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

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

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

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

g. All acoustic, meteorological and audio raw data files should be available for Department review upon request.