Appendix V. SOUND ASSESSMENT

(APPENDICES IN THE SOUND ASSESSMENT HAVE BEEN REMOVED AS APPENDIX A – WINDPRO DECIBEL CALCULATIONS IS 404 PAGES; APPENDIX B PROVIDES CONFIDENTIAL TURBINE MANUFACTURER DATA DEEMED "CONFIDENTIAL")

Hampton Mountain Wind Farm

Environmental Noise Impact Report

Prepared by: *M.K. Ince and Associates Ltd.*

October 15, 2010

M.K. INCE AND ASSOCIATES LTD.
Renewable Energy & Environmental Consulting

www.mkince.ca 11 Cross Street, Dundas, Ontario, L9H 2R3 Tel (905) 628-0077

October 15, 2010

Hugh J. Campbell, P.Eng.
Sprott Power Corp
Royal Bank Plaza, South Tower
Suite 2750, 200 Bay Street
P. O. Box 90
Toronto, Ontario M5J 2J2
hcampbell@sprottpower.com

Attention: **Mr. Hugh Campbell**
Reference: **Hampton Mountain Wind Farm, Environmental Noise Impact Report**

Dear Mr. Campbell,

We are pleased to present a copy of the Environmental Noise Impact Report for the Hampton Mountain Wind Farm. This report provides the noise results and conclusions for the turbine layout received by M. K. Ince and Associates Ltd from you on September 22, 2010.

This report contains eight sections that describe the site, the methodology, interpretation of results, and conclusions. Three appendices are included which outline land use data, noise calculations, and turbine specifications. In summary, only one seasonal residence, within 300 metres of Turbine 3, has noise levels exceeding 45 dB(A). It is concluded that for the remaining surrounding residences the Hampton Mountain Wind Farm turbines will meet an anticipated sound level guideline of 45 dB(A) and meet Nova Scotia Environment requirements for Environmental Assessments of Wind Power Projects.

Sincerely,

M. K. INCE AND ASSOCIATES LTD.

Martin Ince, P. Eng.

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1 INTRODUCTION

M. K. Ince and Associates Ltd. (MKI) was retained by Sprott Power Corp. to prepare an Environmental Noise Impact Assessment for the proposed 25.2 MW Hampton Mountain Wind Farm (the Project) near the Community of Bridgetown, Nova Scotia. This report has been prepared to assess noise levels at nearby residences.

This report:

a) Outlines all points of reception (residences) within approximately 2 km of the nearest wind turbine. Some receptors outside 2 km have also been included in the analysis.

b) Discusses present noise levels experienced at all points of reception.

c) Summarizes background information on noise calculation method and parameters.

d) Provides a summary table of the level of noise at all points of reception at a range of wind speeds, as predicted by the methods outlined in ISO 9613-2 ("Acoustics - Attenuation of sound during propagation outdoors").

e) Provides a map of the project area with the turbine layout, noise receptors, and noise contour lines for a wind speed of 6 m/s at 10 m height.

2 GENERAL DESCRIPTION OF PROJECT SITE AND SURROUNDINGS

2.1 Project Location

The Hampton Mountain Wind Farm is located in a forested area north of Bridgetown, Nova Scotia. The project area is bounded by Hampton Mountain Rd to the West, Arlington Rd to the North, Rumsey Lake to the East, and the valley to the south. The project is comprised of twelve Suzlon S95 turbines. The turbines are three bladed horizontal axis wind turbines that will be installed on 79 m tall towers. **Figure 1** (below) illustrates the project location, location of proposed turbines, and the location of all points of reception surrounding the project. **Figure 2** shows a close-up of the project area with selected receptors. Receptor coordinates can be found in **Appendix A**. Turbine coordinates can be found in **Table 1**.

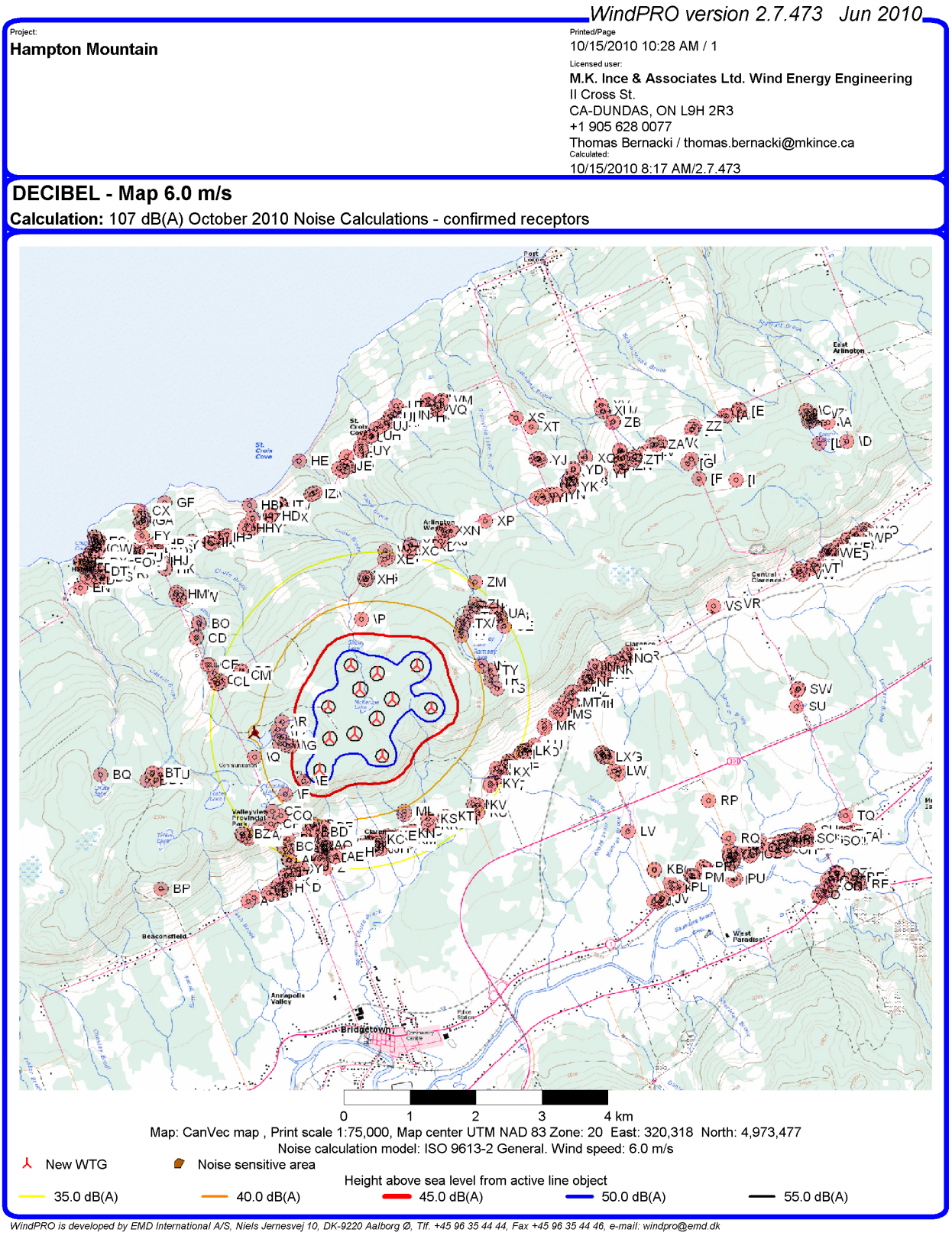

Figure 1: Site Plan with Turbines, Points of Reception, and Noise Isolines (worst case scenario)

2.2 Topography

The Hampton Mountain Wind Farm is located on the top of a mountain. Ground elevation near the turbines is between 230 and 250 m above sea level. The valley to the south of the project is near sea level. The vast majority of the land in the project area is forested.

The calculation method, ISO 9613-2, does not take any echo or attenuation effects due to cliffs into account. However, the fact that the cliff is facing away from the turbines means that there is unlikely to be any noise amplification due to topography.

3 DESCRIPTION OF RECEPTORS

3.1 Hampton Mountain Wind Farm Noise Receptors

This report includes all points of reception (PORs), also referred to as receptors, provided by Sprott Power Corp. near the project area. The accuracy and completeness of this list has not been verified by M. K. Ince and Associates Ltd.

All receptors were modeled as points at 4.5 m above grade, approximating an open second story window. Points lower to the ground generally experience more noise attenuation due to ground effects. A second story window is likely to be more impacted by wind turbine noise than other locations on the building.

Figure 1 illustrates the receptor locations in relation to the turbine layout for the project. **Figure 2** shows a close-up of the immediate area around the project with the receptors receiving the highest noise levels.

3.1.1 Existing Noise Levels

The area surrounding the Hampton Mountain Wind Farm is quiet and rural in nature. General activities in the area include farming in the valley and recreational activities on the mountain. The soundscape is likely generally quiet, with occasional road noise. No background noise monitoring has been performed. Background noise levels are likely between 25 and 35 dB(A). Light automobile traffic on nearby roads has the potential to raise background noise levels to 50 dB(A), measured at a distance of 30 metres.

3.1.2 Receptor and Calculation Assumptions

Noise levels at potential receptors are predicted with the ISO 9613-2 calculation method "*Acoustics – Attenuation of sound during propagation outdoors.*" This method accounts for site geometry, atmospheric conditions, and terrain type. The calculations used several assumptions:

- No acoustic shielding or damping specifically from vegetation or buildings etc.
- Atmospheric conditions resulting in the least impeded noise propagation
- No meteorological correction factor
- Surrounding terrain is consistent with a ground factor of 0.7

- Receptor is 4.5 m off the ground
- Receptor is at the centre of the residence
- Maximum sound power level of the turbine used for all wind speeds

The complex terrain and at the Hampton Mountain Wind Farm could result in high wind shear. Generally, background noise increases with wind speed, due to the noise of the wind passing through trees and other obstacles. This means that the higher noise levels caused by a wind turbine at higher wind speeds can be masked by increasing background noise. In the case of the Hampton Mountain Wind Farm, high wind speeds can be experienced at turbine hub height while wind speeds near residences could be very low.

In order to take the wind shear into account in a conservative manner, the maximum sound power level guaranteed by the turbine manufacturer (107.0 dB(A)) was used in the calculations. Therefore the map including noise contour lines for a wind speed of 6 m/s is the same as the maps for 7 m/s and 8 m/s.

The coordinates for all receptors used in the calculation are included in **Appendix A**.

A detailed discussion of wind turbine noise emissions can be found in **Section 5** of this document.

4 DESCRIPTION OF SOURCES

4.1 Wind Turbine and Transformer Description

The Suzlon S95 turbine proposed for use in the Hampton Mountain Wind Farm is a horizontal axis turbine with a three bladed upwind rotor 95 metres in diameter. The Hampton Mountain Wind Farm turbines will be mounted at a hub height of 79 metres.

Each turbine will be equipped with a transformer at the base. The noise emitted by these transformers is typically negligible next to the turbines and has not been included in this assessment. Additionally, the low height above ground of the transformers is not conducive to significant noise propagation over long distances to receptors.

A transformer substation will house a single 25 to 30 MVA transformer to step the voltage up to 69 kV for integration with the power grid. The transformer substation was modeled as a point source 2 m above the ground.

Appendix B provides the general specifications for the Suzlon S95, including modeled sound power levels. The modeled sound power levels are approximately 2 dB(A) higher than the maximum sound power level guaranteed by the manufacturer.

4.2 Wind Farm Layout

The Hampton Mountain Wind Farm includes twelve (12) Suzlon S95 wind turbines. Turbine coordinates are included in **Table 1**, below. A map illustrating the project layout is shown in **Figure 1**. A close-up map showing the area immediately around the turbines is shown in **Figure 2**.

Table 1: Wind Turbine Locations

Identifier	Equipment Make and Model	UTM Coordinates Zone 20 NAD83	
		Easting (X)	Northing (Y)
Turbine 1	Suzlon S95, 79 m hub height	318115	4972390
Turbine 2	Suzlon S95, 79 m hub height	318440	4973520
Turbine 3	Suzlon S95, 79 m hub height	317970	4971915
Turbine 4	Suzlon S95, 79 m hub height	319450	4973514
Turbine 6	Suzlon S95, 79 m hub height	319070	4973000
Turbine 7	Suzlon S95, 79 m hub height	318582	4973146
Turbine 9	Suzlon S95, 79 m hub height	319664	4972863
Turbine 10	Suzlon S95, 79 m hub height	318096	4972880
Turbine 11	Suzlon S95, 79 m hub height	318839	4972692
Turbine 12	Suzlon S95, 79 m hub height	318500	4972460
Turbine 13	Suzlon S95, 79 m hub height	318920	4972125
Turbine 14	Suzlon S95, 79 m hub height	318845	4973400

Table 2: Transformer Station Location

Identifier	UTM Coordinates Zone 20 NAD 83	
	Easting (X)	Northing (Y)
Transformer Station	316976	4972481

5 WIND TURBINE AND TRANSFORMER NOISE EMISSION RATING

Modeled noise emission data for the Suzlon S95 was provided by Suzlon. No measured noise levels are presently available. The maximum sound power level modeled by Suzlon was 109 dB(A). The report available from Suzlon indicates that the modeled sound power levels are likely 2 dB(A) higher than actual levels. Suzlon has indicated that a sound power level of 107 dB(A) will be guaranteed for the S95 turbines. This sound power level has been used in the simulations for this report. **Appendix B** contains the modeling report provided by Suzlon.

The transformer substation will house a single 25-30 MVA transformer. This transformer will step up the voltage from the turbines to 69 kV for integration with the power grid. The transformer substation has been included in the noise modeling as a noise source.

5.1 Tonality

Tonality refers to higher levels of noise emitted from a narrow band of frequencies. Most modern turbines do not have a tonal quality to their noise emission that is significant enough to require a noise penalty. The turbine manufacturer has confirmed that the Suzlon S95 does not produce tonal noise.

5.2 Impulsivity

Impulsivity refers to short bursts of noise, such as those created by hammering. Impulsive noise is generally not associated with modern wind turbines or transformers. This report assumes that the Suzlon S95 does not produce impulsive noise.

5.3 Transformer Noise

Transformers will be installed at the base of each turbine. The noise emitted by these transformers is typically negligible next to the turbines and has not been included in this assessment. Additionally, the low height above ground of the transformers is not conducive to significant noise propagation over long distances to receptors.

The transformer substation of the wind farm will house a single 25-30 MVA transformer which will step up the voltage coming from each turbine to 69 kV for integration with the power grid.

No measured noise data was available for the transformer at this time. The National Standard of Canada CAN/CSA-C88-M90 indicates that average audible sound levels for transformers of this size will range from 72 to 78 dB(A). For the purposes of noise modeling, the transformer was assumed to emit a sound power level of 80 dB(A).

Transformers generally produce tonal noise, which is generally more audible to the human ear than non-tonal noise. A 5 dB(A) tonal penalty was applied to the 80 dB(A) transformer sound power level to take this into account.

Transformers do not typically produce impulsive noise. This report assumes that the transformer chosen for the Hampton Mountain Wind Farm will not produce impulsive noise.

5.4 Construction Noise

Heavy construction equipment will be required during the construction of the Hampton Mountain Wind Farm. Types of construction equipment and potential noise emissions for each type are provided in **Table 3** below.

Table 3: Typical Construction Equipment Noise

Equipment Type	Typical Noise Levels at 50 Feet (dBA)
Air Compressor	81
Backhoe	85
Concrete Pump	82
Concrete Vibrator	76
Concrete Breaker	82
Dozer	80
Generator	78
Load	79
Paver	88
Water Pump	76
Trucks	88
Pile Drivers	101

(Source: Bolt, Beranek and Newman, 1971)

Not all equipment listed in **Table 3** will be used at the Hampton Mountain Wind Farm. For a complete list of equipment expected on location, and proposed mitigation, please refer to the EA submission document.

6 IMPACT ASSESSMENT

6.1 Calculated Noise Levels

Calculated noise levels for each receptor are listed in **Appendix A**. **Figure 1** shows noise isolines along with all receptors and turbines. **Figure 2** shows a close-up of the area immediately around the turbines, showing noise isolines and only the receptors with a sound power level of greater than 40 dB(A). These maps show the worst case noise levels calculated using the maximum guaranteed sound power level from the Suzlon S95. **Table 4** details the locations and descriptions of the receptors with a modeled sound power level greater than 40 dB(A).

Table 4: Locations, descriptions and sound power levels of receptors >40 dB(A)

	UTM NAD83 Zone 20				
Label	Easting (X)	Northing (Y)	Height (m)	Sound power level dB(A)	Description
\E	317,728	4,971,749	240	47.1	Seasonal cottage
\G	317,540	4,972,276	230	44.7	Seasonally rented cottage

\H	317,492	4,972,280	230	44.1	Seasonally rented cottage
\I	317,436	4,972,298	230	43.5	Seasonally rented cottage
\K	317,397	4,972,406	230	43.1	Seasonally rented cottage
\R	317,403	4,972,646	230	43	Permanent residence
\J	317,368	4,972,310	230	42.8	Laundry facility
\L	317,351	4,972,426	230	42.6	Seasonally rented cottage
\P	318,602	4,974,208	204.5	42.5	Permanent residence
CS	317,332	4,972,533	230	42.4	Former building site
\F	317,446	4,971,543	236.3	41.2	Municipal water structure
\O	320,121	4,973,965	230	40	Construction site

All noise levels at were calculated using conservative parameters. Receptors were modeled as points located 4.5 m above the center of the structures. See **Section 3** for details.

Under worst-case conditions, noise modeling predicts that twelve noise receptors will experience noise levels at or above 40 dB(A). One of these is predicted to experience noise levels above 45 dB(A). The highest predicted noise level at a receptor is 47.1 dB(A). This was found to occur at receptor "\E", a seasonal cottage southwest of Turbine 3.

The noise levels modeled at receptors are cumulative. The model assumes nearly-ideal noise propagation from all turbines and the transformer concurrently to produce a worst-case analysis. Actual experienced noise levels are likely to be lower than modeled levels, since ideal noise propagation will not likely be experienced concurrently from all noise receptors. In particular, receptor "\E", lying to the southwest of the nearest turbine, will ordinarily experience sound power levels lower than the modeled figures due to the predominant northwest winds carrying the sound away from the receptor most of the time. The ideal noise propagation conditions assumed by the model will exist relatively infrequently.

The Hampton Mountain Wind Farm was simulated on its own, as no other wind farms are known to exist or are proposed for the general area.

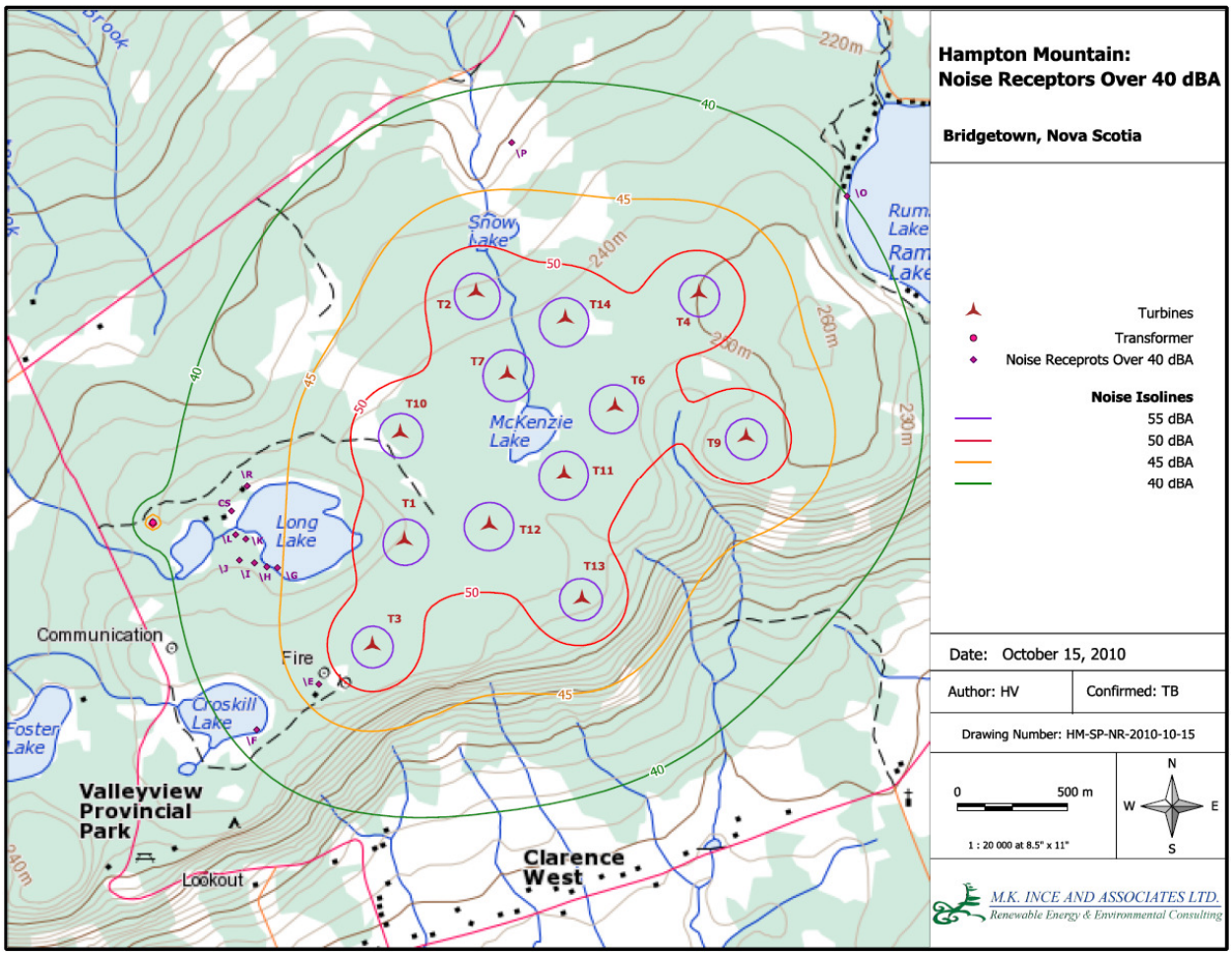

Figure 2: Closeup map showing noise iso-lines and receptors over 40 dB(A)

7 CONCLUSIONS AND RECOMMENDATIONS

When modeled according to the ISO 9613-2 method "*Acoustics – attenuation of sound during propagation outdoors*," most receptors will experience noise levels below 40 dB(A). Eleven receptors will experience noise levels between 40 dB(A) and 45 dB(A). Only one (1) receptor, a seasonal residence, is predicted to experience noise levels above 45 dB(A).

The following conclusions and conditions are also listed:

- Tonality penalties do not apply to the turbine noise emission levels.
- The transformer substation was assumed to generate a noise level of 80 dB(A), in accordance with CAN-CSA-C88-M90.
- A 5 dB(A) tonality penalty has been applied to the transformer substation.
- A modeled turbine sound power level of 107 dB(A) was used.
- Surrounding terrain is consistent with a ground factor of 0.7.

- Conservative atmospheric conditions for least impeded noise propagation were used for the calculations.
- No acoustic shielding or damping specifically from vegetation or buildings etc. is used.
- Receptors were modeled as points 4.5 m above ground level at the centre of the residences.

Conservative assumptions have been selected for the turbine noise emission level, POR height, and atmospheric conditions. In addition, the presence of crops, foliage, and other sound impeding obstacles were not modeled. Therefore the results of the calculations performed for this report are considered to be conservative.

8 QUALIFICATIONS AND LIMITATIONS

M. K. Ince & Associates Ltd. has prepared this report in accordance with its proposal and information provided by its Client. A guaranteed maximum turbine sound power level of 107 dB(A) is assumed based on information supplied by the Client. Turbine and receptor locations were supplied by the Client and have been used without alteration or independent confirmation. References to forthcoming sound power level guidelines are based on information received from the Client. M. K. Ince & Associates Ltd. assumes no liability for the accuracy of the information provided by the Client. The information and analysis contained herein is for the sole benefit of the Client and may not be relied upon by any other person.

The contents of this report are based upon our understanding of guidelines and regulations which we believe to be current at this time. Changes in guidelines, regulations, and enforcement policies can occur at any time, and such changes could affect the conclusions and recommendations of this report.

While we have referred to and made use of reports and specifications prepared by others, we assume no liability for the accuracy of the information contained within those reports and specifications.

October 18, 2010

To Whom It May Concern:

Re: Sprott Power Corp
Hampton Mountain Wind Power Project
Sound Levels at the Cottage
West of DNR Fire Tower
PID: 05170865

I, the undersigned, hereby acknowledge and understand that the current Health Canada recommendations for sound levels resulting from a windfarm project as measured at a private residence are 45 decibels (dBA). I also acknowledge that I have been informed by Sprott, and understand, that the sound levels as a result of the Hampton Mountain Wind Power Project (the "Project") at our camp located on PID 05170865 (the "Camp") are expected to be approximately 47 dBA. In signing this letter, I understand that I am agreeing to release Sprott Power Corp. from adhering to Health Canada's recommended sound levels of 45 dBA (decibels) as they pertain to our Camp. I further understand and acknowledge the purpose of this release is to assist with the environmental regulatory approval process in relation to the Project.

Owner Witness:

Print Name: THURSTON MARSHALL	Print Name: ART MARSHALL
Signature: Thurston Marshall	Signature: A Marshall
Date: OCT 26, 2010	Date: OCT 26, 2010

Appendix VI. ADVERTISEMENTS, POWER POINT PRESENTATIONS, & NEWSLETTERS USED IN PUBLIC CONSULTATION

Church Grove honoured as registered heritage building

At first sight, the little white building in the Church Grove Cemetery may not seem very significant. The small rectangular edifice stands close to the Stronach Mountain Road, its dark framed windows looking out at the graves that surround it. The church may be small in stature, however, it boasts a history as rich as its larger counterparts. It once held one of the few Covenanter congregations in Canada.

On Sunday, August 15th, 2010 following the Annual Memorial Service, a plaque unveiling ceremony recognizing the Church Grove Cemetery Church as a municipally registered heritage building was held with approximately 70 people in attendance. Before the bronze plaque was unveiled, Marilyn Wilkins, Annapolis County Heritage Advisory Committee Chair, presented a watercolour and certificate to Mr. Robert Beck, Chair of the Church Grove Cemetery Church Society.

The wording on the certificate read: The historical significance of the Church Grove Cemetery Church, circa 1855, located in the community of Melvern Square, can be found in the fact that it was built by the Covenanters as a Covenanter Church. The Church Gove Cemetery Church building is a relatively unadorned single story building constructed on a granite field-stone foundation in the Gothic Revival Architectural Style. Hallmark of this style is the emphasis on the vertical line in the building form as shown with the sharply pitched roof, front gable entranceway and pointed arch windows. One of the distinctive flairs is the use of the decorative curvilinear tracery of the front and side pointed arch windows. The idyllic location being surrounded by mature trees and well-kept cemetery grounds adds wonderfully to the visual appeal of the Church Grove Cemetery Church.

The Church Grove Cemetery Church is a Municipal Heritage Property registered by the Municipality of the County of Annapolis.

Official Registered April 20, 2010

The Church has not changed in the past 150 years, with the exception of plastic rain gutters that were installed in recent years to protect the aging structure from the elements. As a municipally registered property, the Church cannot undergo substantial changes without consulting the Municipality. This provides protection so that the building will be preserved for future generations to enjoy and appreciate.

– Submitted

On Sunday, Aug. 15, Church Grove Cemetery Church on Stronach Mountain Road hosted a plaque unveiling ceremony designating the building as a municipally registered heritage building. The ceremony followed Church Grove Cemetery's Annual Memorial Services. Annapolis County councilor Marilyn Wilkens presented a certificate to Mr. Robert Beck, chairman of the Church Society. Submitted

Time again to pass the puck

Another summer is just about over which means that it's time to gear up for another hockey season in Western Valley. Western Valley Minor Hockey has many officials located in communities from Berwick through to Digby. However, there is a strong need for young officials (14+ yrs old). Hockey Nova Scotia has just announced its official clinic dates for this upcoming season.

In Kingston/Greenwood there is a clinic being held on the October 23 at the Greenwood Recreation Center at 9 a.m., as well on the October 2, at 9 a.m. at Acadia University. If you require more information (other dates and locations) check out the Western Valley Minor Hockey website www.westernvalleyminorhockey.ca. or the Hockey Nova Scotia web-site at www.hockeynovascotia.ca.

If you are interested in officiating hockey in the Valley or have any questions please contact Mark Gordon through e-mail at: markgordon@eastlink.

Musical trio hit high note for Sister Fair

By Heather Killen
SPECTATOR
NovaNewsNow.com

Susan Crowe is bringing her friends Raylene Rankin and Cindy Church home to sing with her.

Carole Hill-Bojarski, event coordinator for Sister Fair 2010, says this year's show promises to be a special celebration featuring an evening of art and music at King's Theatre on October 22. This year's event includes a concert and a silent auction.

"We are all so excited to have Raylene Rankin, Cindy Church, and Susan Crowe performing this year," she said. This trio offers a sophisticated mix of folk, country, and jazz with richly textured harmonies and a warm rapport.

Susan Crowe, right, and Cindy Church (seen here performing at King's Theatre) will add Raylene Rankin to their act on October 22 at King's Theatre as they perform as part of Sister Fair. To reserve tickets visit www.kingstheatre.ca or phone 532-7704. File photo

In addition to this musical lineup, the Annapolis Royal Community Artists Council has invited artists from across the province to submit a special piece of work themed around "Celebrating Women in Music and Art" for this event.

Already six artists have signed on according to Hill-Bojarski and the invitation only went out a few weeks ago. Artwork will be submitted to the Annapolis Region Community Arts Council between September 24 and October 8. It will be on display at King's Theatre Gallery from October 12 through October 22 and will be sold by silent auction on the night of the concert.

The Women's Place Resource Centre hosts Sister Fair in co-operation with several community groups including the King's Theatre in Annapolis Royal, the Annapolis Region Community Arts Council, and the municipalities.

This year, a special tribute is being made to honour the life of Frances Mills Clements and her 40 years of community development work. For more information on Sister fest 2010, visit the Women's Place Resource Centre at www.womensplaceresourcecenter.com. To reserve tickets visit www.kingstheatre.ca

Keith Ross, friends at King's Theatre

Well-known Valley Fiddler Keith Ross and his Winter Texan Friends Jay & Tammy Roy, plus Valley musicians Dave Lutz and Barry Helpard will present an evening of Country Music at the Kings Theatre on Saturday, Sept.11 at 7 p.m.

Born and raised in Hants Coounty, Ross is celebrating his 58th year as an entertainer. He started playing guitar in a dance band at the Dyke Dancehall in Falmouth in1952, then playing fiddle in a country band in 1956 doing shows and dances. Next came his own band The Novas in the early 1970s and then in the 1980s he started concentrating on fiddle shows, contests, and recordings.

He's performed across Canada, the US, Europe, and Asia and has played on CBC television with the great Graham Townsend, in New York with Chubby Wise, Hank Snow's fiddle player who had also played with Bill Munroe and other stars; in Texas with the legendary Hank Thompson, and has recorded in Nashville with some of the greatest musicians in the world.

Ross has received many awards, trophies, and commendations including the Curtis Hicks Memorial Award for contribution to Fiddling; Tara Lynn Touesnard Memorial Award for contribution to Fiddling; and was inducted into the Nova Scotia Country Music Hall of Fame in 2007. He was recognized and congratulated by the Nova Scotia Legislature, named Fiddle Player of the year by FAME. Organization in the Southern US, and nominated for Western Swing Hall of Fame in Oklahoma this year.

Ross has released 12 audio recordings including a CD sampling tunes/songs from 1952 to 2007, and one video DVD sampling clips from some of the many shows he appeared on from 1983 to 2007.

SUNDAY, SEPTEMBER 19th (continued from previous page)
12 NOON – CHAMBER OF COMMERCE FITNESS CHALLENGE at the Bridgetown Development Centre, Bay Road. Registration starts at 11:30 AM or preregister at the Queen Street Café on Friday night. Teams of 4 people compete. Contact Gary Olsvik for more information 665-3100/665-4428.
3:30 PM – THE VERNON DAKIN FAMILY CAR RALLY starts at B.R.H.S. Cars, drivers and navigators should be on site by 3:30. $10.00 entry fee per car Everyone will know where to start, where to finish, where you can go and where you can't. Barbecue at the finish. Sponsored by D's Chicken

HAMPTON WIND FARM

Newsletter Vol. 1 No. 1 November 12, 2009

Renewable Energy Developers Inc. (ReD) is releasing this Community Newsletter to provide information regarding efforts to restart the development of the Hampton Wind Farm. Any comments or questions should be directed to Jeff Jenner, President of ReD at jjenner@red-inc.ca or 416-819-9925.

Acquisition of Hampton Wind Farm Developments

ReD announced on June 29th, 2009 that it had acquired the Hampton Wind Farm from its prior owners along with eleven other Eastern Canadian wind development project assets. The purchases included all the land agreements, meteorological masts and data accumulated at these sites over the past 3.5 years.

Jeff Jenner stated that, "We are extremely pleased to acquire this portfolio and are excited to re-energize the development efforts within each community. We look forward to meeting with the individual landowners and other interested stakeholders over the next few months."

We understand the community may have been disappointed in past efforts; therefore, we plan to keep individuals fully updated on this new development to prove our devotion and maintain a trusting relationship.

Initial Stakeholder Meeting Early December 2009

I would like to meet various landowners and other interested community members in early December to discuss the project and explain the purpose and background of ReD. I am hoping that you could suggest an appropriate meeting location whether that be a church or community centre.

At the meeting we will introduce some of the ReD team whom will be working on the Hampton Wind Farm. We will discuss information about the project and our company. We will also circulate with the landowners a confirmation of their understanding of the properties optioned for the project. Those landowners who cannot be in attendance will have had their confirmation letters mailed directly to them.

Should the information regarding the optioned property be incorrect please let us know.

Municipal new Request for Proposal

On September 16, 2009 a co-operative representing various Nova Scotia municipalities announced that it is seeking up to 70 Megawatts of renewable energy generation from projects within Nova Scotia through a defined Request for Proposal (RFP) process. The RFP bids are due on December 10, 2009. ReD will be working extremely hard to prepare a bid to submit into the RFP over the next several weeks.

Engineers, environmentalists and wind resource analysts have been hired by ReD to work through the remainder of the fall. These professionals have been on-site and are creating a new project plan that is smaller than the original project and better suited to the land agreements signed.

Please note that there are many difficult tasks to complete in a very short period of time. In order for the Hampton project to be ready by the RFP deadline support from the community is necessary and greatly appreciated.

Should anyone have further questions please call me at 416-819-9925.

Thank you for your support,

Jeff Jenner, President

HAMPTON MOUNTAIN WIND FARM

Newsletter Vol. 2 No. 1 March 15, 2010

Renewable Energy Developers Inc. (ReD) is releasing this Community Newsletter to provide information regarding efforts to restart the development of the Hampton Mountain Wind Farm. Any comments or questions should be directed to Jeff Jenner, President of ReD at jjenner@red-inc.ca or 416-819-9925.

Draft Bylaws Developments in Annapolis County

The County Council recently held public meetings to determine whether Annapolis County should create new bylaws that restrict wind energy development from windy areas of the County. These meetings were held on February 9th and February 23rd. ReD made presentations at each meeting about the risks to the County for such a Bylaw proposal. Other landowners and stakeholders also made presentations and speeches supporting the wind energy project on Hampton Mountain. Unfortunately, the Council voted in favour of proceeding with the draft bylaw. The one councillor to vote against the bylaw was Wayne Fowler.

Public consultation for the draft Bylaw is being held on March 23rd at 10:00 am at the Council Chambers. We plan on attending this meeting to continue to press our case that Bylaws should address proper setbacks in windy areas of the County to foster development.

A Bridgetown community meeting is also being held at the Lions Hall at 7:00 pm on March 22nd. This presentation will cover information that you have already seen at other landowner presentations. I would be greatly appreciative of seeing a friendly landowner face or two at the meeting should you wish to attend.

Building Permits

At our February meeting we discussed the opportunity to obtain Building Permits for twelve turbine locations within the project area. ReD pursued these permits as agent for various landowners. I would like to confirm that 11 Building Permits have been issued and the final permit will be obtained next week. The staff at the land registry office in Lawrencetown did a great job is assisting us on this matter.

Municipal Request for Proposal Update

On September 16, 2009 a co-operative representing various Nova Scotia municipalities announced that it is seeking up to 70 Megawatts of renewable energy generation from projects within Nova Scotia through a defined Request for Proposal (RFP) process. The RFP bids were due on December 10, 2009. ReD submitted a 24 Megawatt bid into the RFP.

The co-operative is meeting March 19th to determine whether they plan on proceeding with negotiations of power purchase contracts. I expect to meet with representatives of the co-operative early next week. I will be able to update you on the outcomes of these meetings shortly.

Project Development Activities Continue

ReD is planning to commence the environmental studies program for the project area in 2010. We are interviewing local and regional environmental consultants to perform bird and bat inventories in the wind farm project area. The studies will be started in May/June of this year and will be completed by the end of October 2010. A wetlands survey will also be performed within the study area. All wetlands or waterways located close to the planned infrastructures of the project will be delineated before the end of the fall.

The above studies and other information are valuable to avoid and/or mitigate the environmental impact of the final placement of wind turbines and access areas. This information will be used should we be successful in the current municipal RFP or other renewable energy opportunities that come about in the near future.

Thank you for your support,

Jeff Jenner, President

HAMPTON MOUNTAIN

Newsletter Vol. 2 No. 2 July 31, 2010

Sprott Power Corp. (SPC) is releasing this Community Newsletter to provide information regarding efforts to restart the development of the Hampton Mountain Wind Farm. Any comments or questions should be directed to Jeff Jenner, President and CEO of SPC at jjenner@sprottpower.com or 416-819-9925.

ReD is Renamed Sprott Power Corp.

Renewable Energy Developers Limited Partnership ("ReD") has been renamed and become Sprott Power Corp. SPC is affiliated with Sprott Inc. which is a TSX listed company under the symbol SII with $5 billion of Assets Under Management. The founder of ReD, Jeff Jenner, and his team, will lead SPC in the development, financing and build out of ReD portfolio as well as partnering with other developers for new projects.

Sprott Power Corp. has the additional mandate of investing with other developers to expand its geographic footprint and increase its development pipeline and operations. These additional project assets may be in operations or have achieved significant development milestones.

"It is projected that approximately $80 billion of Canadian wind projects will require financing in the coming years. I believe there is a tremendous need for an entity such as Sprott Power Corp. that will vet projects and serve as a conduit for shareholders looking to invest in power generation assets for low risk yield and developers seeking capital. With Jeff Jenner, and his experienced management team and track record, I have confidence that projects meeting our investment hurdle will be built on-time and on-budget", said Kevin Bambrough, President, Sprott Inc.

"I'm extremely pleased to lead Sprott Power Corp. and bring the ReD development portfolio as the foundation for the company. I'm looking forward to building out our existing development pipeline as well as partnering with others who have renewable projects that require capital", said Jeff Jenner, President and CEO.

Environmental Permits

We have begun the field work to identify any environmental issues that may impact the Hampton Mountain turbine placements. The field work will be completed over the next year and includes biological and avian studies, waterway determinations, potential noise and visual impacts. The protocols used in the studies have been presented to various environmental agencies to ensure the work is adequate for their assessments. Any potential environmental impact identified will need to be mitigated in order to apply for the necessary Environmental Permits.

Municipal Request for Proposal Update

We met with the various Nova Scotia municipalities on March 19th to determine whether they plan on proceeding with negotiations of power purchase contracts. The municipalities agreed to move forward with drafting of a Memorandum of Understanding (MOU) for the supply of renewable power from the Hampton Mountain project. The MOU has been circulated and the response has been positive. A further meeting with representatives of some the Municipalities was held to address outstanding issues.

We will be in Nova Scotia in the middle of September to make further presentations to local stakeholders. We will call the Hampton landowners and other community groups and be available to present an update to the project at that time.

Thank you for your continuing support,

Jeff Jenner, President

Wind Energy in Annapolis County

February 9, 2010

Agenda

- Summary
- Wind Development in Nova Scotia
- Economic Impact to County of Annapolis
- Project Description
- Draft Bylaw
- Alternatives to Draft
- Questions and comments

Summary

• Wind energy is the cheapest form of renewable energy currently available.

• Nova Scotia wants wind energy within the province and will be promoting development through policies.

• Draft Bylaw will prevent wind development within the Annapolis County boundaries.

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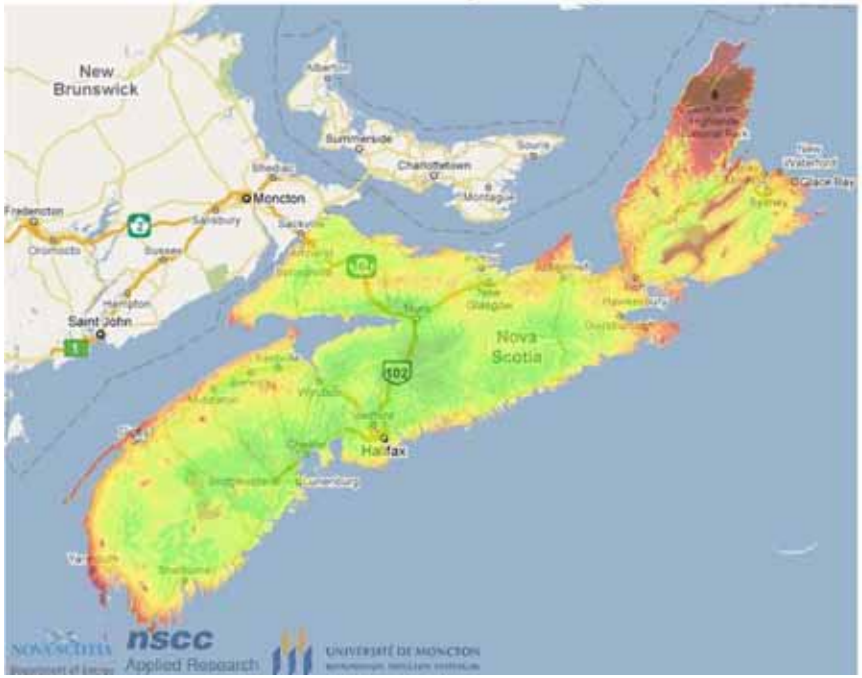
Nova Scotia Wind Map

•Coastal areas are very windy



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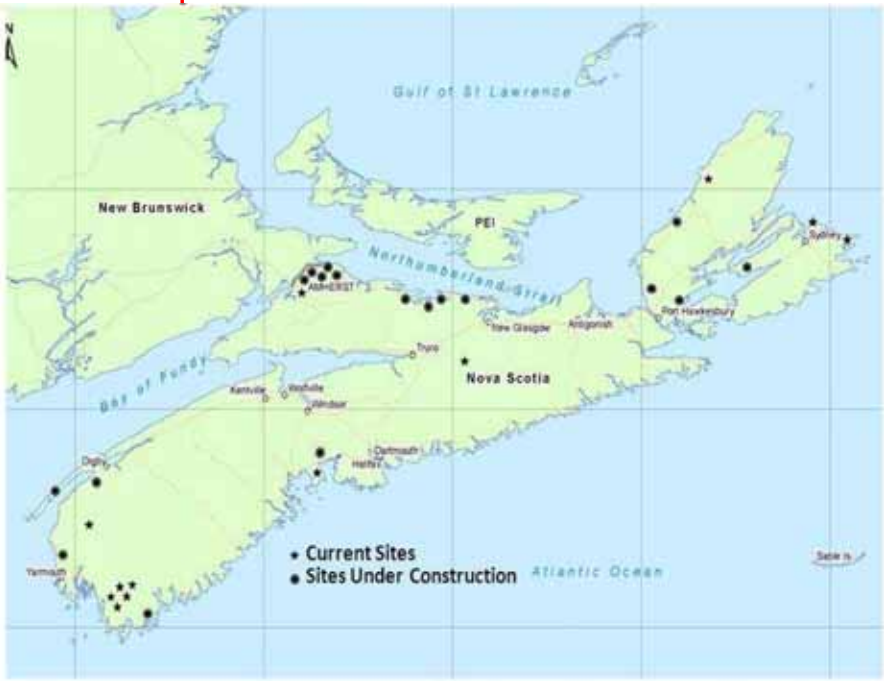

Impact to Local Community of 40 MW Wind Farm

- It represents an investment of approximately $100 million;
- An estimated $20 million of goods and services purchased locally and within the province;
- It would provide more than $220,000 in annual property taxes for County of Annapolis as well as support for local initiatives;
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- Almost 50 person-years of construction labour filled mostly by local trades people and 5 direct full time jobs thereafter;
- Spin-off economic benefits to local businesses, hospitality and tourism.

Description of Hampton Hills Wind Farm

Location

• Arlington Road and Hampton Mountain Road on North Mountain.

• 4 km from Hampton and 5 km from Bridgetown.

• 21 landowners in local community support the development.

Reason for Location

• Wind turbines need to be placed in windy spots to be economically viable (see Nova Scotia map – slide 5);

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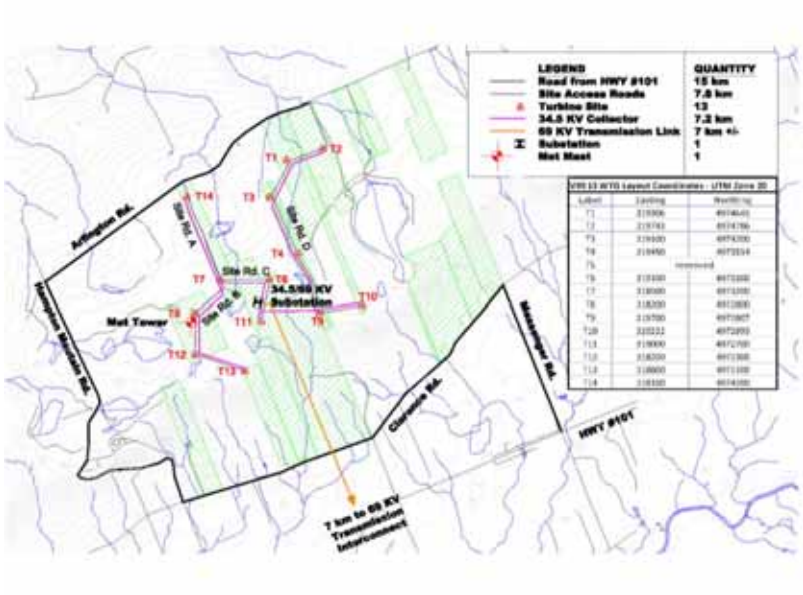

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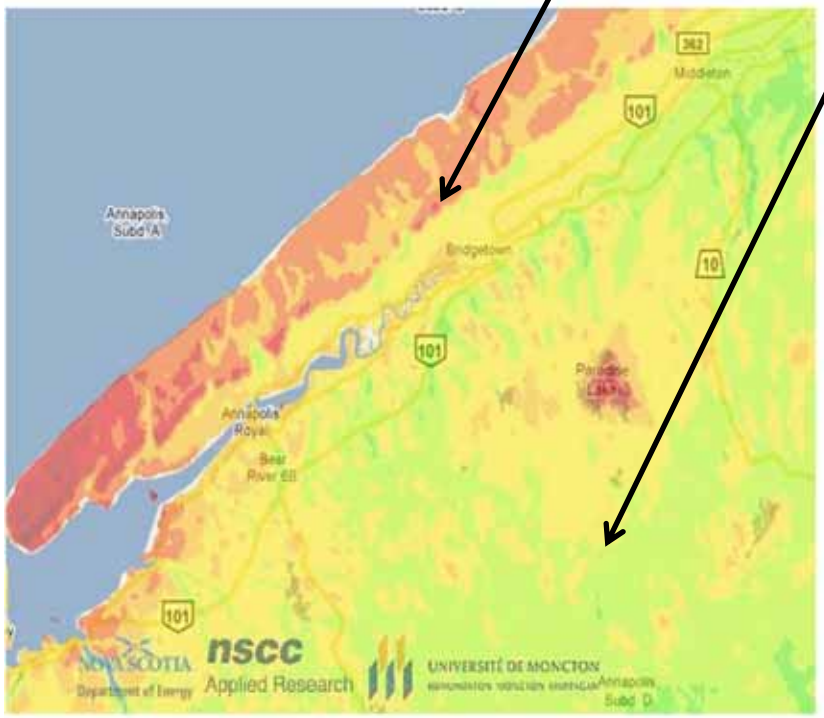

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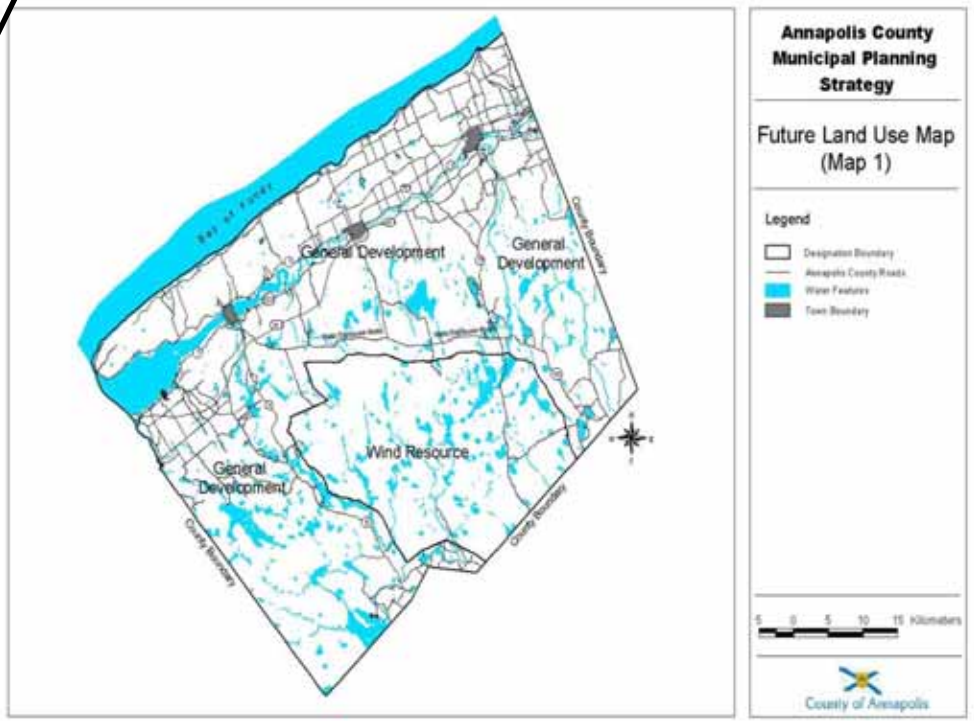

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Near Bridgetown

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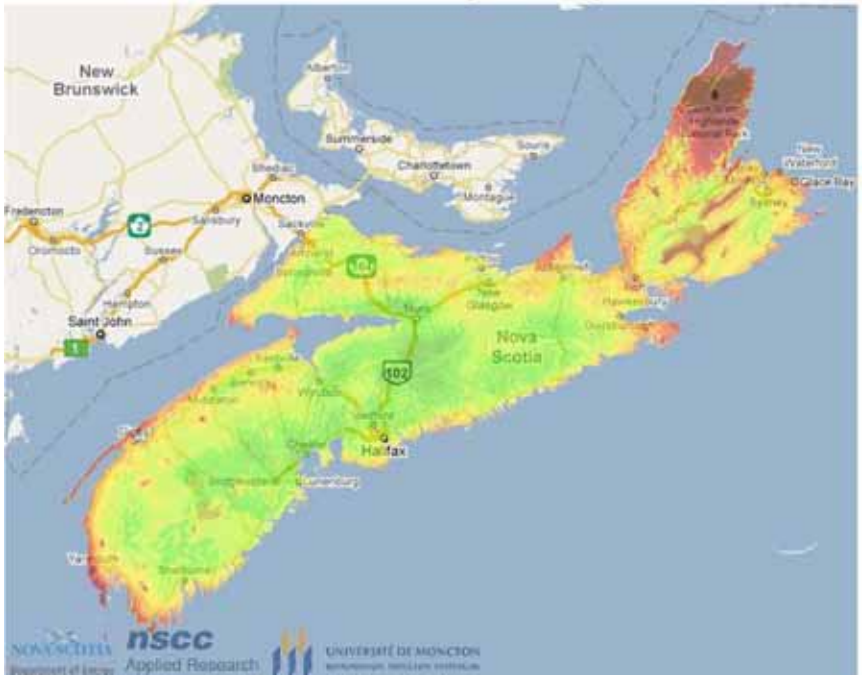

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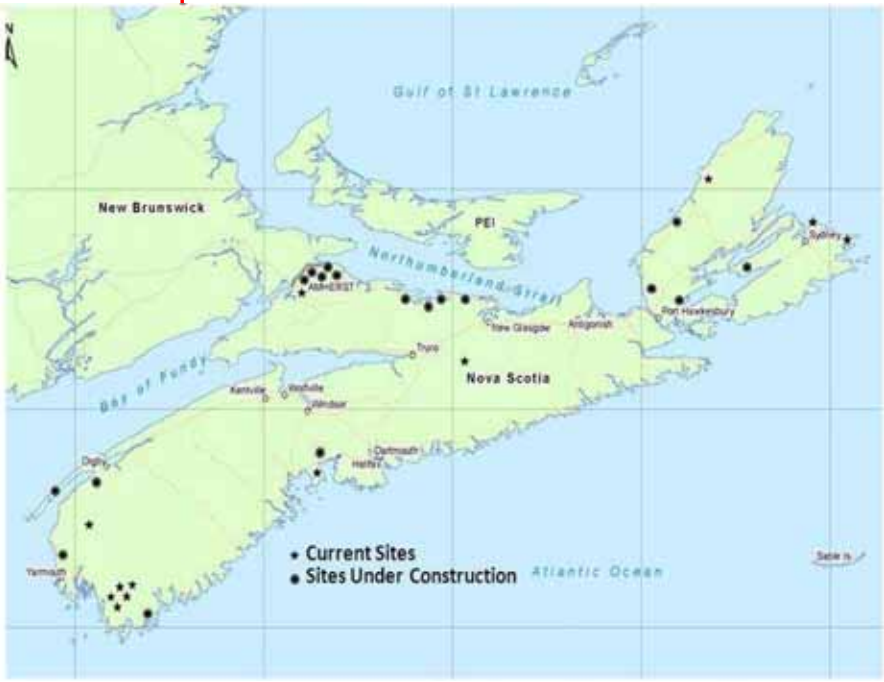

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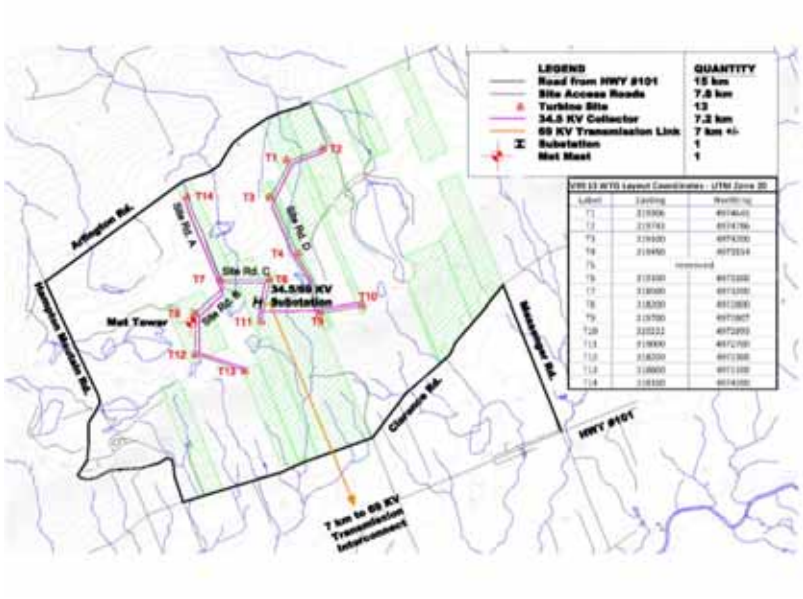

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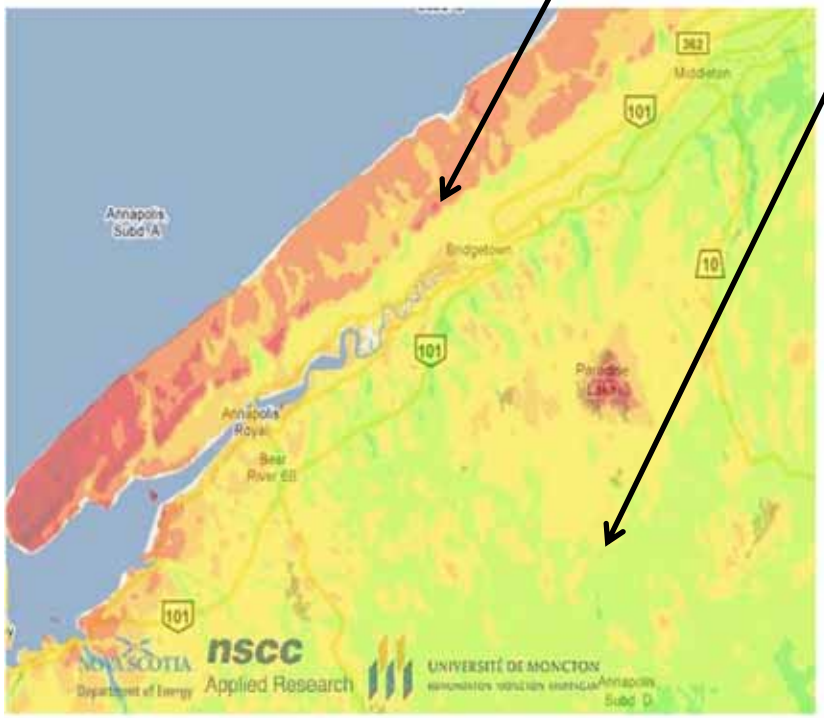

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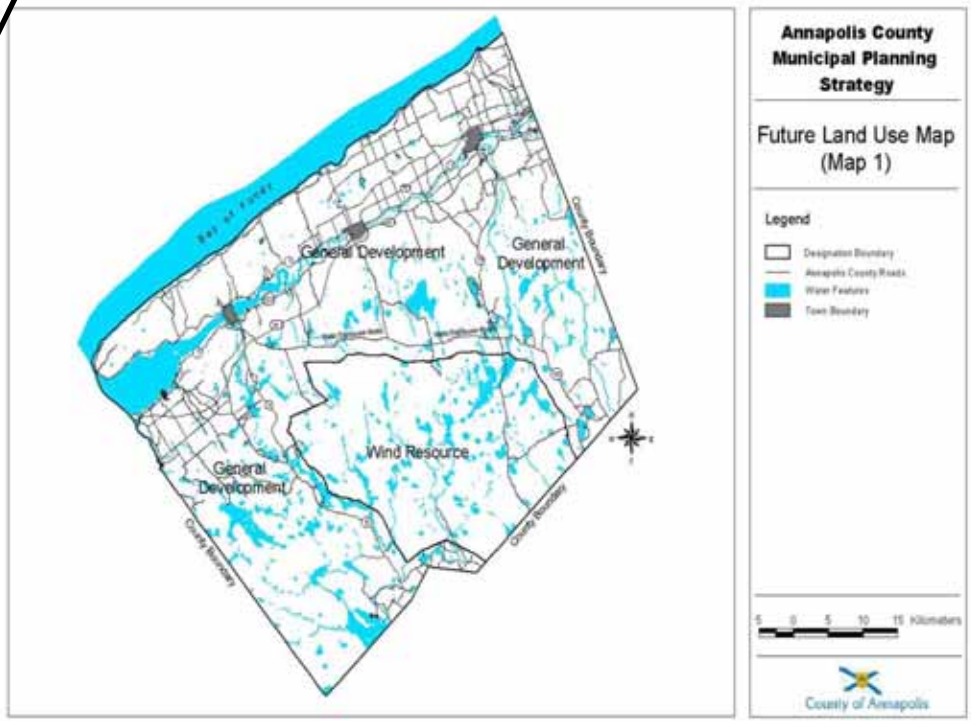

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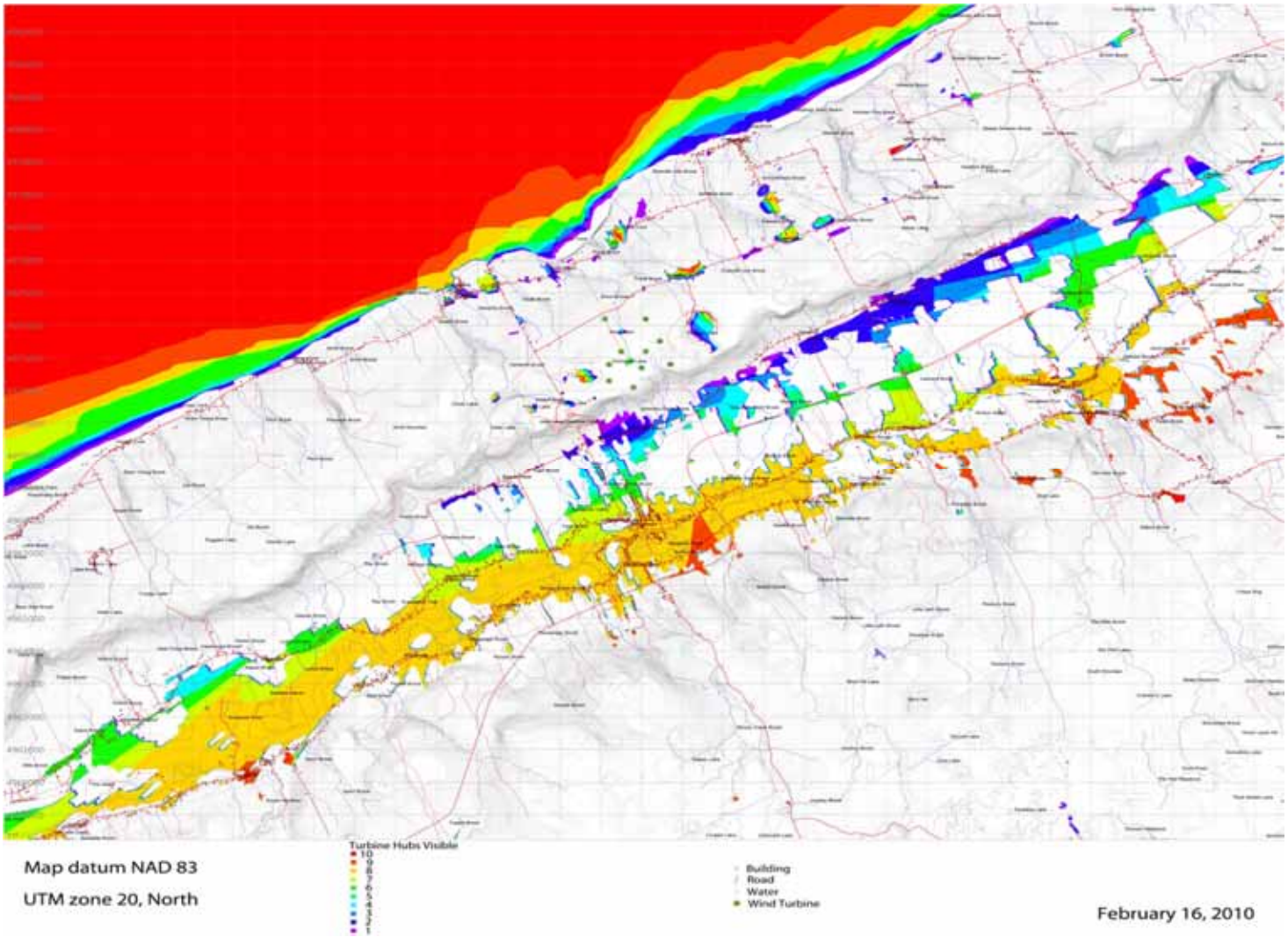

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Maritime Communities Support Wind Energy

- Maritime communities have an abundance of renewable energy

- Maritime electrical energy costs are the highest in Canada

- Communities have embraced wind energy to:
  - Reduce carbon footprint
  - Reduce electrical costs
  - Increase local revenues
  - Create new renewable energy jobs
  - Support other local businesses
  - Support local landowners

Wind versus Coal

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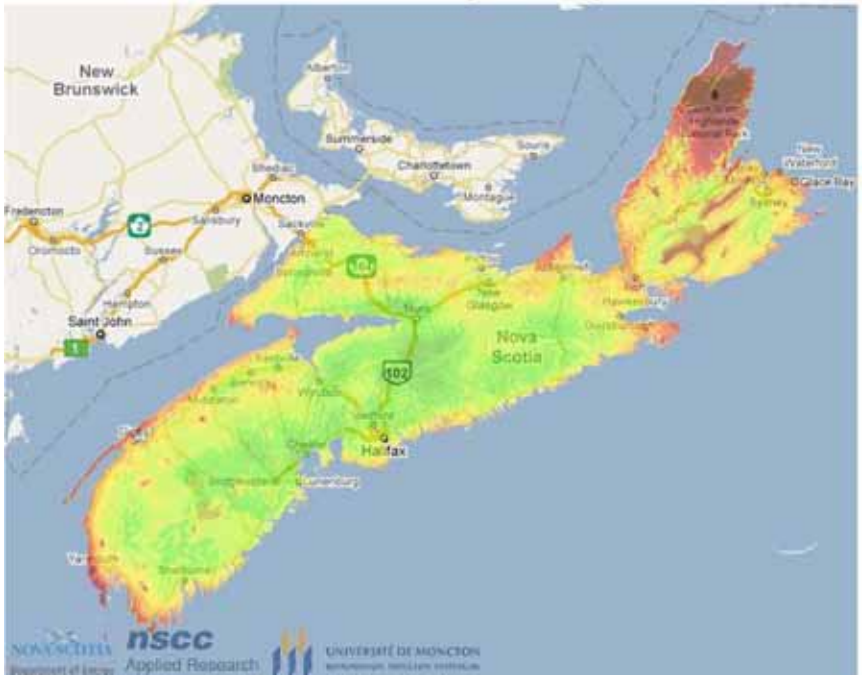

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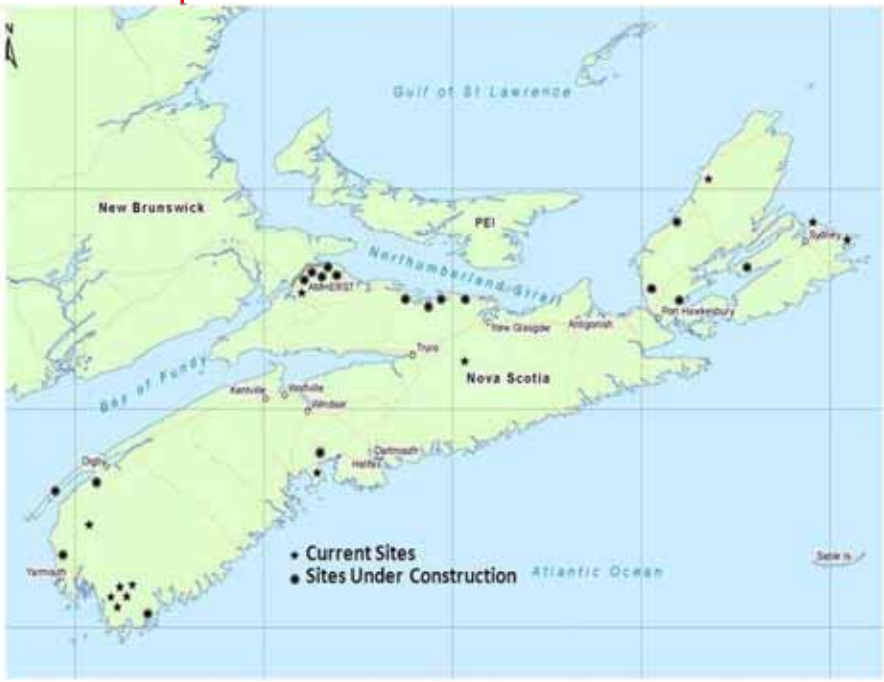

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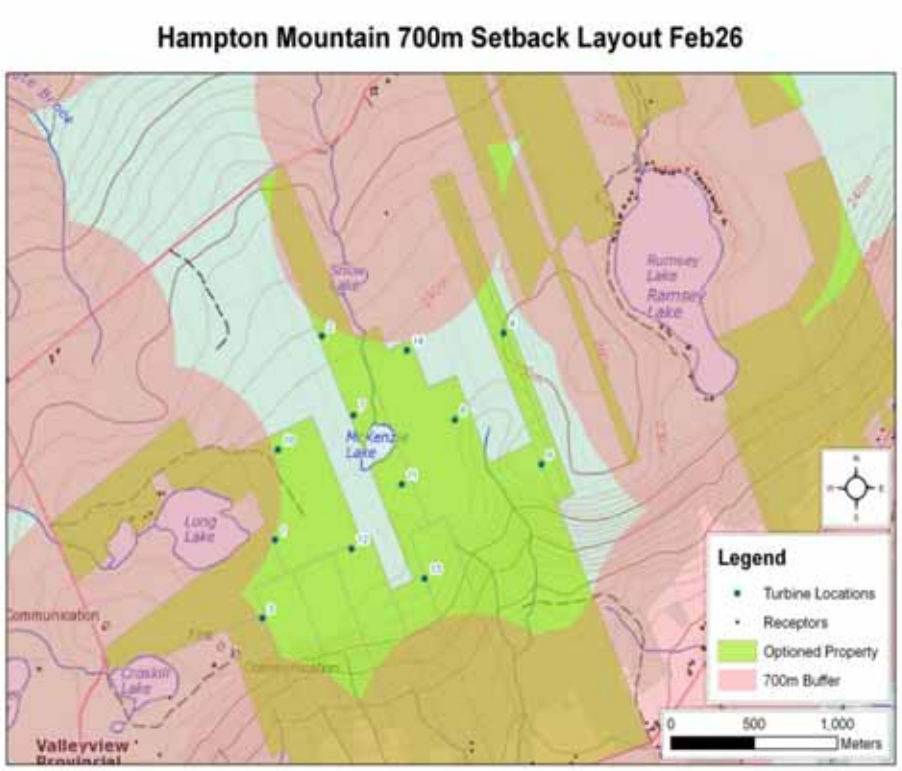

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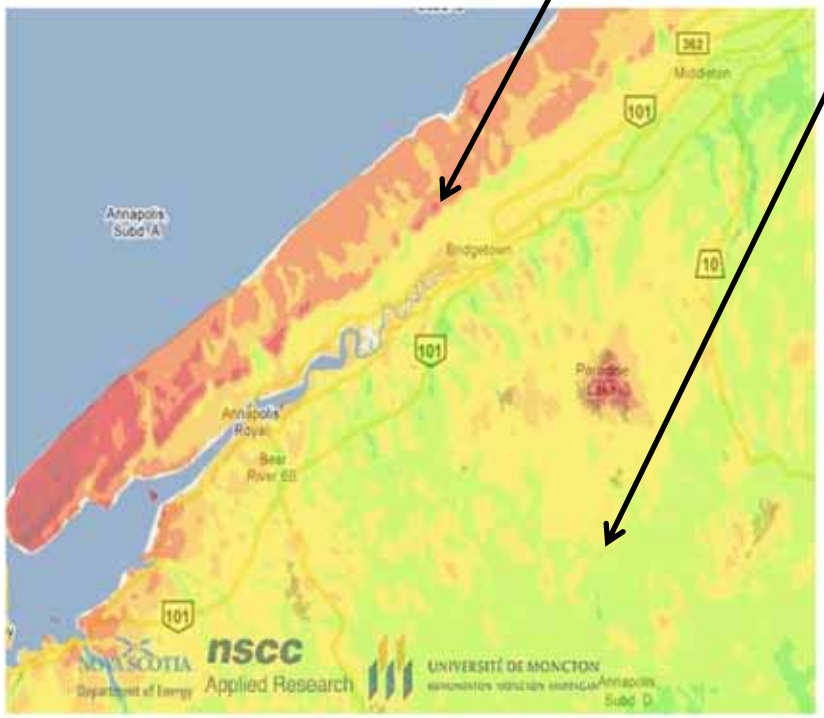

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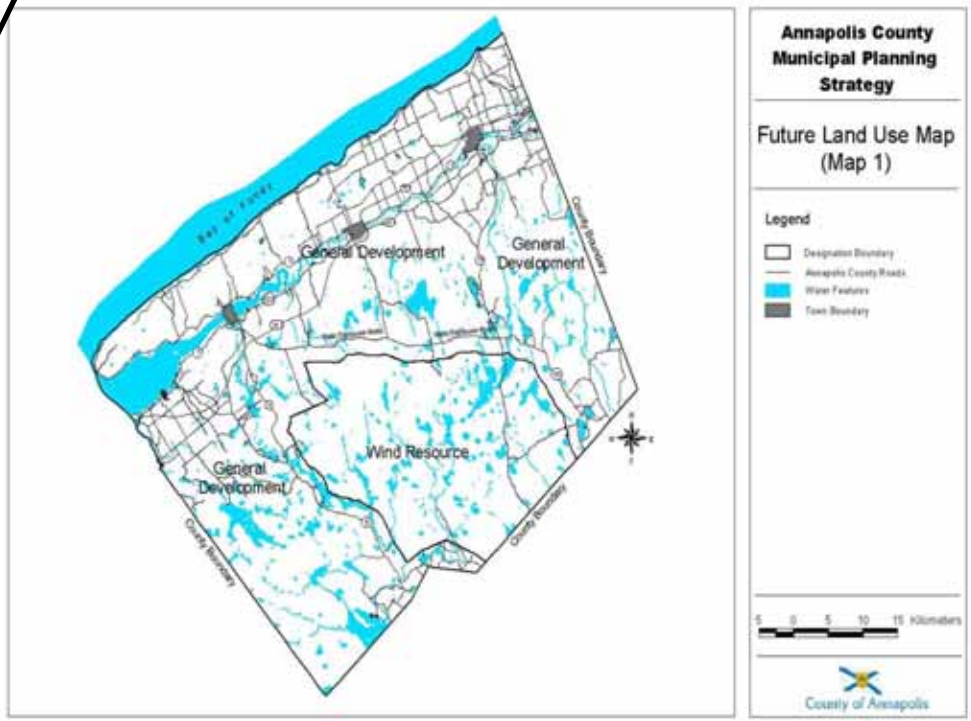

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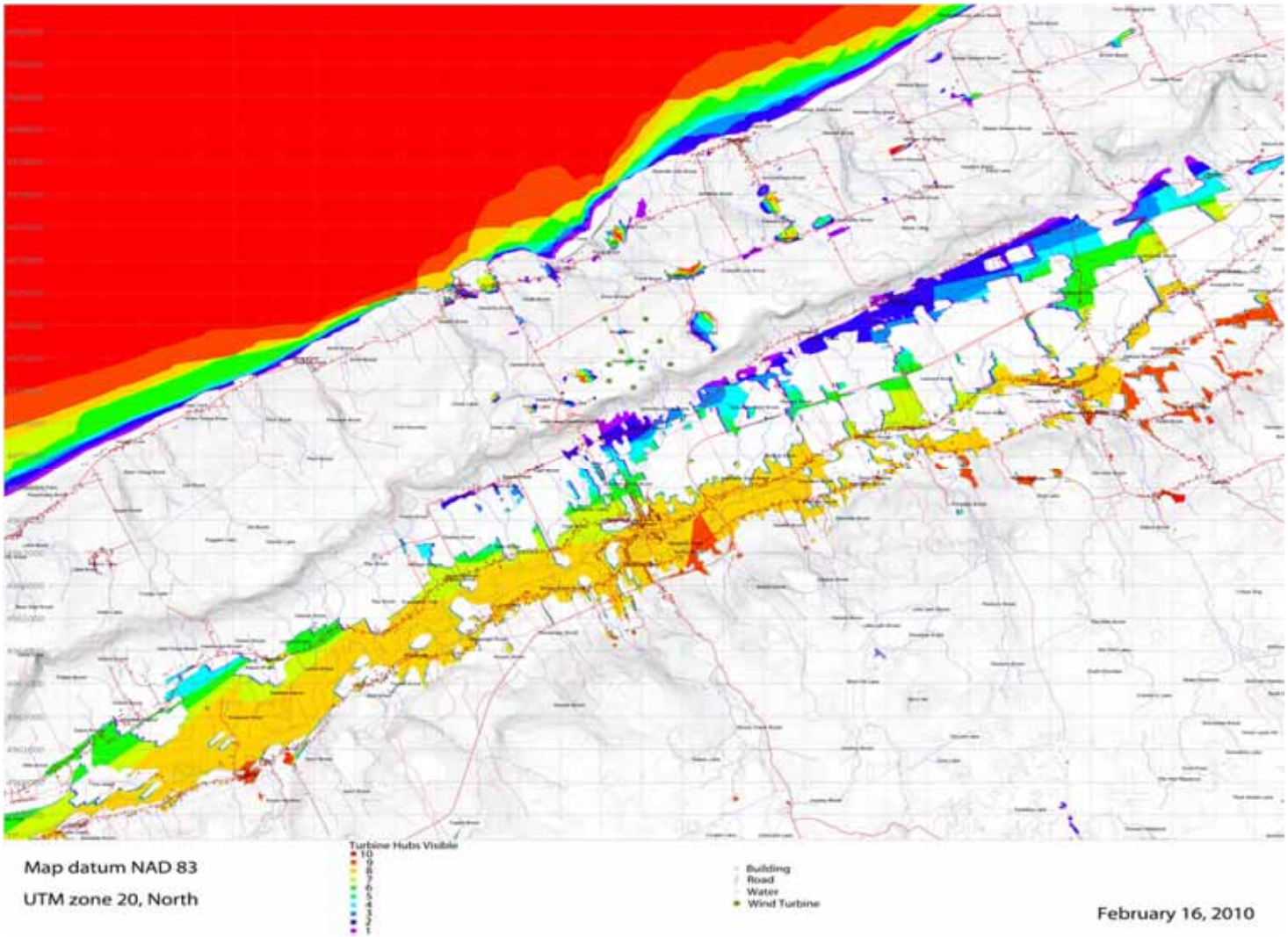

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• Municipal Bylaws to manage wind development already exist in Nova Scotia and other jurisdictions to guide decision makers.

• Policy uncertainty will curtail development.

•ReD needs local community support to address County bylaw initiatives.

Contact

Contact:

Jeff Jenner, CA, CBV
President
Renewable Energy Developers Inc.
416-819-9925
jjenner@red-inc.ca

Hampton Mountain Wind Power Project Update

The Annapolis County Commission

September 14, 2010

Hampton Mountain Wind Power Project Update

Agenda:

- Sprott Power Corp.
- Introduction to Hampton Mountain Development Team
- Project Status
- Project Milestones
- Questions and Answers

Sprott Power Corp.

- Created by the merger of Renewable Energy Developers Limited Partnership ("ReD") in June 2010.
- Sprott Inc. is a publicly traded company on the Toronto Stock Market and manages $7 billion in investments.
- ReD's founder, Jeff Jenner, and his team, will lead SPC in the development, financing and completion of the Renewable Energy Projects including the Proposed Hampton Mountain Wind Project.
- Sprott Power Corp. is a privately held Canadian company dedicated and committed to the development and financing of renewable energy projects.

Hampton Mountain Wind Power Development Team

Sprott Power Corp.

- Jeff Jenner, CA, CBV – President and Chief Executive Officer
- Don Bartlett, P.Eng. – Chief Operating Officer (Bedford, NS)
- Martin Lim, CA – Chief Financial Officer
- Hugh Campbell, P.Eng. – Vice President Technology and Procurement

Environmental Assessment Project Team

- Robert McCallum, P.Biol., McCallum Environmental Ltd., Halifax
- Michael Parker, Biologist, East Coast Aquatics, Bridgetown
- Andrew Sharpe, Biologist, Bridgetown
- Sharon Hawboldt, Biologist, Granville Ferry
- Steve Davis, Professional Archeologist, Davis McIntyre & Associates,Halifax

Hampton Mountain Wind Power Environmental Assessment Status

Sprott Power Corp.

Activities Completed: (represents 450 man hours completed by local specialists)

Archaeological and Historical Resources	– Desktop analysis completed
Assessment for flora and fauna Species at Risk	– Field Work completed and analyzed
Assessment of Bat Use	– Summer Field data collected
Assessment of vegetation within the Project area	– Field Work completed and analyzed
Assessment of Watercourses & Fisheries Potential	– Field Work completed and analyzed
Effects of the Project on current Land Use	– Field Work completed and analyzed
Noise Modeling to ensure compliance with setbacks	– Field Work completed and analyzed
Soils assessments to determine presence of unique soils	– No unique soils found during study
Spring and Summer Bird Studies	– Field Work completed and analyzed
Wetland Delineations	– Field Work completed and analyzed
Wildlife and Habitat Assessments	– Field Work completed and analyzed
Consultation with Mi'kmaq & Aboriginal People's Council	–Completed

Hampton Mountain Wind Power Environmental Assessment Status

Sprott Power Corp.

Activities Pending: (represents a further 350 man hours)

- Archaeological and Historical Resources - October 10, 2010
- Analysis of Bat Data - October 15, 2010
- Fall Bird Studies - October 15, 2010
- Public Consultation - September 15, 2010
- Regulatory Consultation - February 1, 2011
- Completion of the Environmental Protection Plan - September 15, 2010
- Report writing for above noted components - October 20, 2010
- Completion and submittal of the Environmental
- Registration Document to the NS Dept of Environment - October 20, 2010

Other Investigations Pending: (represents a further 240 man hrs)

- Centerline and Turbine Foundation Surveys - September 31, 2010
- Geotechnical Assessment - October 25, 2010

Hampton Mountain Wind Power
Remaining Project Milestones*

- Submittal of the Environmental Registration Document to the NS Dept of Environment : October 2010
- Environmental Assessment Approval : February 2011
- Power Purchase Agreement: March 2011
- Turbine Purchase Agreement: March 2011
- Interconnection Studies and GIA: June 2011
- Commence Construction: February 2011
  - Clearing for roads and turbine foundations: February 2011
  - Preliminary Roads: March 2011
  - Pour concrete mud slabs for Turbine foundations March 2011
  - Final Roads: May/July 2011
  - Long-lead equipment procurement: May 2011
  - Turbine foundations, turbine delivery and erection: June/September 2012
  - Substation & 34.5kV Collection System: May/July 2012
- Commercial Operation Date: October/Nov 2012

(* All Milestone dates are subject to change)

QUESTIONS AND ANSWERS


Sprott
Power Corp.

Hampton Mountain Wind Power Project

Economic Benefits Fact Sheet

September 28, 2010

Hampton Mountain Wind Power Project
Economic Benefits Fact Sheet

The final 40 MW Wind Farm represents:

- An investment of approximately $100 million;
- An estimated $20 million of goods and services purchased locally and within the province;
- More than $220,000 in annual property taxes for County of Annapolis as well as continued economic support for local community initiatives;
- Provides over $150,000 in annual royalty payments to local landowners;
- Almost 50 person-years of construction labour filled mostly by local trades people and 5 direct full time jobs thereafter;
- Long term Project spin-offs will provide economic benefits to local businesses, hospitality and tourism.

Permanent Jobs due to the 99MW West Cape Wind Farm in PEI

Per Robbie Thibodeau, Manager West Cape Wind Farm for GDF SUEZ:

- 17 full-time jobs remain at the operating project
- several part-time jobs
- 6 contractors provide daily, weekly or monthly services to the project

Communities Support For Wind Energy

- Maritime communities have an abundance of renewable energy
- The Maritimes electrical energy costs are the highest in Canada
- Communities are embracing wind energy to:
  - Reduce carbon footprint
  - Reduce electrical costs
  - Increase local revenues
  - Create new renewable energy jobs
  - Support other local businesses
  - Support local landowners

Appendix VII. CV**S** OF PROJECT PERSONNEL

Years in Practice
14

Memberships
Member of Alberta Society of Professional Biologists (ASPB), 2001
AB# 875

Certifications
Watercourse Alteration Certification, Nova Scotia, 2013

Education
Bachelor of Science, Biology/Environmental Studies, University of Victoria, Victoria , BC

Training
- ISO 14064-1 Essentials: Greenhouse Gas Inventories
- ISO 14064-2 Expert – Greenhouse Gas Projects (Carbon Emissions Reduction Expert Course)
- Standard First Aid w/ CPR Level C 2012
- H2S Alive, 2011

Experience Summary

Mr. McCallum is a Registered Professional Biologist with 14 years of experience within the environmental consulting industry. He has completed over 100 Federal environmental impact assessments (under the Canadian Environmental Assessment Act) and hundreds of Provincial environmental assessments. Every one of those projects required the development and implementation of a project specific Environmental Protection Plan (EPP) He has assisted numerous clients with corporate environmental project management, environmental operations coordination, regulatory audits, regulatory response and compliance, liability assessments of properties or companies prior to acquisition, and operational project management.

His professional field experience has encompassed environmental management, construction supervision, site assessments, spill response, site remediation, and reclamation projects. He has liaised between Industry, Regulators, First Nations, Special Interest Groups, and working interest partners as required.

Selected Project Experience

WIND POWER PROJECTS

- Completed Environmental Protection Plan, Erosion & Sedimentation Control Plan, acting as Environmental Monitor and regulatory specialist, and completion of the Cumulative Effects Assessment for the Glen Dhu Wind Power Project in Nova Scotia for Shear Wind Inc.;
- Coordination and completion of the environmental assessment, EPP, and regulatory applications for an 80 MW wind power project in Central Alberta, Canada for Nexen Inc;
- Coordination and completion of all regulatory applications for a 65 MW wind power project in Southern Alberta for Shear Wind Inc.;
- Coordination of regulatory permitting and environmental assessments for a 65 – 100 MW Wind Power Project in New Brunswick (anonymous client);
- Completion of preliminary constraints and regulatory analysis for 3 different wind power projects in Saskatchewan as a component of the Saskatchewan RFP process;
- Construction monitoring for EPP compliance, and reclamation management, at the Kettle Hills Wind Power Project, Alberta;

ALTERNATIVE ENERGY PROJECTS

- Coordination and completion of the 10 year Alberta Environment renewal application for the 105 MW Balzac Thermal Power generating station for Nexen Inc.;

OIL & GAS PROJECTS WHICH REQUIRE FEDERAL APPROVALS

- Completion of 53 regulatory compliance audits for three oil and gas clients in Alberta;
- Completion of site selection, CEAA screening document, first nation consultation, regulatory consultation, and surface land application for a wellsite, access road, and pipeline for Eagle Rock Exploration Inc;
- Completion of site selection, CEAA screening documents, first nation consultation, regulatory consultation, and surface land applications for 10 wellsites, access road, and pipelines for Maverick Oil & Gas Ltd on the Louis Bull First Nation since 2006;
- Completion of the Cumulative Effects Assessment and Environmental Protection Plan for a 107 shallow gas well program on federally regulated PFRA lands in S.W. Saskatchewan for submission to the Canadian Wildlife Service and Environment Canada;
- Completion of all CEAA environmental applications for 53 oil and gas developments on the Hay Lake I.R. #209, Alberta, since 2001. Conducted construction compliance monitoring, reclamation and completed regulatory compliance audits for ongoing activities
- Completion of construction monitoring for environmental compliance for a 10 km water pipeline for the Joffre Gas Plant, Alberta;

OTHER PROJECTS

- Completion of the CEAA screening document and NAV Canada application for the Deer Lake Regional Airport Authority (Newfoundland) Runway expansion, access road relocation, and transmission line relocation;
- Assistance with project management and regulatory permitting for the 2010 Heritage Gas pipeline expansion within the Halifax Regional Municipality, Halifax, N.S.;

Environmental Experience

McCallum Environmental Ltd., Nova Scotia

President - Since 2001, has provided project management expertise for site and/or route selection, constraints mapping, land acquisition, first nation/public consultation, regulatory consultation, environmental assessments, environmental protection plan development, survey supervision, regulatory applications, license and permit acquisitions, construction monitoring, and reclamation for small and large scale industrial projects. Other responsibilities include marketing, budget management, report preparation and client service.

Indian Oil & Gas Canada, Department of Indian & Northern Affairs, AB

Environmental & Surface Land Analyst - applied federal environmental legislation (CEAA, CEPA, Fisheries Act, and Indian Oil & Gas regulations (1995), which incorporate provincial legislation, on oil and gas producing Indian reserves in Canada. Analyzed environmental assessments for proposed projects and conducted site inspections where required (acting as the Responsible Authority under CEAA). Audited projects to ensure compliance by lessees with federal and provincial legislation. Negotiated and resolved environmental issues while maintaining an effective working relationship with First Nations, industry, IOGC and other federal and provincial regulators. Conducted reclamation inquiries to ensure compliance with reclamation criteria.

Stantec Consulting Ltd., AB

Project Manager - responsibilities included marketing, budget management, report preparation and client service. Project experience related to reclamation and environmental monitoring of construction projects. Completed federal and provincial environmental assessments, conservation and reclamation plans, designed and monitored environmental Protection Plans for developments in environmentally sensitive areas. Completed Phase I and Phase II Contamination Assessments and dig & dump supervision and closure sampling.

Pioneer Land Services Ltd., Calgary, AB

Assistant Environmental Manager -responsibilities included employee time management, billings, report preparation and quality control, marketing and client service. Consulting responsibilities included project management of reclamation programs, environmental monitoring of pipeline and wellsite construction projects. Completed environmental assessments as per provincial and federal requirements, designed and monitored environmental Protection Plans for developments in environmentally sensitive areas, Phase I and Phase II Contamination Assessments. Developed Emergency Response Plans for field personnel.

Pioneer Land Services Ltd., Grande Prairie, AB

Environmental Division Manager - responsibilities included employee time management, billings, report preparation and quality control, marketing and client service. Consulting responsibilities included project management of reclamation programs, environmental monitoring of pipeline and wellsite construction projects. Designed and monitored environmental Protection Plans for developments in environmentally sensitive areas. Completed Phase I and Phase II Contamination Assessments. Developed Emergency Response Plans for field personnel.

Great White North Environmental Services Ltd., AB

Senior Environmental Scientist - responsible for the preparation and implementation of Phase I and Phase II Contamination Assessments and Risk Assessments. Conducted Waste Auditing, Soil Vapour Surveys, and site remediation.

Curriculum Vitae

Michael Alan Parker
Aquatic biologist – East Coast Aquatics Inc.

Work Experience:

2000 – Present
Senior Biologist / President
East Coast Aquatics Inc., Bridgetown, Nova Scotia

Project management, and senior biologist for all client projects. Development of integrated watershed management plans, ecosystem management frameworks, water quality monitoring and evaluation, fish habitat assessment, wetland assessment, rehabilitation prescriptions, ecological inventories, terrestrial fauna inventories, and fish inventory activities. Project liaison with directly with project proponents or full service firm clients. Integrating aquatic and terrestrial components within broad-spectrum environmental projects. Authoring of final project reports.

1996 - 2000
Regional Fisheries Specialist
Ministry of Environment Lands and Parks; Williams Lake, British Columbia

Administering, monitoring, and delivering all Watershed Restoration Program contracts in the Cariboo Region, British Columbia. Directing and monitoring the design and implementation of stream and riparian restoration for the improvement of anadromous and resident fish populations. Coordinating with upslope management and restoration activities of forest resources. Assessing habitat impacts from mining, forestry, and agricultural activities.
Activities:
-Wrote and delivered contracts totaling $3 million annually.
-Carried out field habitat assessments, and designed and implemented restoration work for slope stabilization and fish habitat.
-Developed and authored a Fish Passage Culvert Inspection Procedures manual, project reporting, and technical bulletin articles.
-Worked with multi-stakeholder groups including forest companies, community groups, and Provincial and Federal Government offices.
-Ensured regulatory approvals were obtained and adhered to during resource management activities.
-Completed radio telemetry projects, fish inventories through electrosiening and snorkel counts, fish tagging, bioengineering, water quality monitoring, linear profile surveys, aerial reconnaissance, and air photo review activities.

1994-96
Program Coordinator
Bluenose Atlantic Coastal Action Program; Mahone Bay, Nova Scotia

Coordinated all activities associated with the development and actioning of a strategy to restore and maintain the greater Lunenburg/Mahone Bay ecosystem. Coordinated and facilitated a multi-stakeholder forum that included environmental, governmental, academic, business and other sectoral interests. Developed and oversaw implementation of the Oil Spill Response Project, which was chosen by the Peter F. Drucker Foundation as one of the top seven innovative non-profit projects in Canada, as well as a water quality monitoring project, slate pit wetland restoration project, and various public education projects.

Activities:
-Prepared project substantiation’s and managed approved projects.

-Conducted an environmental quality assessment.
-Developed and actioned communication and public participation plans.
-Environmental education and environmental remediation activities.
-Worked with a 12 member volunteer Board of Directors.
-Coordinated and hosted and Atlantic Region Conference attended by representatives from across Canada.
-Hired and managed a staff of up to 8 persons.

1993-94
Fish Habitat Restoration and Training Project Leader
Clean Annapolis River Project, Annapolis Royal, Nova Scotia

Lead an innovative new project of stream fish habitat restoration for salmonids. Performed design, implementation and monitoring of in stream work. Carried out a watershed wide stream habitat evaluation to identify appropriate locations for in-stream restoration on seven secondary streams.
Activities:
-Monitored changes in stream morphology through transect measurements.
-Performed regular water quality analysis, and carried out electrofishing to determine species composition and age distribution.
-Established working relationships with adjourning property owners.
-Immediate supervision of a nine staff of diverse education and experience.
-Comprehensive management of project design, implementation, and reporting.
-Conducted radio, television and public interviews of restoration providing explanation of work to a diverse audience.
-Georeferenced data and performed basic digitizing and GIS work.

1993
Independent Consultant - Fish Habitat Restoration Manual
Department of Fisheries and Oceans - Habitat Management Division; Halifax, Nova Scotia

Authored and illustrated a *Fish Habitat Restoration: Community Project Manual* for the Department of Fisheries and Oceans. This manual is aimed to guide community groups through low impact, in stream restoration techniques to restore habitat for salmonid species in gravel bed streams. The manual also outlined support activities for restoration including monitoring stream water quality, and adjoining land use. The manual has been distributed to community groups throughout the Scotia Fundy Region, and as requested in other locations.
Activities:
-Carried out contract negotiation involving budgeting, restitution scheduling, and product edits.
-Researched, designed, and wrote a community habitat restoration manual.
-Created computer graphics demonstrating stream flow dynamics and morphology associated with restoration structures.

Education:
Degrees:
1992 Bachelor of Science, Biology from Dalhousie University, Halifax, Nova Scotia.

1990 Bachelor of Commerce, Management from Dalhousie University, Halifax, Nova Scotia.

Additional Courses and Training:
2009 Nova Scotia Advanced Wetlands Delineation and Evaluation Course - Maritime College of Forest Technology

2008 Basic Wetlands Delineation Certification for Nova Scotia – Maritime College of Forest Technology
2007 Soil Bioengineering for Land Restoration and Slope Stabilization – instructed by David F. Polster.
2003 Canadian Aquatic BioMonitoring Network advanced macroinvertebrate identification training. Environment Canada.
2002 Canadian Aquatic BioMonitoring Network macroinvertebrate sampling and identification training. Environment Canada.
1998 Hydrologic and Hydraulic Designs of Culverts and Small Bridges course by BC Forestry Continuing Studies Network.
1998 Hydrology and Stream Restoration Session – instructed by Robert W. Newbury.
1997 British Columbia Ministry of Environment Lands and Parks Contract Management Course.
1996 WRP Riparian Assessment and Prescriptions Procedures Workshop by British Columbia Forestry Continuing Studies Network.
1996 WRP Fish Habitat Assessment and Rehabilitation Course Modules 1-2 by British Columbia Forestry Continuing Studies Network.

Volunteer Experience:

2006 -Present Bridgetown Triathlon Organizing Committee/Race Director

In 2006, Michael was awarded the 2006 Annapolis County Volunteer Award in recognition of outstanding volunteer service benefiting the Communities and Towns within the County of Annapolis.

2004 - 2007 Nova Scotia Fisheries and Aquaculture Loan Board
2001- 2007 Clean Annapolis River Project, Vice President and Board member.
2003 Bay of Fundy Marine Resource Centre, Board Member.
2002-03 Kejimkujik National Park Brook Trout Study.
1998 Volunteer mentor for BC Government Mentorship Program, Cariboo Region.
1997-98 Province of BC Scientists and Innovators in the Schools program.
1993-94 Voting Committee Member - Regional Aquaculture Development Advisory Committee Mahone Bay, NS

Other Relevant Activities:

Guest Speaker. Canadian Land Reclamation Association Atlantic Conference. Stellarton, NS. Speech titled, "Development around Wetlands in Nova Scotia, Assessment and Design." October 2008.

Guest Speaker. Atlantic Canadian Species at Risk Conference, Lunenburg, Nova Scotia. October 2006; and, Canadian Land Reclamation Conference, Halifax, Nova Scotia. Speech titled, "Descriptive Habitat Study of Low Impacted Streams of the Bay of Fundy." August 2007.

Guest Speaker. Aquaculture Association of Nova Scotia. Speech titled, "Slow Release Fertilizer for Restoring Pacific Salmonid Habitat: A British Columbia Experience". Halifax, Nova Scotia. Jan. 2005

Guest Speaker. BC-USFS Watershed Restoration Technical Exchange. Speech titled, "Cost benefit analysis of culvert replacement for fish access". Hood River, Oregon. Jun. 2000.

Guest Speaker. Canadian Water Resources Association Workshop. Speech Titled, "Fish Passage Culvert Inspection". Burnaby, BC. Mar. 2000.

Guest Speaker. BC-USFS Watershed Restoration Exchange Workshop. Speech titled, "Fish passage through culverts in the Cariboo Region, British Columbia". Kelowna, BC. Apr. 1999.

Licenses & Certificates:

Basic Wetlands Delineation Certification for Nova Scotia – Maritime College of Forest Technology

British Columbia Backpack Electrofishing Certificate - Crew Supervisor

Memberships and Professional Associations

Atlantic Society of Fish and Wildlife Biologists
American Fisheries Society
Bridgetown Area Chamber of Commerce
Canadian Land Reclamation Association
Canadian Society of Environmental Biologists
Nova Scotia Institute of Science

Publications, Reports and Manuals:

Parker, M. 2010. *Preliminary Ecological Overview of Candidate AOI's Eastern Scotian Shelf.* Fisheries and Oceans Canada. Bedford Institute of Oceanography. Dartmouth, Nova Scotia. Department of Oceans and Habitat Managment. (draft at March 31, 2010) 79 pp.

Parker, M. A. 2009. *Halifax International Airport Environmental Effects Monitoring Program 2009. Final Report.* Halifax International Airport Authority. Enfield, NS. Unpublished. Pp.58.

Parker, M. and A. Service. 2009. *Gulf of Maine Ecosystem Overview Report*. Fisheries and Oceans Canada. Bedford Institute of Oceanography. Dartmouth, Nova Scotia. Department of Oceans and Habitat Managment. (under peer review) 178 pp.

Parker, M. 2008. *Southwest New Brunswick Marine Resources Planning: A Background Document*. SWNB Marine Resources Planning Office. St. George, New Brunswick. Unpublished. 122 pp.

Parker, M. M. Westhead and A. Service. 2007. *Ecosystem Overview Report for the Minas Basin, Nova Scotia.* Fisheries and Oceans Canada. Bedford Institute of Oceanography. Dartmouth, Nova Scotia. Oceans and Habitat Report 2007-05. 179 pp.

Parker, M., P. Wells and D. Wamsley. 2007. *Developing a Gulf of Maine Ecosystem Overview Report: A Scoping Exercise to Identify Key Review Literature and Considerations for Report Production.* Department of Fisheries and Oceans. Oceans and Coastal Management Division. Dartmouth, Nova Scotia. 40 pp.

Parker, M., M. Westhead, P. Doherty and J. Naug. 2007. *Ecosystem Overview and Assessment Report for the Bras d'Or Lakes, Nova Scotia.* Can. Manuscr. Rep. Fish. Aquat. Sci. 2789. Pp. 223.

Parker, M.A. 2006. *A Descriptive Habitat Study of Low Impacted Streams of the Bay of Fundy*. Annapolis Fly Fishing Association. Unpublished. Pp. 47.

Parker, M.A. and R.J. Rutherford. 2003. *Development of a Musquash Ecosystem Framework.* Chapter 1. In: Musquash Ecosystem Framework Development. Progress to Date. Singh, R. and M-I. Buzeta (eds.) 2005. Can. Manuscr. Rep. Fish. Aquat. Sci. 2727: x+202pp.

Parker, M. A. 2003. *An Ecosystem Based Ocean & Coastal Management Framework*. 2nd Draft. June 2003. Department of Fisheries and Oceans. Ocean Act Coordination Office. Dartmouth, NS. Unpublished. Pp. 14.

Parker, M. A. 2003. *Ecological Inventory of the Melanson Property.* February 2003. Kejimkujik National Park. Unpublished. Pp. 24 + app.

Parker, M. A. 2002. *Sustainability Issues: Bras d'Or.* June 2002. Nova Scotia Sustainable Communities Initiative. Unpublished. Pp. 20 + app.

Parker, M. A. 2001. *Atlantic Coastal Action Program: A review of the Project Funding Process*. Environment Canada. Dartmouth, Nova Scotia. Unpublished. 29 + app.

Parker, M. A. 2001. *River Denys Integrated Management Report*. March 2001. Department of Fisheries and Oceans, Ocean Act Coordination Office. Bedford, NS. Unpublished. Pp.49.

Parker, M. A. 1999. *Fish Passage - Culvert Inspection Procedures. Watershed Restoration Technical Circular No. 11*. British Columbia Ministry of Environment Lands and Parks. ISBN 0-7726-4290-7. iv. 50p.

McCALLUM ENVIRONMENTAL LTD
Solutions for Environmental Approvals and Compliance

Meghan Milloy, BSc. (Bio), MES
Project Manager

Years in Practice
10

Certifications
Nova Scotia Advanced Wetlands Delineator and Evaluator

Memberships
Nova Scotia Wetlands Delineation, Maritime College of Forest Technology

Auditing Association of Canada (AAC) - Regional Chapter Committee Member

Education
Master in Environmental Studies (MES), York University, Toronto, Ontario, 1999
BSc. (Biology), Dalhousie University, 1997
BA (Political Science), Honours, Dalhousie University, 1997

Training
- Nova Scotia Advanced Wetlands Delineation and Evaluation Course, 2009;
- Water Management and Wetland Restoration Training Course, 2009;
- Identifying and Delineating Wetlands for Nova Scotia, 2008

Experience Summary

Ms. Milloy oversees, manages, and executes environmental projects. She completes wetland delineations and characterizations, and guides clients through the environmental and permitting stages of development projects. Ms. Milloy also guides clients through provincial and federal environmental assessment requirements. Ms. Milloy has submitted multiple applications for Transport Canada, under the Navigable Waters Protection Program, has submitted numerous Department of Fisheries and Oceans HADD applications (freshwater and marine) and has developed HADD compensation programs. Ms. Milloy regularly completes applications for wetland alteration and development across Atlantic Canada, and has developed and implemented wetland compensation programs. Ms. Milloy is a trained wetland restoration professional. Ms. Milloy is also knowledgeable in preparing Environmental Management Plans and Emergency Preparedness Plans for development projects.

Ms. Milloy is also involved with programs including the remediation of contaminated commercial and residential sites, and the execution of Phased Site Assessments in accordance with the Nova Scotia Management of Contaminated Sites Guidelines and CSA. Ms. Milloy is knowledgeable in risk assessment processes, and completes both qualitative and quantitative risk assessments for commercial and residential properties. Ms. Milloy has extensive experience working with the Atlantic Risk Based Corrective Action (RBCA) risk assessment process for hydrocarbon-impacted sites, and is proficient in plume characterization and exposure assessment.

Selected Project Experience

- Completion of provincial permitting requirements including wetland alteration and compensation planning, and watercourse alteration for a proposed marine terminal and associated 20 km rail and transmission line in Nova Scotia.
- Coordination and completion of federal and provincial regulatory requirements for a large scale commercial and residential development and associated marina in Dartmouth Nova Scotia involving HADD permitting, wetland infill and compensation planning, and completion of a phased assessment, risk assessment and completion of a Certificate of Compliance.
- Completion of 20-30 projects involving wetland delineation, wetland alteration and infill, and compensation planning for numerous residential and commercial large-scale developments across Nova Scotia and New Brunswick.
- Developed and implemented wetland restoration and creation projects as compensation for wetland losses for numerous development clients.
- Completion of more than 50 phased site assessment and remediation projects - Phase I, II, III and risk assessment for commercial property transfers.

Environmental Experience

McCallum Environmental Ltd., Nova Scotia

Project Manager - Provides project management expertise for site and/or route selection, constraints mapping, regulatory consultation, environmental assessments, wetland alteration and restoration planning, environmental protection plan development, regulatory applications, construction monitoring, and reclamation for small and large scale industrial projects. Other responsibilities include marketing, budget management, report preparation and client service.

Strum Environmental Services Ltd., Nova Scotia

Project Manager- From 2000- 2010, provided project management expertise for development clients across Atlantic Canada. Projects included environmental assessment, large scale commercial and residential developments, wetland alteration projects, wetland compensation planning and implementation, wetland restoration and creation projects, phased site assessments, and risk assessment and management.

Environmental Sciences Group, Kingston, ON

Environmental Scientist- in1997/1998, provided contaminant and project management expertise to Department of National Defense in the Canadian Arctic in support of remediation of several remote military sites. Identified areas required for remediation and completed associated boundary soil and sediment confirmatory sampling and analysis.

Curriculum Vitae of Andrew G. Sharpe

R.R. # 3, Bridgetown
NS, B0S 1C0 CANADA

OVERVIEW OF SKILLS AND EXPERIENCE

Over the past 15 years, I have had the opportunity to build considerable expertise in the field of the Environmental Impact Assessment, with direct experience in two Canadian provinces, the United Kingdom and Malawi. I have worked in numerous environmenal assessment teams, from perspective of regulator, proponent/consultant, and non-governmental organisation.

POST-SECONDARY EDUCATION

1990 to 1993 Master's in Environmental Design (M.E.Des.)
(Environmental Science)
Faculty of Environmental Design
University of Calgary, Canada

1986 to 1990 Bachelor of Science (Honours) (B.Sc.)
Department of Chemistry
Faculty of Science
University of New Brunswick, Canada

EMPLOYMENT HISTORY

Environmental Impact Assessment Consultant, Annapolis Royal, Nova Scotia, September 2002 to present. Part-time self- employed.

Projects undertaken include:

- Lecturer in Environmental Impact Assessment, Environmental Science Department, Acadia University, Wolfville, Nova Scotia.
- Principal advisor to the Society for the Sustainable Development of Digby Neck and Islands Society on the Canadian Environmental Assessment Act (CEAA) and the Nova Scotia Environmental Impact Assessment Regulations.
- Advisor to the Bay of Fundy Marine Resource Centre on the application of the Canadian Environmental Assessment Act to local resource developments.

Science Coordinator, Clean Annapolis River Project, Annapolis Royal, Nova Scotia, Canada, April 2003 to present.

- Responsible for the design, implementation, analysis and reporting of ecological monitoring programs within the Annapolis River watershed. These currently include: the Annapolis River Guardians volunteer monitoring program, and Operation SWIM (Sub-Watershed Investigative Monitoring).
- Responsible for the communication of ecological monitoring results, and information on the underlying ecological and physical processes to a variety of stakeholders, including local elected officials, members of the public, and representatives of the Provincial and Federal Government.

Local Agenda 21 Co-ordinator, East Lindsey District Council, Louth, Lincolnshire, November 1998 to July 2002.

- Reviewed of project environmental impact assessments received under land use planning regulations.
- Reviewed of existing Council policies, leading to the development and adoption of a comprehensive Environmental Policy for the Authority.
- Responsible for the co-ordinating the preparation and implementation of a Local Agenda 21 (Sustainable Development) Strategy for the District Council.
- Responsible for the development and monitoring of quantifiable sustainability indicators to assess the Council's environmental performance.

Environmental Technology Instructor, College of the North Atlantic, Baie Verte Campus, September 1997 to December 1997. Full-time contract employment.

- Responsible for instruction of courses on the topics of Environmental Impact Assessment, Environmental Sampling, Solid Water Management, and Occupational Hazards as part of the three year Environmental Engineering Technology Program.

Environmental Consultant, Baie Verte, Newfoundland, December 1995 to September 1997.

Projects undertaken include:

- Prepared Environmental Assessments as required under the Environment Assessment Act for the development of new mine sites.
- Developed and Implemented water quality monitoring programs.
- Managed of provincial and federal environmental permit requirements for client companies.

Environmental Planner, MGI Limited, Fredericton, New Brunswick, September 1995 to November 1995. Full-time contract employment.

- Evaluated monitoring results and participated in the preparation of an Environmental Effects Monitoring program for a development of an antimony mine.
- Planned, investigated, analyzed, and documented Phase I Environmental Site Assessments of commercial properties;

Communication and Information Officer, Coordination Unit for the Rehabilitation of the Environment (CURE), Blantyre, Malawi, September 1993 to August 1995. Employed via World University Service of Canada.

- Served as the NGO-sector representative in the drafting of Environmental Impact Assessment and Environmental Management legislation.
- Provided technical assistance to the Department of Forestry and Ministry of Research and Environmental Affairs in the development of their national environmental activities.

PROFESSIONAL ASSOCIATIONS

Member	Institure of Environmental Managment & Assessment (No. 5468) since December 2001
Member	Institution of Environmental Sciences (No 1723) since 7th April 1998

SUPPLEMENTARY TRAINING

Screening Under the Canadian Environmental Assessment Act, Canadian Environmental Assessment Agency, 16-19 October, 2002, Halifax.

Introduction to the Canadian Environmental Assessment Act, Canadian Environmental Assessment Agency, 3rd October 2002, Halifax.

Project Appraisal, University of the West of England, Faculty of the Built Environment, May to November 2000. An extension course graded by continuing assessment, taken by distance education. Final Grade: Pass

Advanced Environmental Management System Auditing, Environmental Management Services International (emsi). September 1999. A five day residential course with an invigilated final examination. Final Grade 79.5%.

Physical Hydrogeology, University of Waterloo, Canada, September to December 1997. A senior undergraduate course with an invigilated final examination, taken by distance education. Final Grade: 90%.

Chemical Hydrogeology, University of Waterloo, Canada, January to April 1998. A senior undergraduate course with an invigilated final examination, taken by distance education. Final Grade: 94%.

Sharon Hawboldt
R.R. 3, Granville Ferry, NS B0S 1K0

Professional Experience

1976-2004 - Teacher, Annapolis Valley School Board, retired

1968-1976 - Teacher, Halifax City School Board

Related Professional Experience

Avian Surveyor, East Coast Aquatics, various projects since 2007.

Avian Atlasser, Atlas of Breeding Birds of the Maritime Provinces, 2007 to 2010

Avian Biologist, Ecological Inventory of Melanson Property for Parks Canada**,** 2002**,** Avian survey of 25 hectare property**.**

Avian Atlasser, Atlas of Breeding Birds of the Maritime Provinces**,** 1986- 1990**,** Development of a breeding bird Atlas for Maritime Canada**.**

Avian observer, Bird Study Canada's Project FeederWatch and Canadian Lakes Loon Survey**,** 1984-present**,** Avian census projects**.**

Avian observer, Kejimkujik National Park Loon Survey**,** 2003-2004**,** Annual volunteer loon enumeration program on National Park lakes**.**

Compiler for Annapolis Royal area**,** Christmas Bird Count**,** 1980's, On-going annual winter census.

Field trip leader, Avian Field Trips for Nova Scotia Bird Society and Annapolis Field Naturalists**,** 1980's to May, 2004**,** Avian surveys**.**

Supervisor and compiler, Classroom FeederWatch for Bird Studies Canada and Cornell University**,** 1997-2004**,** Avian census projects**.**

Education

Bachelor of Education, Dalhousie University, 1970
Bachelor of Arts, Acadia University, 1968

Awards

Nova Scotia Environmental Award, 1998
Nova Scotia Provincial Education Week Award, 1999

Appendix VIII. ATLANTIC CANADA CONSERVATION DATA CENTER DOCUMENTED SPECIES OBSERVATIONS

Atlantic Canada Conservation Data Center documented species observations for North Mountain Study Area between Cape Split and Digby Gut. The distance from the proposed Hampton Wind Farm Study Site for each observation is noted.

Scientific Name	Common Name	Global Rank	National Protection	Provincial Rank	NS Protection	Dist. (km)
Chaetura pelagica	Chimney Swift	G5	T	S4B	Endangered	17 ±5
Chordeiles minor	Common Nighthawk	G5	T	S4B	Threatened	39 ±5
Falco peregrinus anatum	Peregrine Falcon anatum ssp	G4T4	SC	S1B	Vulnerable	41 ±10
Isoetes prototypus	Prototype Quillwort	G2G3	SC	S2	Vulnerable	16 ±0.1
Isoetes prototypus	Prototype Quillwort	G2G3	SC	S2	Vulnerable	16 ±0.1
Isoetes prototypus	Prototype Quillwort	G2G3	SC	S2	Vulnerable	16 ±0.1
Isoetes prototypus	Prototype Quillwort	G2G3	SC	S2	Vulnerable	22 ±0.1
Catharus bicknelli	Bicknell's Thrush	G4	T	S1S2B	Vulnerable	62 ±5
Glyptemys insculpta	Wood Turtle	G4	T	S3	Vulnerable	17 ±10
Thuja occidentalis	Eastern White Cedar	G5		S1S2	Vulnerable	17 ±10
Thuja occidentalis	Eastern White Cedar	G5		S1S2	Vulnerable	17 ±10
Thuja occidentalis	Eastern White Cedar	G5		S1S2	Vulnerable	4 ±10
Thuja occidentalis	Eastern White Cedar	G5		S1S2	Vulnerable	17 ±10
Floerkea proserpinacoides	False Mermaidweed	G5	NAR	S2S3		50 ±10
Hemidactylium scutatum	Four-toed Salamander	G5	NAR	S3		26 ±0.1
Hemidactylium scutatum	Four-toed Salamander	G5	NAR	S3		25 ±0.5
Hemidactylium scutatum	Four-toed Salamander	G5	NAR	S3		25 ±0.5
Hemidactylium scutatum	Four-toed Salamander	G5	NAR	S3		25 ±0.5
Hemidactylium scutatum	Four-toed Salamander	G5	NAR	S3		25 ±0.5
Hemidactylium scutatum	Four-toed Salamander	G5	NAR	S3		25 ±0.5
Hemidactylium scutatum	Four-toed Salamander	G5	NAR	S3		25 ±0.5
Accipiter gentilis	Northern Goshawk	G5	NAR	S3B		4 ±5
Accipiter gentilis	Northern Goshawk	G5	NAR	S3B		41 ±5
Accipiter gentilis	Northern Goshawk	G5	NAR	S3B		64 ±5
Ammodramus nelsoni	Nelson's Sharp-tailed Sparrow	G5	NAR	S3B		64 ±5
Contopus cooperi	Olive-sided Flycatcher	G4	T	S4B		62 ±5
Wilsonia canadensis	Canada Warbler	G5	T	S4B		41 ±5
Wilsonia canadensis	Canada Warbler	G5	T	S4B		50 ±5
Wilsonia canadensis	Canada Warbler	G5	T	S4B		50 ±5
Wilsonia canadensis	Canada Warbler	G5	T	S4B		64 ±5
Wilsonia canadensis	Canada Warbler	G5	T	S4B		62 ±5
Wilsonia canadensis	Canada Warbler	G5	T	S4B		17 ±5
Cardamine maxima	Large Toothwort	G5		S1		59 ±0
Draba glabella	Rock Whitlow-Grass	G4G5		S1		64 ±0.1
Hepatica nobilis var. obtusa	Round-lobed Hepatica	G5T5		S1		58 ±1
Hepatica nobilis var. obtusa	Round-lobed Hepatica	G5T5		S1		58 ±1
Hepatica nobilis var. obtusa	Round-lobed Hepatica	G5T5		S1		66 ±0.5
Hepatica nobilis var. obtusa	Round-lobed Hepatica	G5T5		S1		17 ±10
Carex laxiflora var. laxiflora	Loose-Flowered Sedge	G5T5		S1		58 ±1

Allium tricoccum	Wild Leek	G5		S1		58 ±1
Allium tricoccum	Wild Leek	G5		S1		65 ±1
Allium tricoccum	Wild Leek	G5		S1		65 ±0.1
Allium tricoccum	Wild Leek	G5		S1		65 ±0.1
Allium tricoccum	Wild Leek	G5		S1		63 ±0.1
Malaxis brachypoda	White Adder's-Mouth	G4Q		S1		65 ±0.1
Conopholis americana	American Cancer-root	G5		S1S2		46 ±0
Carex hystericina	Porcupine Sedge	G5		S1S2		57 ±0.1
Carex hystericina	Porcupine Sedge	G5		S1S2		53 ±5
Festuca subverticillata	Nodding Fescue	G5		S1S2		65 ±0.1
Festuca subverticillata	Nodding Fescue	G5		S1S2		64 ±0.1
Lobelia spicata	Pale-Spiked Lobelia	G5		S1S2SE		65 ±0.5
Lobelia spicata	Pale-Spiked Lobelia	G5		S1S2SE		64 ±10
Huperzia selago	Northern Firmoss	G5		S1S3		62 ±1
Huperzia selago	Northern Firmoss	G5		S1S3		58 ±5
Martes pennanti	Fisher	G5		S2		17 ±10
Martes pennanti	Fisher	G5		S2		17 ±10
Osmorhiza longistylis	Smooth Sweet Cicely	G5		S2		65 ±5
Osmorhiza longistylis	Smooth Sweet Cicely	G5		S2		64 ±1
Osmorhiza longistylis	Smooth Sweet Cicely	G5		S2		64 ±1
Impatiens pallida	Pale Jewelweed	G5		S2		64 ±1
Arabis drummondii	Drummond's Rockcress	G5		S2		58 ±1
Arabis drummondii	Drummond's Rockcress	G5		S2		65 ±0.1
Arabis drummondii	Drummond's Rockcress	G5		S2		65 ±0.1
Arabis drummondii	Drummond's Rockcress	G5		S2		64 ±0.1
Cardamine parviflora var. arenicola	Small-flowered Bittercress	G5T5		S2		64 ±1
Cardamine parviflora var. arenicola	Small-flowered Bittercress	G5T5		S2		64 ±1
Draba arabisans	Rock Whitlow-Grass	G4		S2		58 ±1
Draba arabisans	Rock Whitlow-Grass	G4		S2		65 ±0.1
Draba arabisans	Rock Whitlow-Grass	G4		S2		65 ±0.1
Draba arabisans	Rock Whitlow-Grass	G4		S2		65 ±0.1
Hudsonia ericoides	Pinebarren Golden Heather	G4		S2		27 ±1
Hudsonia ericoides	Pinebarren Golden Heather	G4		S2		19 ±10
Polygonum scandens	Climbing False Buckwheat	G5		S2		17 ±10
Anemone quinquefolia	Wood Anemone	G5		S2		17 ±10
Galium boreale	Northern Bedstraw	G5		S2		64 ±1
Galium boreale	Northern Bedstraw	G5		S2		64 ±1
Saxifraga paniculata ssp. neogaea	White Mountain Saxifrage	G5T5?		S2		59 ±0.5
Saxifraga paniculata ssp. neogaea	White Mountain Saxifrage	G5T5?		S2		59 ±0.5
Saxifraga paniculata ssp. neogaea	White Mountain Saxifrage	G5T5?		S2		65 ±1
Eriophorum gracile	Slender Cottongrass	G5		S2		17 ±10
Cypripedium parviflorum var. makasin	Yellow Lady's-slipper	G5T4Q		S2		31 ±5
Asplenium trichomanes	Maidenhair Spleenwort	G5		S2		46 ±0
Asplenium trichomanes	Maidenhair Spleenwort	G5		S2		65 ±5

Asplenium trichomanes	Maidenhair Spleenwort	G5		S2		65 ±0.1
Asplenium trichomanes	Maidenhair Spleenwort	G5		S2		58 ±1
Rallus limicola	Virginia Rail	G5		S2B		62 ±5
Piranga olivacea	Scarlet Tanager	G5		S2B		17 ±5
Cardinalis cardinalis	Northern Cardinal	G5		S2B		50 ±5
Cardinalis cardinalis	Northern Cardinal	G5		S2B		50 ±5
Cardinalis cardinalis	Northern Cardinal	G5		S2B		50 ±5
Hedeoma pulegioides	American False Pennyroyal	G5		S2S3		27 ±1
Hedeoma pulegioides	American False Pennyroyal	G5		S2S3		63 ±0.5
Hedeoma pulegioides	American False Pennyroyal	G5		S2S3		64 ±1
Hedeoma pulegioides	American False Pennyroyal	G5		S2S3		58 ±1
Hedeoma pulegioides	American False Pennyroyal	G5		S2S3		25 ±0.5
Juncus marginatus	Grass-leaved Rush	G5		S2S3		39 ±10
Juncus marginatus	Grass-leaved Rush	G5		S2S3		39 ±10
Juncus marginatus	Grass-leaved Rush	G5		S2S3		37 ±0.1
Juncus marginatus	Grass-leaved Rush	G5		S2S3		4 ±10
Cypripedium parviflorum	Yellow Lady's-slipper	G5		S2S3		41 ±10
Alopecurus aequalis	Short-awned Foxtail	G5		S2S3		64 ±5
Poa glauca	Glaucous Blue Grass	G5		S2S3		65 ±1
Ophioglossum pusillum	Northern Adder's-tongue	G5		S2S3		39 ±10
Sayornis phoebe	Eastern Phoebe	G5		S2S3B		17 ±5
Cepphus grylle	Black Guillemot	G5		S3		19 ±5
Cepphus grylle	Black Guillemot	G5		S3		41 ±5
Cepphus grylle	Black Guillemot	G5		S3		62 ±5
Hieracium paniculatum	Panicled Hawkweed	G5		S3		25 ±0
Polygonum pensylvanicum	Pennsylvania Smartweed	G5		S3		39 ±10
Polygonum pensylvanicum	Pennsylvania Smartweed	G5		S3		50 ±10
Carex rosea	Rosy Sedge	G5		S3		46 ±0
Carex rosea	Rosy Sedge	G5		S3		18 ±0
Carex rosea	Rosy Sedge	G5		S3		7 ±0.1
Carex rosea	Rosy Sedge	G5		S3		25 ±0
Carex rosea	Rosy Sedge	G5		S3		63 ±0.1
Eleocharis nitida	Quill Spikerush	G4		S3		41 ±5
Eleocharis nitida	Quill Spikerush	G4		S3		57 ±5
Eleocharis nitida	Quill Spikerush	G4		S3		57 ±5
Eleocharis nitida	Quill Spikerush	G4		S3		37 ±0.5
Eleocharis nitida	Quill Spikerush	G4		S3		13 ±0.5
Eleocharis nitida	Quill Spikerush	G4		S3		13 ±0.5
Eleocharis nitida	Quill Spikerush	G4		S3		13 ±0.1
Trillium erectum	Red Trillium	G5		S3		46 ±0
Trillium erectum	Red Trillium	G5		S3		7 ±0.1
Trillium erectum	Red Trillium	G5		S3		59 ±0
Trillium erectum	Red Trillium	G5		S3		64 ±5
Trillium erectum	Red Trillium	G5		S3		64 ±5
Trillium erectum	Red Trillium	G5		S3		59 ±5
Trillium erectum	Red Trillium	G5		S3		11 ±1

Platanthera hookeri	Hooker's Orchid	G4		S3		57 ±1
Milium effusum var. cisatlanticum	Tall Millet Grass	G5TNR		S3		59 ±0
Milium effusum var. cisatlanticum	Tall Millet Grass	G5TNR		S3		64 ±0.1
Trisetum spicatum	Narrow False Oats	G5		S3		62 ±1
Trisetum spicatum	Narrow False Oats	G5		S3		62 ±0.5
Trisetum spicatum	Narrow False Oats	G5		S3		64 ±5
Isoetes acadiensis	Acadian Quillwort	G3Q		S3		38 ±0.5
Botrychium dissectum	Cut-leaved Moonwort	G5		S3		58 ±0.5
Agrimonia gryposepala	Hooked Agrimony	G5		S3?		63 ±0
Rubus pensilvanicus	Pennsylvania Blackberry	G5		S3?		63 ±100
Sparganium fluctuans	Floating Burreed	G5		S3?		62 ±0.5
Cystopteris tenuis	Mackay's Brittle Fern	G4G5		S3?		63 ±1
Coccyzus erythropthalmus	Black-billed Cuckoo	G5		S3B		17 ±5
Mimus polyglottos	Northern Mockingbird	G5		S3B		50 ±5
Dolichonyx oryzivorus	Bobolink	G5		S3B		62 ±5
Dolichonyx oryzivorus	Bobolink	G5		S3B		19 ±5
Dolichonyx oryzivorus	Bobolink	G5		S3B		41 ±5
Dolichonyx oryzivorus	Bobolink	G5		S3B		64 ±5
Dolichonyx oryzivorus	Bobolink	G5		S3B		14 ±0.1
Dolichonyx oryzivorus	Bobolink	G5		S3B		17 ±5
Dolichonyx oryzivorus	Bobolink	G5		S3B		4 ±0.5
Dolichonyx oryzivorus	Bobolink	G5		S3B		50 ±5
Dolichonyx oryzivorus	Bobolink	G5		S3B		50 ±5
Dolichonyx oryzivorus	Bobolink	G5		S3B		50 ±5
Dolichonyx oryzivorus	Bobolink	G5		S3B		4 ±5
Icterus galbula	Baltimore Oriole	G5		S3B		17 ±5
Icterus galbula	Baltimore Oriole	G5		S3B		62 ±5
Loxia curvirostra	Red Crossbill	G5		S3S4		62 ±5
Loxia curvirostra	Red Crossbill	G5		S3S4		4 ±5
Carex argyrantha	Silvery-flowered Sedge	G5		S3S4		63 ±0.1
Carex tribuloides	Blunt Broom Sedge	G5		S3S4		64 ±0
Sphenopholis intermedia	Slender Wedge Grass	G5		S3S4		65 ±10
Sphenopholis intermedia	Slender Wedge Grass	G5		S3S4		63 ±0.5
Polystichum braunii	Braun's Holly Fern	G5		S3S4		59 ±0
Polystichum braunii	Braun's Holly Fern	G5		S3S4		59 ±0.5
Polystichum braunii	Braun's Holly Fern	G5		S3S4		59 ±1
Polystichum braunii	Braun's Holly Fern	G5		S3S4		59 ±0
Polystichum braunii	Braun's Holly Fern	G5		S3S4		57 ±5
Polystichum braunii	Braun's Holly Fern	G5		S3S4		57 ±5
Polystichum braunii	Braun's Holly Fern	G5		S3S4		57 ±5
Polystichum braunii	Braun's Holly Fern	G5		S3S4		57 ±5
Polystichum braunii	Braun's Holly Fern	G5		S3S4		7 ±1
Puma concolor pop. 1	Cougar - Eastern pop.	G5THQ	DD	SH	indeterminate	41 ±1

Appendix IX. SUMMARY OF BIRD OBSERVATIONS

Summary of Seasonal Observations of bird species at the Hampton Wind Farm Study Site, sorted by number of total observations. All observations were recorded during 2010 field surveys.

		Spring Migration	Breeding Season	Fall Migration	
Scientific Name	**Common Name**	**Observed**	**Observed**	**Observed**	**Total Obs.**
Seiurus aurocapillus	Ovenbird	115	95	8	218
Parus atricapillus	Chickadee, Black capped	25	63	114	202
Dendroica virens	Warbler, Black throated Green	126	39	29	194
Dendroica coronata	Warbler, Yellow Rumped	29	23	36	88
Turdus migratorius	Robin, American	46	29	11	86
Regulus satrapa	Kinglet, Golden Crown	14	21	48	83
Vireo olivaceus	Vireo, Red eyed	7	53	22	82
Catharus guttatus	Thrush, Hermit	31	29	14	74
Cyanocitta cristata	Jay, Blue	5	6	61	72
Mniotilta varia	Warbler, Black and White	32	19	14	65
Vireo solitarius	Vireo, Blue Headed	31	7	10	48
Sitta canadensis	Nuthatch, Red Breasted	9	18	17	44
Junco hyemalis	Junco, Dark eyed	16	4	20	40
Dendroica palmarum	Warbler, Palm	1	0	23	24
Setophaga ruticilla	Redstart, American	14	9	0	23
Dendroica magnolia	Warbler, Magnolia	6	9	4	19
Spinus tristis	Goldfinch, American	2	1	13	16
Corvus corax	Raven	5	2	8	15
Empidonax minimus	Flycatcher, Least	8	6	0	14
Zenaida macroura	Dove, Mourning	12	0	2	14
Dendroica caerulescens	Warbler, Black throated Blue	6	5	1	12
Geothlypis trichas	Common Yellowthroat	1	2	9	12
Zonotrichia albicollis	Sparrow, White throated	7	4	1	12
Anas rubripes	Duck, Black	9	2	0	11
Aythya collaris	Duck, Ring Necked	11	0	0	11
Coccothraustes vespertinus	Grosbeak, Evening	0	0	10	10
Catharus ustulatus	Thrush, Swainsons	3	5	1	9
Loxia leucoptera	Crossbill, White winged	1	8	0	9
Colaptes auratus	Flicker, Northern	3	0	5	8
Picoides villosus	Woodpecker, Hairy	3	1	3	7
Branta canadensis	Goose, Canada	5	0	1	6
Dendroica petechia	Warbler, Yellow	6	0	0	6
Melospiza melodia	Sparrow, Song	1	0	5	6
Bonasa umbellus	Grouse, Ruffed	3	0	2	5
Wilsonia canadensis	**Warbler, Canada**	4	1	0	5
Catharus fuscescens	Veery	1	3	0	4
Poecile hudsonicus	**Chickadee, Boreal**	2	0	2	4
Carpodacus purpureus	Finch, Purple	3	0	0	3
Gavia immer	Loon, Common	2	1	0	3
Picoides pubescens	Woodpecker, Downy	0	1	2	3

Quiscalus quiscula	Grackle	3	0	0	3
Strix varia	Owl, Barred	2	1	0	3
Accipiter striatus	Hawk, Sharp Shin	0	0	2	2
Dryocopus pileatus	Woodpecker, Pileated	0	2	0	2
Empidonax flaviventris	Flycatcher, Yellow Bellied	2	0	0	2
Melospiza georgiana	Sparrow, Swamp	0	0	2	2
Parula americana	Parula, Northern	1	0	1	2
Regulus calendula	Kinglet, Ruby Crown	0	0	2	2
Actitis macularius	Sandpiper, Spotted	0	1	0	1
Archilochus colubris	Hummingbird, Ruby Throated	0	1	0	1
Ardea herodias	Heron, Great Blue	0	0	1	1
Buteo jamaicensis	Hawk, Red-tailed	0	0	1	1
Buteo platypterus	Hawk, Broad winged	0	1	0	1
Certhia americana	Creeper, Brown	0	0	1	1
Falco peregrinus anatum	**Falcon, Perigrine**	0	0	1	1
Mergus merganser	Merganser, Common	1	0	0	1
Phalacorcorax auritus	Cormorant, Double crested	0	1	0	1
Sayornis phoebe	Phoebe, Eastern	0	0	1	1
Seiurus noveboracensis	Waterthrush, Northern	0	1	0	1
Wilsonia pusilla	Warbler, Wilsons	0	0	1	1
Seasonal Totals		**614**	**474**	**509**	**1597**

NS Yellow Listed

NS Red Listed

Appendix X. VEGETATION INVENTORIES

Plant inventory of select wetlands on the proposed Hampton Wind Farm Study Site. Surveys completed in May 2010. Wetland numbers correspond to “Hampton Study Area Habitats Map”.

Scientific Name	Common Name	ACCDC Provincial Rank	Indicator Status
Wetland 1			
Acer rubrum	Red Maple	S5	FAC
Carex trisperma	Three-Seed Sedge	S5	OBL
Gaultheria hispidula	Creeping Snowberry	S5	FACW
Ilex verticillata	Black Holly	S5	OBL
Kalmia angustifolia	Sheep-Laurel	S5	FAC
Listera cordata	Heartleaf Twayblade	S4	FACW+
Nemopanthus mucronata	False Mountain Holly	S5	OBL
Onoclea sensibilis	Sensitive Fern	S5	FACW
Osmunda cinnamomea	Cinnamon Fern	S5	FACW
Picea mariana	Black Spruce	S5	FACW-
Thelypteris noveboracensis	New York Fern	S5	FAC
Viburnum nudum	Possum-Haw Viburnum	S5	OBL
Abies balsamea	Balsam Fir	S5	FAC
Acer rubrum	Red Maple	S5	FAC
Gaultheria hispidula	Creeping Snowberry	S5	FACW
Ilex verticillata	Black Holly	S5	OBL
Iris versicolor	Blueflag	S5	OBL
Nemopanthus mucronata	False Mountain Holly	S5	OBL
Onoclea sensibilis	Sensitive Fern	S5	FACW
Osmunda cinnamomea	Cinnamon Fern	S5	FACW
Thelypteris noveboracensis	New York Fern	S5	FAC
Wetland 2			
Betula alleghaniensis	Yellow Birch	S5	FAC
Carex magellanica	A Sedge	S5	OBL
Carex trisperma	Three-Seed Sedge	S5	OBL
Equisetum sylvaticum	Woodland Horsetail	S5	FACW
Kalmia angustifolia	Sheep-Laurel	S5	FAC
Linnaea borealis	Twinflower	S5	FAC
Nemopanthus mucronata	False Mountain Holly	S5	OBL
Osmunda cinnamomea	Cinnamon Fern	S5	FACW
Osmunda claytoniana	Interrupted Fern	S5	FAC
Rubus pubescens	Dwarf Red Raspberry	S5	FACW+
Vaccinium angustifolium	Late Lowbush Blueberry	S5	FACU-
Viburnum nudum	Possum-Haw Viburnum	S5	OBL
Viola septentrionalis	Northern Blue Violet	S5?	FACU
Abies balsamea	Balsam Fir	S5	FAC
Acer rubrum	Red Maple	S5	FAC
Kalmia angustifolia	Sheep-Laurel	S5	FAC
Maianthemum trifolium	Three-Leaf Solomon's-Plume	S4S5	OBL
Nemopanthus mucronata	False Mountain Holly	S5	OBL
Osmunda cinnamomea	Cinnamon Fern	S5	FACW
Osmunda regalis	Royal Fern	S5	OBL
Rubus pubescens	Dwarf Red Raspberry	S5	FACW+
Toxicodendron radicans	Eastern Poison Ivy	S4	FAC
Viola cucullata	Marsh Blue Violet	S5	FACW+

Wetland 4

Alnus incana	Speckled Alder	S5	FACW
Athyrium filix-femina	Lady-Fern	S5	FAC
Betula alleghaniensis	Yellow Birch	S5	FAC
Coptis trifolia	Goldthread	S5	FACW
Equisetum sylvaticum	Woodland Horsetail	S5	FACW
Iris versicolor	Blueflag	S5	OBL
Nemopanthus mucronata	False Mountain Holly	S5	OBL
Onoclea sensibilis	Sensitive Fern	S5	FACW
Osmunda cinnamomea	Cinnamon Fern	S5	FACW
Rubus pubescens	Dwarf Red Raspberry	S5	OBL
Viburnum nudum	Possum-Haw Viburnum	S5	OBL

Wetland **5**

Acer rubrum	Red Maple	S5	FAC
Alnus viridis	Green Alder	S5	FAC
Betula alleghaniensis	Yellow Birch	S5	FAC
Carex canescens	Hoary Sedge	S5	OBL
Carex leptalea	Bristly-Stalk Sedge	S5	OBL
Clintonia borealis	Clinton Lily	S5	FAC
Fraxinus americana	White Ash	S5	FACU
Iris versicolor	Blueflag	S5	OBL
Maianthemum trifolium	Three-Leaf Solomon's-Plume	S4S5	OBL
Nemopanthus mucronata	False Mountain Holly	S5	OBL
Onoclea sensibilis	Sensitive Fern	S5	FACW
Osmunda cinnamomea	Cinnamon Fern	S5	FACW
Rubus pubescens	Dwarf Red Raspberry	S5	FACW+
Thelypteris palustris	Marsh Fern	S5	OBL
Viburnum nudum	Possum-Haw Viburnum	S5	OBL

Wetland **6**

Acer rubrum	Red Maple	S5	FAC
Kalmia angustifolia	Sheep-Laurel	S5	FAC
Maianthemum canadense	Wild Lily-of-The-Valley	S5	FAC-
Nemopanthus mucronata	False Mountain Holly	S5	OBL
Osmunda cinnamomea	Cinnamon Fern	S5	FACW
Viburnum nudum	Possum-Haw Viburnum	S5	OBL

Wetland 1**0**

Acer rubrum	Red Maple	S5	FAC
Betula alleghaniensis	Yellow Birch	S5	FAC
Calamagrostis canadensis	Blue-Joint Reedgrass	S5	OBL
Lycopus americanus	American Bugleweed	S5	OBL
Onoclea sensibilis	Sensitive Fern	S5	FACW
Osmunda cinnamomea	Cinnamon Fern	S5	FACW
Viburnum nudum	Possum-Haw Viburnum	S5	OBL

Wetland X - not mapped

Acer rubrum	Red Maple	S5	FAC
Athyrium filix-femina	Lady-Fern	S5	FAC
Betula alleghaniensis	Yellow Birch	S5	FAC
Carex gynandra	A Sedge	S5	OBL
Coptis trifolia	Goldthread	S5	FACW
Equisetum sylvaticum	Woodland Horsetail	S5	FACW

Onoclea sensibilis	Sensitive Fern	S5	FACW
Osmunda cinnamomea	Cinnamon Fern	S5	FACW
Rubus pubescens	Dwarf Red Raspberry	S5	OBL
Thelypteris noveboracensis	New York Fern	S5	FAC

APPENDIX XXXX: Inventory of plants within each turbine footprint area Hampton Wind farm. Field Surveys completed September 10th, 2010.

Turbine 1

Species	Common Name	ACCDC Rank	NSDNR Rank
Acer saccharum	Sugar Maple	S5	green
Picea rubens	Red Spruce	S5	green
Actaea pachypoda	White Baneberry	S4	green
Maianthemum canadense	Wild Lily-of-The-Valley	S5	green
Fagus grandifolia	American Beech	S5	green
Abies balsamea	Balsam Fir	S5	green
Polystichum acrostichoides	Christmas Fern	S5	green
Aralia nudicaulis	Wild Sarsaparilla	S5	green
Phegopteris connectilis	Northern Beech Fern	S5	green
Osmunda cinnamomea	Cinnamon Fern	S5	green
Lonicera canadensis	American Fly-Honeysuckle	S5	green
Carex communis	Fibrous-Root Sedge	S5	green
Clintonia borealis	Clinton Lily	S5	green
Thelypteris noveboracensis	New York Fern	S5	green
Lycopodium annotinum	Stiff Clubmoss	S5	green
Dennstaedtia punctilobula	Eastern Hay-Scented Fern	S5	green
Corylus cornuta	Beaked Hazelnut	S5	green
Betula alleghaniensis	Yellow Birch	S5	green
Fraxinus americana	White Ash	S5	green
Acer pensylvanicum	Striped Maple	S5	green
Dryopteris intermedia	Evergreen Woodfern	S5	green
Symphyotrichum lateriflorum	Farewell-Summer	S5	green
Acer rubrum	Red Maple	S5	green
Polygonatum pubescens	Downy Solomon's-Seal	S4S5	green
Medeola virginiana	Indian Cucumber-Root	S5	green
Monotropa uniflora	Indian-Pipe	S5	green
Streptopus lanceolatus	Rosy Twistedstalk	S5	green
Orthilia secunda	One-Side Wintergreen	S5	green
Oxalis montana	White Wood-Sorrel	S5	green
Aster acuminatus	Wood Aster	S5	green

Turbine 2

Species	Common Name	ACCDC Rank	NSDNR Rank
Fagus grandifolia	American Beech	S5	green
Acer saccharum	Sugar Maple	S5	green
Acer rubrum	Red Maple	S5	green
Aralia nudicaulis	Wild Sarsaparilla	S5	green
Betula alleghaniensis	Yellow Birch	S5	green
Dennstaedtia punctilobula	Eastern Hay-Scented Fern	S5	green
Cornus canadensis	Dwarf Dogwood	S5	green
Abies balsamea	Balsam Fir	S5	green
Mitchella repens	Partridge-Berry	S5	green
Thelypteris noveboracensis	New York Fern	S5	green
Dryopteris intermedia	Evergreen Woodfern	S5	green
Picea rubens	Red Spruce	S5	green
Cypripedium acaule	Pink Lady's-Slipper	S5	green
Polystichum acrostichoides	Christmas Fern	S5	green
Medeola virginiana	Indian Cucumber-Root	S5	green
Phegopteris connectilis	Northern Beech Fern	S5	green
Fraxinus americana	White Ash	S5	green
Maianthemum canadense	Wild Lily-of-The-Valley	S5	green
Lycopus americanus	American Bugleweed	S5	green
Streptopus lanceolatus	Rosy Twistedstalk	S5	green
Lycopodium annotinum	Stiff Clubmoss	S5	green
Acer pensylvanicum	Striped Maple	S5	green

Species	Common Name	ACCDC Rank	NSDNR Rank
Coptis trifolia	Goldthread	S5	green
Aster acuminatus	Wood Aster	S5	green
Corylus cornuta	Beaked Hazelnut	S5	green

Turbine 3

Species	Common Name	ACCDC Rank	NSDNR Rank
Acer saccharum	Sugar Maple	S5	green
Picea rubens	Red Spruce	S5	green
Fagus grandifolia	American Beech	S5	green
Aster acuminatus	Wood Aster	S5	green
Maianthemum canadense	Wild Lily-of-The-Valley	S5	green
Thelypteris noveboracensis	New York Fern	S5	green
Polystichum acrostichoides	Christmas Fern	S5	green
Aster macrophyllus	Large leaved Aster	S5	green
Aralia nudicaulis	Wild Sarsaparilla	S5	green
Brachyelytrum septentrionale	Bearded Short-Husk	S4S5	green
Carex gynandra	A Sedge	S5	green
Polygonatum pubescens	Downy Solomon's-Seal	S4S5	green
Acer pensylvanicum	Striped Maple	S5	green
Dryopteris intermedia	Evergreen Woodfern	S5	green
Lonicera canadensis	American Fly-Honeysuckle	S5	green
Viola cucullata	Marsh Blue Violet	S5	green
Trientalis borealis	Northern Starflower	S5	green
Symphyotrichum lateriflorum	Farewell-Summer	S5	green
Carex intumescens	Bladder Sedge	S5	green
Euthamia graminifolia	Flat-Top Fragrant-Golden-Rod	S5	green
Osmunda cinnamomea	Cinnamon Fern	S5	green
Galium palustre	Marsh Bedstraw	S5	green
Onoclea sensibilis	Sensitive Fern	S5	green
Rubus pubescens	Dwarf Red Raspberry	S5	green
Oxalis montana	White Wood-Sorrel	S5	green
Coptis trifolia	Goldthread	S5	green
Mitchella repens	Partridge-Berry	S5	green
Medeola virginiana	Indian Cucumber-Root	S5	green
Clintonia borealis	Clinton Lily	S5	green
Carex trisperma	Three-Seed Sedge	S5	green
Viburnum nudum	Possum-Haw Viburnum	S5	green
Hydrocotyle americana	American Water-Pennywort	S5	green
Carex stipata	Stalk-Grain Sedge	S5	green
Cornus canadensis	Dwarf Dogwood	S5	green
Chelone glabra	White Turtlehead	S5	green
Abies balsamea	Balsam Fir	S5	green
Cypripedium acaule	Pink Lady's-Slipper	S5	green
Dryopteris cristata	Crested Shield-Fern	S5	green
Viburnum lantanoides	Alderleaf Viburnum	S5	green
Iris versicolor	Blueflag	S5	green
Vaccinium myrtilloides	Velvetleaf Blueberry	S5	green
Corylus cornuta	Beaked Hazelnut	S5	green
Prunus serotina	Wild Black Cherry	S5	green
Epifagus virginiana	Beechdrops	S4S5	green
Lycopodium clavatum	Running Pine	S5	green
Carex arctata	Black Sedge	S5	green
Betula populifolia	Gray Birch	S5	green
Rubus idaeus	Red Raspberry	S5	green
Aster umbellatus	Flat-topped White Aster	S5	green
Glyceria striata	Fowl Manna-Grass	S5	green
Osmunda regalis	Royal Fern	S5	green
Acer spicatum	Mountain Maple	S5	green
Streptopus lanceolatus	Rosy Twistedstalk	S5	green

Turbine 4

Species	Common Name	ACCDC Rank	NSDNR Rank
Acer pensylvanicum	Striped Maple	S5	green
Picea rubens	Red Spruce	S5	green
Lycopodium obscurum	Tree Clubmoss	S5	green
Lycopodium annotinum	Stiff Clubmoss	S5	green
Coptis trifolia	Goldthread	S5	green
Aralia nudicaulis	Wild Sarsaparilla	S5	green
Abies balsamea	Balsam Fir	S5	green
Acer rubrum	Red Maple	S5	green
Linnaea borealis	Twinflower	S5	green
Clintonia borealis	Clinton Lily	S5	green
Thelypteris noveboracensis	New York Fern	S5	green
Dryopteris intermedia	Evergreen Woodfern	S5	green
Trientalis borealis	Northern Starflower	S5	green
Streptopus lanceolatus	Rosy Twistedstalk	S5	green
Cornus canadensis	Dwarf Dogwood	S5	green
Betula alleghaniensis	Yellow Birch	S5	green
Betula papyrifera	Paper Birch	S5	green
Osmunda claytoniana	Interrupted Fern	S5	green
Rubus pubescens	Dwarf Red Raspberry	S5	green
Brachyelytrum septentrionale	Bearded Short-Husk	S4S5	green
Medeola virginiana	Indian Cucumber-Root	S5	green
Carex intumescens	Bladder Sedge	S5	green
Lycopodium digitatum	Fan Club-Moss	S5	green

No Turbine 5 Exists

Turbine 6

Species	Common Name	ACCDC Rank	NSDNR Rank
Acer rubrum	Red Maple	S5	green
Fagus grandifolia	American Beech	S5	green
Coptis trifolia	Goldthread	S5	green
Carex arctata	Black Sedge	S5	green
Viola cucullata	Marsh Blue Violet	S5	green
Aster acuminatus	Wood Aster	S5	green
Dryopteris intermedia	Evergreen Woodfern	S5	green
Betula alleghaniensis	Yellow Birch	S5	green
Acer pensylvanicum	Striped Maple	S5	green
Abies balsamea	Balsam Fir	S5	green
Viburnum nudum	Possum-Haw Viburnum	S5	green
Lycopodium annotinum	Stiff Clubmoss	S5	green
Clintonia borealis	Clinton Lily	S5	green
Trientalis borealis	Northern Starflower	S5	green
Aralia nudicaulis	Wild Sarsaparilla	S5	green
Picea rubens	Red Spruce	S5	green
Maianthemum canadense	Wild Lily-of-The-Valley	S5	green
Lonicera canadensis	American Fly-Honeysuckle	S5	green
Thelypteris noveboracensis	New York Fern	S5	green
Polystichum acrostichoides	Christmas Fern	S5	green
Symphyotrichum lateriflorum	Farewell-Summer	S5	green
Acer saccharum	Sugar Maple	S5	green
Medeola virginiana	Indian Cucumber-Root	S5	green
Epifagus virginiana	Beechdrops	S4S5	green
Fraxinus americana	White Ash	S5	green
Streptopus lanceolatus	Rosy Twistedstalk	S5	green

Turbine 7

Species	Common Name	ACCDC Rank	NSDNR Rank

Species	Common Name	ACCDC Rank	NSDNR Rank
Betula alleghaniensis	Yellow Birch	S5	green
Thelypteris noveboracensis	New York Fern	S5	green
Aralia nudicaulis	Wild Sarsaparilla	S5	green
Acer saccharum	Sugar Maple	S5	green
Picea rubens	Red Spruce	S5	green
Lonicera canadensis	American Fly-Honeysuckle	S5	green
Abies balsamea	Balsam Fir	S5	green
Clintonia borealis	Clinton Lily	S5	green
Trientalis borealis	Northern Starflower	S5	green
Acer pensylvanicum	Striped Maple	S5	green
Cornus canadensis	Dwarf Dogwood	S5	green
Medeola virginiana	Indian Cucumber-Root	S5	green
Mitchella repens	Partridge-Berry	S5	green
Oxalis montana	White Wood-Sorrel	S5	green
Cypripedium acaule	Pink Lady's-Slipper	S5	green
Osmunda claytoniana	Interrupted Fern	S5	green
Dryopteris intermedia	Evergreen Woodfern	S5	green
Coptis trifolia	Goldthread	S5	green
Viola sp	Not a sp at risk	n/a	n/a
Brachyelytrum septentrionale	Bearded Short-Husk	S4S5	green
Linnaea borealis	Twinflower	S5	green
Gaultheria procumbens	Teaberry	S5	green
Monotropa uniflora	Indian-Pipe	S5	green
Osmunda cinnamomea	Cinnamon Fern	S5	green
Lycopodium obscurum	Tree Clubmoss	S5	green
Betula populifolia	Gray Birch	S5	green
Scirpus cyperinus	Cottongrass Bulrush	S5	green
Anaphalis margaritacea	Pearly Everlasting	S5	green
Spiranthes lacera	Ladies'-Tresses	S5	green
Aster umbellatus	Flat-topped White Aster	S5	green
Epigaea repens	Trailing Arbutus	S5	green
Drosera rotundifolia	Roundleaf Sundew	S5	green
Kalmia angustifolia	Sheep-Laurel	S5	green
Danthonia spicata	Poverty Oat-Grass	S5	green
Gaultheria hispidula	Creeping Snowberry	S5	green
Juncus canadensis	Canada Rush	S5	green
Viburnum nudum	Possum-Haw Viburnum	S5	green
Eupatorium perfoliatum	Common Boneset	S5	green
Iris versicolor	Blueflag	S5	green
Pinus banksiana	Jack Pine	S4	green
Hamamelis virginiana	American Witch-Hazel	S5	green
Rubus pubescens	Dwarf Red Raspberry	S5	green
Carex trisperma	Three-Seed Sedge	S5	green
Nemopanthus mucronatus	Mountain Holly	S5	green
Glyceria grandis	American Mannagrass	S4S5	green

No Turbine 8 Exists

Turbine 9

Species	Common Name	ACCDC Rank	NSDNR Rank
Acer saccharum	Sugar Maple	S5	green
Fagus grandifolia	American Beech	S5	green
Maianthemum canadense	Wild Lily-of-The-Valley	S5	green
Dryopteris intermedia	Evergreen Woodfern	S5	green
Acer pensylvanicum	Striped Maple	S5	green
Lonicera canadensis	American Fly-Honeysuckle	S5	green
Lycopodium obscurum	Tree Clubmoss	S5	green
Picea rubens	Red Spruce	S5	green

Species	Common Name	ACCDC Rank	NSDNR Rank
Polystichum acrostichoides	Christmas Fern	S5	green
Aster acuminatus	Wood Aster	S5	green
Aralia nudicaulis	Wild Sarsaparilla	S5	green
Prunus serotina	Wild Black Cherry	S5	green
Abies balsamea	Balsam Fir	S5	green
Clintonia borealis	Clinton Lily	S5	green
Lycopodium annotinum	Stiff Clubmoss	S5	green
Dennstaedtia punctilobula	Eastern Hay-Scented Fern	S5	green
Carex intumescens	Bladder Sedge	S5	green
Coptis trifolia	Goldthread	S5	green
Corylus cornuta	Beaked Hazelnut	S5	green
Fraxinus americana	White Ash	S5	green
Oxalis montana	White Wood-Sorrel	S5	green
Platanthera clavellata	Small Green Woodland Orchid	S5	green
Quercus rubra	Northern Red Oak	S5	green
Streptopus lanceolatus	Rosy Twistedstalk	S5	green
Prenanthes trifoliolata	Three-Leaved Rattlesnake-root	S5	green
Brachyelytrum septentrionale	Bearded Short-Husk	S4S5	green
Thelypteris noveboracensis	New York Fern	S5	green
Cypripedium acaule	Pink Lady's-Slipper	S5	green
Phegopteris connectilis	Northern Beech Fern	S5	green

Turbine 10

Species	Common Name	ACCDC Rank	NSDNR Rank
Betula alleghaniensis	Yellow Birch	S5	green
Picea rubens	Red Spruce	S5	green
Acer rubrum	Red Maple	S5	green
Aralia nudicaulis	Wild Sarsaparilla	S5	green
Linnaea borealis	Twinflower	S5	green
Carex trisperma	Three-Seed Sedge	S5	green
Dryopteris intermedia	Evergreen Woodfern	S5	green
Thelypteris noveboracensis	New York Fern	S5	green
Coptis trifolia	Goldthread	S5	green
Acer pensylvanicum	Striped Maple	S5	green
Trientalis borealis	Northern Starflower	S5	green
Clintonia borealis	Clinton Lily	S5	green
Carex intumescens	Bladder Sedge	S5	green
Taxus canadensis	Canadian Yew	S5	green
Aster acuminatus	Wood Aster	S5	green
Aster umbellatus	Flat-topped White Aster	S5	green
Brachyelytrum septentrionale	Bearded Short-Husk	S4S5	green
Solidago rugosa	Rough-Leaf Goldenrod	S5	green
Oxalis montana	White Wood-Sorrel	S5	green
Rubus pubescens	Dwarf Red Raspberry	S5	green
Dennstaedtia punctilobula	Eastern Hay-Scented Fern	S5	green
Osmunda cinnamomea	Cinnamon Fern	S5	green
Euthamia graminifolia	Flat-Top Fragrant-Golden-Rod	S5	green
Acer saccharum	Sugar Maple	S5	green
Lycopodium annotinum	Stiff Clubmoss	S5	green
Rubus allegheniensis	Allegheny Blackberry	S5	green
Rubus idaeus	Red Raspberry	S5	green
Fragaria virginiana	Virginia Strawberry	S5	green
Cypripedium acaule	Pink Lady's-Slipper	S5	green
Polystichum acrostichoides	Christmas Fern	S5	green
Lycopodium obscurum	Tree Clubmoss	S5	green
Carex gynandra	A Sedge	S5	green
Glyceria canadensis	Canada Manna-Grass	S5	green
Symphyotrichum lateriflorum	Farewell-Summer	S5	green

Turbine 11

Species	Common Name	ACCDC Rank	NSDNR Rank
Equisetum sylvaticum	Woodland Horsetail	S5	green
Aster umbellatus	Flat-topped White Aster	S5	green
Dryopteris intermedia	Evergreen Woodfern	S5	green
Linnaea borealis	Twinflower	S5	green
Abies balsamea	Balsam Fir	S5	green
Rubus pubescens	Dwarf Red Raspberry	S5	green
Trientalis borealis	Northern Starflower	S5	green
Coptis trifolia	Goldthread	S5	green
Aralia nudicaulis	Wild Sarsaparilla	S5	green
Fagus grandifolia	American Beech	S5	green
Betula alleghaniensis	Yellow Birch	S5	green
Acer rubrum	Red Maple	S5	green
Picea rubens	Red Spruce	S5	green
Cornus canadensis	Dwarf Dogwood	S5	green
Ilex verticillata	Black Holly	S5	green
Aster acuminatus	Wood Aster	S5	green
Gaultheria procumbens	Teaberry	S5	green
Oxalis montana	White Wood-Sorrel	S5	green
Onoclea sensibilis	Sensitive Fern	S5	green
Fragaria virginiana	Virginia Strawberry	S5	green
Solidago rugosa	Rough-Leaf Goldenrod	S5	green
Acer spicatum	Mountain Maple	S5	green
Thelypteris noveboracensis	New York Fern	S5	green
Streptopus lanceolatus	Rosy Twistedstalk	S5	green
Prenanthes trifoliolata	Three-Leaved Rattlesnake-root	S5	green
Clintonia borealis	Clinton Lily	S5	green
Viburnum nudum	Possum-Haw Viburnum	S5	green
Medeola virginiana	Indian Cucumber-Root	S5	green
Sorbus americana	American Mountain-Ash	S5	green
Cypripedium acaule	Pink Lady's-Slipper	S5	green
Lycopodium obscurum	Tree Clubmoss	S5	green
Lycopodium annotinum	Stiff Clubmoss	S5	green
Maianthemum canadense	Wild Lily-of-The-Valley	S5	green
Viola cucullata	Marsh Blue Violet	S5	green
Lonicera canadensis	American Fly-Honeysuckle	S5	green
Acer saccharum	Sugar Maple	S5	green
Fraxinus americana	White Ash	S5	green
Impatiens capensis	Spotted Jewel-Weed	S5	green

Turbine 12

Species	Common Name	ACCDC Rank	NSDNR Rank
Acer saccharum	Sugar Maple	S5	green
Abies balsamea	Balsam Fir	S5	green
Picea rubens	Red Spruce	S5	green
Acer pensylvanicum	Striped Maple	S5	green
Coptis trifolia	Goldthread	S5	green
Maianthemum canadense	Wild Lily-of-The-Valley	S5	green
Pteridium aquilinum	Bracken Fern	S5	green
Aralia nudicaulis	Wild Sarsaparilla	S5	green
Dryopteris intermedia	Evergreen Woodfern	S5	green
Clintonia borealis	Clinton Lily	S5	green
Aster acuminatus	Wood Aster	S5	green
Lycopodium annotinum	Stiff Clubmoss	S5	green
Betula alleghaniensis	Yellow Birch	S5	green
Fagus grandifolia	American Beech	S5	green
Thelypteris noveboracensis	New York Fern	S5	green
Streptopus lanceolatus	Rosy Twistedstalk	S5	green
Lycopodium obscurum	Tree Clubmoss	S5	green

Species	Common Name	ACCDC Rank	NSDNR Rank
Trientalis borealis	Northern Starflower	S5	green
Cornus canadensis	Dwarf Dogwood	S5	green
Osmunda cinnamomea	Cinnamon Fern	S5	green
Lonicera canadensis	American Fly-Honeysuckle	S5	green
Sorbus americana	American Mountain-Ash	S5	green
Linnaea borealis	Twinflower	S5	green
Medeola virginiana	Indian Cucumber-Root	S5	green
Vaccinium myrtilloides	Velvetleaf Blueberry	S5	green
Polystichum acrostichoides	Christmas Fern	S5	green
Phegopteris connectilis	Northern Beech Fern	S5	green
Prenanthes trifoliolata	Three-Leaved Rattlesnake-root	S5	green
Viburnum nudum	Possum-Haw Viburnum	S5	green
Viburnum lantanoides	Alderleaf Viburnum	S5	green
Mitchella repens	Partridge-Berry	S5	green
Gaultheria procumbens	Teaberry	S5	green
Quercus rubra	Northern Red Oak	S5	green
Oxalis montana	White Wood-Sorrel	S5	green
Acer spicatum	Mountain Maple	S5	green
Aster umbellatus	Flat-topped White Aster	S5	green
Brachyelytrum septentrionale	Bearded Short-Husk	S4S5	green
Glyceria striata	Fowl Manna-Grass	S5	green
Eupatorium perfoliatum	Common Boneset	S5	green
Rosa sp	not a sp at risk	n/a	n/a
Carex gynandra	A Sedge	S5	green
Solidago rugosa	Rough-Leaf Goldenrod	S5	green
Rubus allegheniensis	Allegheny Blackberry	S5	green
Symphyotrichum puniceum	Swamp Aster	S5	green
Viola cucullata	Marsh Blue Violet	S5	green
Galium palustre	Marsh Bedstraw	S5	green
Taxus canadensis	Canadian Yew	S5	green

Turbine 13

Species	Common Name	ACCDC Rank	NSDNR Rank
Acer saccharum	Sugar Maple	S5	green
Picea rubens	Red Spruce	S5	green
Betula alleghaniensis	Yellow Birch	S5	green
Fagus grandifolia	American Beech	S5	green
Trientalis borealis	Northern Starflower	S5	green
Aralia nudicaulis	Wild Sarsaparilla	S5	green
Abies balsamea	Balsam Fir	S5	green
Dryopteris intermedia	Evergreen Woodfern	S5	green
Aster acuminatus	Wood Aster	S5	green
Acer rubrum	Red Maple	S5	green
Cypripedium acaule	Pink Lady's-Slipper	S5	green
Maianthemum canadense	Wild Lily-of-The-Valley	S5	green
Lycopus americanus	American Bugleweed	S5	green
Carex arctata	Black Sedge	S5	green
Medeola virginiana	Indian Cucumber-Root	S5	green
Coptis trifolia	Goldthread	S5	green
Epifagus virginiana	Beechdrops	S4S5	green
Monotropa uniflora	Indian-Pipe	S5	green
Hieracium paniculatum	Panicled Hawkweed	S3	green
Veronica officinalis	Gypsy-Weed	S5SE	green
Polygonatum pubescens	Downy Solomon's-Seal	S4S5	green
Symphyotrichum lateriflorum	Farewell-Summer	S5	green
Solidago flexicaulis	Broad-Leaved Goldenrod	S5	green
Solidago rugosa	Rough-Leaf Goldenrod	S5	green

Turbine 14

Species	Common Name	ACCDC Rank	NSDNR Rank

Species	Common Name	ACCDC Rank	NSDNR Rank
Fagus grandifolia	American Beech	S5	green
Fraxinus americana	White Ash	S5	green
Acer rubrum	Red Maple	S5	green
Betula alleghaniensis	Yellow Birch	S5	green
Thelypteris noveboracensis	New York Fern	S5	green
Polystichum acrostichoides	Christmas Fern	S5	green
Aster acuminatus	Wood Aster	S5	green
Trientalis borealis	Northern Starflower	S5	green
Lonicera canadensis	American Fly-Honeysuckle	S5	green
Acer pensylvanicum	Striped Maple	S5	green
Solidago rugosa	Rough-Leaf Goldenrod	S5	green
Brachyelytrum septentrionale	Bearded Short-Husk	S4S5	green
Medeola virginiana	Indian Cucumber-Root	S5	green
Aralia nudicaulis	Wild Sarsaparilla	S5	green
Picea rubens	Red Spruce	S5	green
Lycopodium annotinum	Stiff Clubmoss	S5	green
Clintonia borealis	Clinton Lily	S5	green
Cypripedium acaule	Pink Lady's-Slipper	S5	green
Symphyotrichum lateriflorum	Farewell-Summer	S5	green
Maianthemum canadense	Wild Lily-of-The-Valley	S5	green
Carex gynandra	A Sedge	S5	green
Lycopus americanus	American Bugleweed	S5	green
Coptis trifolia	Goldthread	S5	green
Osmunda claytoniana	Interrupted Fern	S5	green
Mitchella repens	Partridge-Berry	S5	green
Betula papyrifera	Paper Birch	S5	green
Phegopteris connectilis	Northern Beech Fern	S5	green
Carex intumescens	Bladder Sedge	S5	green

APPENDIX XXX: A list of all vascular plants inventoried at the proposed Hampton Wind Farm study site. A short, but incomplete, list of incidental lichen and bryophyte species of interest is included. S rank is the Nova Scotia Provincial Rank as issued by the Atlantic Canada Conservation Data Center. NSDNR Status is the General Status Rank of Wild Species in Nova Scotia as issued by the Nova Scotia Department of Natural Resources. Field surveys completed May 24th, 25th, August 15th, and September 10th, 2010.

VASCULAR PLANTS			
Species	**Common Name**	**ACCDC S-Rank**	**NSDNR Status**
Hepatica nobilis	**Round-Lobe Hepatica**	**S1**	**Red**
Conopholis americana	**Squaw-Root**	**S1S2**	**Red**
Asplenium trichomanes	**Maidenhair Spleenwort**	**S2**	**Yellow**
Maianthemum trifolium	Three-Leaf Solomon's-Plume	S4	Green
Toxicodendron radicans	Eastern Poison Ivy	S4	Green
Maianthemum stellatum	Starflower Solomon's-Plume	S4	Green
Ranunculus recurvatus	Hooked Crowfoot	S4	Green
Actaea pachypoda	White Baneberry	S4	Green
Viola renifolia	Kidney-Leaf White Violet	S4	Green
Woodsia ilvensis	Rusty Woodsia	S4	Green
Brachyelytrum septentrionale	Bearded Short-Husk	S4S5	Green
Polygonatum pubescens	Downy Solomon's-Seal	S4S5	Green
Tsuga canadensis	Eastern Hemlock	S4S5	Green
Geranium robertianum	Herb-Robert	S4S5	Green
Acer rubrum	Red Maple	S5	Green
Acer pensylvanicum	Striped Maple	S5	Green
Picea rubens	Red Spruce	S5	Green
Abies balsamea	Balsam Fir	S5	Green
Clintonia borealis	Clinton Lily	S5	Green
Medeola virginiana	Indian Cucumber-Root	S5	Green
Thelypteris noveboracensis	New York Fern	S5	Green
Aralia nudicaulis	Wild Sarsaparilla	S5	Green
Coptis trifolia	Goldthread	S5	Green
Maianthemum canadense	Wild Lily-of-The-Valley	S5	Green
Lycopodium obscurum	Tree Clubmoss	S5	Green
Cypripedium acaule	Pink Lady's-Slipper	S5	Green
Fagus grandifolia	American Beech	S5	Green
Populus tremuloides	Quaking Aspen	S5	Green
Osmunda cinnamomea	Cinnamon Fern	S5	Green
Pteridium aquilinum	Bracken Fern	S5	Green
Lycopodium annotinum	Stiff Clubmoss	S5	Green
Lonicera canadensis	American Fly-Honeysuckle	S5	Green
Viburnum lantanoides	Alderleaf Viburnum	S5	Green
Cornus canadensis	Dwarf Dogwood	S5	Green
Streptopus lanceolatus	Rosy Twistedstalk	S5	Green
Sorbus americana	American Mountain-Ash	S5	Green
Mitchella repens	Partridge-Berry	S5	Green
Viola cucullata	Marsh Blue Violet	S5	Green
Viola macloskeyi	Smooth White Violet	S5	Green
Phegopteris connectilis	Northern Beech Fern	S5	Green
Prenanthes trifoliolata	Three-Leaved Rattlesnake-root	S5	Green
Rubus pubescens	Dwarf Red Raspberry	S5	Green
Carex communis	Fibrous-Root Sedge	S5	Green
Vaccinium myrtilloides	Velvetleaf Blueberry	S5	Green
Dryopteris intermedia	Evergreen Woodfern	S5	Green

Dennstaedtia punctilobula	Eastern Hay-Scented Fern	S5	Green
Carex leptonervia	Finely-Nerved Sedge	S5	Green
Aster acuminatus	Whorled Wood Aster	S5	Green
Polystichum acrostichoides	Christmas Fern	S5	Green
Scutellaria galericulata	Hooded Skullcap	S5	Green
Onoclea sensibilis	Sensitive Fern	S5	Green
Osmunda cinnamomea	Cinnamon Fern	S5	Green
Dryopteris carthusiana	Spinulose Shield Fern	S5	Green
Ilex verticillata	Black Holly	S5	Green
Taxus canadensis	Canadian Yew	S5	Green
Athyrium filix-femina	Lady-Fern	S5	Green
Oxalis montana	White Wood-Sorrel	S5	Green
Osmunda claytoniana	Interrupted Fern	S5	Green
Juncus effusus	Soft Rush	S5	Green
Equisetum sylvaticum	Woodland Horsetail	S5	Green
Hamamelis virginiana	American Witch-Hazel	S5	Green
Viburnum nudum	Possum-Haw Viburnum	S5	Green
Carex magellanica	A Sedge	S5	Green
Nemopanthus mucronatus	Mountain Holly	S5	Green
Kalmia angustifolia	Sheep-Laurel	S5	Green
Carex trisperma	Three-Seed Sedge	S5	Green
Betula alleghaniensis	Yellow Birch	S5	Green
Picea glauca	White Spruce	S5	Green
Picea mariana	Black Spruce	S5	Green
Ledum groenlandicum	Common Labrador Tea	S5	Green
Gaultheria hispidula	Creeping Snowberry	S5	Green
Equisetum arvense	Field Horsetail	S5	Green
Pinus strobus	Eastern White Pine	S5	Green
Cornus canadensis	Dwarf Dogwood	S5	Green
Carex leptalea	Bristly-Stalk Sedge	S5	Green
Myrica pensylvanica	Northern Bayberry	S5	Green
Fraxinus americana	White Ash	S5	Green
Osmunda regalis	Royal Fern	S5	Green
Photinia melanocarpa	Black Chokeberry	S5	Green
Quercus rubra	Northern Red Oak	S5	Green
Carex stipata	Stalk-Grain Sedge	S5	Green
Lycopodium clavatum	Running Pine	S5	Green
Carex intumescens	Bladder Sedge	S5	Green
Lycopodium obscurum	Tree Clubmoss	S5	Green
Acer saccharum	Sugar Maple	S5	Green
Acer spicatum	Mountain Maple	S5	Green
Dryopteris marginalis	Marginal Wood-Fern	S5	Green
Sambucus racemosa	Red Elderberry	S5	Green
Corylus cornuta	Beaked Hazelnut	S5	Green
Luzula acuminata	Hairy Woodrush	S5	Green
Coptis trifolia	Goldthread	S5	Green
Clintonia borealis	Clinton Lily	S5	Green
Carex canescens	Hoary Sedge	S5	Green
Fragaria virginiana	Virginia Strawberry	S5	Green
Ostrya virginiana	Eastern Hop-Hornbeam	S5	Green
Antennaria howellii ssp. neodioica	Pussy-Toes	S5	Green
Polypodium virginianum	Rock Polypody	S5	Green
Calamagrostis canadensis	Blue-Joint Reedgrass	S5	Green
Lycopus americanus	American Bugleweed	S5	Green

Rhododendron canadense	Rhodora	S5	Green
Iris versicolor	Blueflag	S5	Green
Diervilla lonicera	Northern Bush-Honeysuckle	S5	Green
Populus grandidentata	Large-Tooth Aspen	S5	Green
Prunus virginiana	Choke Cherry	S5	Green
Prunus serotina	Wild Black Cherry	S5	Green
Carex gynandra	A Sedge	S5	Green
Viola septentrionalis	Northern Blue Violet	S5?	Green
Anthoxanthum odoratum	Sweet Vernal Grass	SE	n/a
Rosa sp	Rosa	not a species at risk	
Amelanchier sp	Serviceberry	not a species at risk	
Mentha sp	Mint	not a species at risk	

BRYOPHYTES

Species		ACCDC S-Rank	NSDNR Rank
Sphagnum fallax	A peatmoss	S?	
Sphagnum wulfianum	A peatmoss	S2S3	
Sphagnum subsecundum	A peatmoss	S2S3	
Sphagnum girgensohnii	A peatmoss	S5	
Sphagnum palustre	A peatmoss	S5	
Sphagnum magellanicum	A peatmoss	S5	

LICHENS

Species		ACCDC S-Rank	NSDNR Rank
Leptogium saturninum	**A lichen**	**SNR**	**Yellow**
Spilonema revertens	**A lichen**	**SNR**	**Red**
Parmeliella tryptophylla	A lichen	SU	Green
Lobaria pulmonaria	A lichen	S4S5	Green
Lobaria scrobiculata	A lichen	S4S5	Green
Lobaria quercizans	A lichen	S4S5	Green
Collema subflaccidum	A lichen	S4S5	Green
Parmotrema crinitum	A lichen	S4S5	Green
Heterodermia neglecta	A lichen	S4S5	Green
Parmelia squarrosa	A lichen	S4S5	Green
Melanelia subaurifera	A lichen	S4S5	Green
Punctelia rudecta	Speckleback Lichen	S4S5	Green
Nephroma laevigatum	A lichen	S4S5	Green
Lasallia papillosa	Toadskin Lichen	S4S5	Green

Appendix XI. BAT SPECIES INVENTORY & ACTIVITY

Bat species composition and activity at the site of the proposed wind turbine farm at Hampton Mountain, Nova Scotia.

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1.0 Context

The proponent is proposing to install electricity generating wind turbines on Hampton Mountain of the Annapolis Valley between Valley View Provincial Park and Rumsay Lake (approx UTM 317812 4971786, NAD 83). The Renewable Energy Plan for the Province of Nova Scotia has an objective that, by 2015, 25% of its energy will be acquired from renewable sources such as wind. Wind energy is commonly cited as a "green" energy source because once in operation it does not contribute direct atmospheric emissions, uses limited land area for operation and requires minimal economic expenditure following decommission (Andersen and Jensen, 2000). Despite these advantages, there are several potential negative effects of wind energy generation on wildlife and wildlife habitat. Direct mortality of birds and bats from collisions with turbine generators, or other facility structures, has recently been documented at several facilities (Erickson et al., 2001; Johnson, 2005; Kunz et al., 2007; Osborn et al., 2000). Additionally, bats may also be killed from barotrauma associated with moving turbine blades (Baerwald et al., 2008). Beyond these direct effects, habitat loss or alteration can

also affect wildlife during the construction of facilities. Lastly, the construction and operation of facilities may also cause wildlife to abandon areas through disturbances to their patterns of use. The goal of this study was to provide information on bat species occurrence in the proposed development area and their resource requirements that might be useful for informing the decision-making process on whether there might be any negative impact of the proposed development on local bat populations.

2.0 Study Objectives

Consistent with the requirements as set out in the by the NS Dept of Environment and Labour (NSDEL, 2007, updated September 2009) we had the following objectives for this project:

(1) To review of the potential impacts of wind turbine developments on bats.

(2) To provide a summary of the ecology of the bat species that are likely to be present in the area that is relevant to the proposed development.

(3) To assess whether there are any known bat hibernacula within 25 km of the proposed development site.

(4) To conduct a survey to determine local species richness and assess the level of bat activity levels at the site.

3.0 Review of Key Issues

By now, it is widely known that some wind turbine farms are a major source of mortality for many bat species (Barclay et al., 2007; Johnson, 2005), whereas other farms cause few, if any, direct mortalities. Estimates of the number of bat fatalities is highly variable ranging from less than 3 up to 50 bats/turbine/year (Jain et al., 2007a; Johnson et al., 2003a; Johnson et al., 2003b; Kerns et al., 2005; Kerns and Kerlinger, 2004;

Nicholson, 2003). These estimates have occurred in various landscapes from agricultural, mixed woodland-shrub-grasslands to forested ridges. Approximately 80% of the documented bat fatalities are migratory species especially in areas of western North America (Kunz et al., 2007). Smaller numbers of resident hibernating species have also been documented in fatalities in high numbers in the eastern United States (Kunz et al. 2007). Mortalities occur due to direct strikes of the animals with the rotating turbine blades or by experiencing a rapid drop in pressure as they fly in proximity to the rotating blades-barotrauma (Baerwald et al., 2008). Beyond direct mortalities, additional potential impacts to bats from wind farm developments include changes to habitat availability and changes to movement patterns (e.g., foraging movements, localized resident migrations and large scale migrations).

3.1 Direct Mortality (Collisions or Barotrauma)

In North America, large bat fatality events occur primarily in late summer and early fall and the species most affected are the long distance migrant species including hoary bats (*Lasiurus cinereus*), silver-haired bats (*Lasionycteris noctivagans*) and eastern red bats (*Lasiurus borealis*). However, bat fatalities have also been reported, in smaller numbers for short-distance migrant (or 'resident') bat species such as the tri-colored bat (*Perimyotis subflavus;* the common name of this species was formerly the eastern pipistrelle), northern long-eared bat (*Myotis septentrionalis*) and little brown bats (*Myotis lucifugus*) (Jain et al., 2007a; Johnson, 2005; Nicholson, 2003). Although some mortality has been documented in the spring (see review in Arnett et al., 2008; Brown and Hamilton, 2006) it is thought that spring migration behavior is scattered and less organized and may occur by different routes compared to fall migration.

The large variability in species composition and rates of fatalities among wind generation facilities has been suggested to be due to the placement of facilities (e.g., along migratory routes or not), and from the use of increasingly larger turbines which extend into the flight space of migrating bats (Barclay et al., 2007). However, behavioral observations suggest that bats that are killed often display foraging – type flight pattern rather than simply passing through the area (Horn et al., 2008). Further, bat mortalities tend to occur more often during nights with low windspeed (Horn et al., 2008). Therefore, as mortalities may be a result of site- and design-specific characteristics and conditions, it is important to conduct site-specific monitoring studies to make reliable inferences on the potential impacts of a wind farms on bat populations (Mammalogists, 2008).

3.2 Movement Patterns

Resource selection by bats occur across different scales and therefore the effects of alterations to habitats and movements can also be at different scales. At a localized level, resident bats can be affected by wind power project developments in alterations to their daily foraging and/or commuting movements between roosting and foraging areas. There is some genetic evidence to suggest that bat movements can be impeded by fragmentation of habitat which can scale up to population or distributional level effects (Kerth and Petit, 2005). However this is not well understood for most species.

Little is also known about the dynamics of movement (e.g., altitude and travel routes) of 'resident' bats (e.g., little brown and northern long-eared bats) to and from hibernation sites. Anecdotal evidence suggests that bats would likely use ridges and other linear landscape elements (riparian corridors) as travel routes depending on the

landscape (Arnett, 2005; Lausen, 2007). In the late summer, bats begin to congregate at hibernacula 1-2 months before the onset of hibernation when courtship and copulation is believed to occur (Fenton, 1969). During this period bats do not roost inside the hibernacula and research we are conducting in Nova Scotia indicates that resident bats are 'on the move' roosting transiently on the landscape. However, at this time we do not fully understand the dynamics of these behaviors and this is an active area of research.

Movement data from Ontario suggests that resident bats move up to at least 120 km between hibernacula within a year and up to at least 500 km between years (Fenton, 1969). In New England bats moved 214 km between hibernacula within one year with one female moving 128 km in only 3 nights during the spring emergence from hibernation (Davis and Hitchcock, 1965) which demonstrates large scale movements by resident hibernating species. Flight behavior (height above ground level, routes, etc.) during this time is likely different from when they are on the 'summering grounds'. The paucity of information on this aspect of bat biology would appear to be one of the largest impediments in accurately predicting the impact of wind farms on bats (Weller et al., 2009). This is, of course, assuming that mortality of bats at wind farms are not the result of being attracted to them out of curiosity, as sites for mating or for some other reason (Cryan, 2008; Horn et al., 2008).

3.3 Habitat Availability

The management and removal of vegetation alters the physical structure (species composition, tree densities, seral stage etc.) of existing bat habitats at multiple spatial scales from localized sites to larger landscapes. Habitat availability for bats can be

altered by the direct loss of resources (e.g., roost trees), fragmentation of habitat components (e.g., foraging and roosting areas), and from disturbances which can cause bats to avoid certain areas. The alteration of forest structure (removal and fragmentation of trees for road building and deployment of turbines, etc.) for the development will likely act to degrade the local environment for colonies/populations that reside in the area during the summer. Specifically this can be done by eliminating roost trees and isolating remaining ones as well as eliminating or degrading foraging areas. This negative aspect is likely to occur and will add to the cumulative effect of loss of bat habitat that is occurring throughout the range of these species.

At the site level, small scale clearing has been shown to attract certain bat species to foraging areas relative to adjacent undisturbed forest in forested landscapes (Grindal and Brigham, 1998; Hayes and Loeb, 2007). Vegetation removal can create edge habitats or small clearings which provide ease of flight and can concentrate insect prey. However, it is not known to what extent this loss can be considered as beneficial to bats because there must be a balance between the availability of suitable foraging areas with the availability of roosting resources (within connected, commuting distance) to provide suitable summer habitat for resident bats (e.g., Henderson and Broders, 2008). Therefore, forest removal and alterations may still act to cause bats to abandon summer sites. In general, it is difficult to assess the impacts of habitat and resource changes on bat populations because there is little information on bat distributions, habitat use and population dynamics especially at a regional management scale.

4.0 Bat Species in Nova Scotia

In Nova Scotia there are occurrence records for seven bat species (each of the 6 mentioned above as well as the big brown bat, *Eptesicus fuscus*; Table 1) (Broders et al., 2003; van Zyll De Jong, 1985), and each have been documented to have experienced fatalities at wind turbine sites. Nova Scotia is at, or near the periphery of the current known range for each of these species, with the exceptions of the northern long-eared bat and the little brown bat (van Zyll De Jong, 1985). These two species, as well as the tri-colored bat, appear to be the only bat species with significant populations in Nova Scotia (Broders et al., 2003; Farrow, 2007b). Little brown bats and northern long-eared bats are widespread in Nova Scotia while the population of tri-colored bats in Nova Scotia appears to be restricted to southwestern region (Broders et al., 2003; Farrow, 2007b; Rockwell, 2005). The low number of echolocation recordings of migratory species (i.e., red, hoary and silver-haired bats; 15 out of 30 000 echolocation sequences) by Broders (2003) and other unpublished work suggests there are no significant populations or migratory movements of these species in southwest Nova Scotia. As for big brown bats, there is only one unconfirmed observation of 2 individuals of this species hibernating at Hayes Caves, there are no other confirmed records (Moseley, 2007; Taylor, 1997).

Table 1. Bat species previously documented to occur in or off-shore of Nova Scotia

Common name	Scientific name	Overwintering Strategy	Documented in known fatalities[1]	Global Ranking[2]	ACCDC status[3]
little brown bat	*Myotis lucifugus*	Resident hibernator (NS and NB)	Yes	G5	S4
northern long-eared bat	*Myotis septentrionalis*	Resident hibernator (NS and NB)	Yes	G4	S2
tri-colored bat	*Perimyotis subflavus*	Resident hibernator (NS and NB)	Yes	G5	S1?
big brown bat	*Eptesicus fuscus*	Resident hibernator (NB)	Yes	G5	N/A
hoary bat	*Lasiurus cinereus*	Migratory	Yes	G5	S2?
silver-haired bat	*Lasionycterus noctivagans*	Migratory	Yes	G5	S1?
eastern red bat	*Lasiurus borealis*	Migratory	Yes	G5	S2?

[1] Bat species documented in fatality events from carcass surveys conducted at other wind energy development sites in N.A.

[2]Global ranking based on the NatureServe Explorer, G5= **Secure**—Common; widespread and abundant: G4= **Apparently Secure**—Uncommon but not rare; some cause for long-term concern due to declines or other factors.

[3]Atlantic Canada Conservation Data Centre ranking, based on occurrence records from NB and NS; S1= **Extremely rare**--May be especially vulnerable to extirpation (typically 5 or fewer occurrences or very few individuals; S2= **Rare**--May be vulnerable to extirpation due to rarity or other factors (6 to 20 occurrences or few remaining individuals); S4= **Usually widespread--** fairly common and apparently secure with many occurrences; (?) qualified as inexact or uncertain.

4.1 Summary of the ecology of resident species

Northern long-eared and little brown bats are expected to be the most frequently encountered species in the proposed development area. The life history of both of these species is typical for temperate bats. Their annual cycle consists of a period of activity (reproduction) in the summer and a hibernation period in the winter. Females of the two species bear the cost of reproduction in the summer from pregnancy and by providing

sole parental care to juveniles (Barclay, 1991; Broders et al., 2006; Hamilton and Barclay, 1994). The northern long eared bat is a forest interior species that primarily roosts and forages in the interior of forests (Broders et al., 2006; Henderson and Broders, 2008; Jung et al., 2004). Females form maternity roosting colonies in coniferous or deciduous trees, depending on availability (Broders et al., 2006; Foster and Kurta, 1999; Garroway and Broders, 2008). Males typically roost solitarily in either deciduous or coniferous trees (Ford et al., 2006; Jung et al., 2004; Lacki and Schwierjohann, 2001).

The little brown bat is a generalist species, associated with forests, as well as human-dominated environments (Barclay, 1982; Jung et al., 1999b). This species has been found to forage over water and in forests (Anthony and Kunz, 1977; Fenton and Barclay, 1980) and both males and females (*i.e.*, maternity colonies) have been shown to roost in buildings and trees (Broders and Forbes, 2004; Crampton and Barclay, 1998). During the summer it appears that most of the commuting and foraging activity of northern long-eared and little brown bats occurs close to the ground (Broders, 2003). Regardless, our ability to sample bat activity at high altitudes is extremely limited and therefore our ability to make inference on the vertical distribution of bats is extremely limited.

A third species that is likely to occur in the proposed development area is the tri-colored bat (*Perimyotis subflavus*) (Farrow and Broders, 2010). In Nova Scotia, work that we have done in Kejimkujik National Park suggests that this species roosts is Usnea spp. lichen and forage over waterways (Poissant, 2009). Although there are a few records of tri-colored bats at known hibernacula (Garroway, 2004; Moseley, 2007;

Poissant, 2007), we believe that there are other yet-to-be-found sites at which this species hibernate.

4.2 Potential for hibernacula in project area

The guide to wind development prepared by the Nova Scotia Department of Environment and Labour (NSDEL, 2007, updated September 2009) states that wind farm sites within 25 km of a known bat hibernaculum have a 'very high' site sensitivity. Based on published literature, only one site (Vault Cave) which is approximately 25 kms from the proposed development site, was known to have the potential to be a hibernacula in the area (Moseley, 2007). To my knowledge, prior to this fall no survey work was done at this site since Moseley's visit in October 1973 at which point Moseley notes that a few bats were seen. During the swarming period this fall, we conducted a systematic trap survey at this site and our results suggests this site has the potential to be a major hibernacula with 234 bats captured at the entrance of the cave (Randall and Broders, unpublished). In our experience of conducting similar surveys at tens of other sites in Nova Scotia, this result is suggestive of a significant hibernation site. No investigation of the inside of the cave was conducted.

Additionally, there are at least 29 government records of abandoned mines within 25 kms of the proposed development site with 3 near Slokum brook and the remaining 26 near Torbrook. Although there is only scant data available on these sites it would appear that each of the 3 sites at Slokum brook would be unsuitable as the maximum original depth indicated is 6 m. Of the remaining 26 sites at Torbrook, 2 have original depths listed as 50 and 55m, all others are <10m. Therefore, based on the available data, the

potential for there to be hibernacula in abandoned mines within 25 kms of the proposed development site is low.

5.0 Environmental Context

The Hampton Mountain wind project is located north of the town of Bridgetown, NS. The project is located in the valley district of the Triassic lowlands theme region. This region has the most favorable climates in Nova Scotia with less precipitation than elsewhere. Forests in this area are characterized by red spruce, eastern hemlock, oak and maples (Davis and Browne, 1996).

Currently in Nova Scotia, there are approximately 50 wind turbines in operation and, as of yet, there have been only a couple of bat mortalities (Elderkin, NSDNR, pers. comm. August 2010). For context and qualification though most of these turbines have been operating for only a short period of time (months to a few years) and it is not known how thoroughly existing operational turbines are being surveyed for bat kills and how well documented and reported the finding are. Therefore, it is not advisable to only rely on this data to make predictions for elsewhere in the region and into the future.

6.0 Acoustic Detection Methods

We used Anabat bat detectors (Titley electronics, Ballina, NSW, Australia) to sample the echolocation calls of bats. The seasonal timing of the sampled period likely corresponded to the end of the summer residency period and the fall migration period (Griffin, 1945; Kunz et al., 2007). A detector was deployed at ground level along a forest edge located in the clearing for the meterological tower within the project area. This unit was placed in a weather proof casing with the microphone protected inside an angled

PVC conduit such that the angle of reception to the microphone was at 45 degrees to the ground and oriented parallel to the forest edge (Weller and Zabel, 2002). A second detector was placed approximately 25 m above ground level on the platform of a fire tower to record bat echolocation sequences at height more representative of airspace where the turbine blades will be operating and to maximize the chances of recording any high-flying migratory bats. Both bat detectors were programmed to record calls from 1900 until 0700 daily.

Identification of many bat species is possible because of the distinctive nature of their echolocation calls (Fenton and Bell, 1981; O'Farrell et al., 1999). Species were qualitatively identified from echolocation sequences by comparison with known echolocation sequences recorded in this and other geographic regions. In the case of species in the genus Myotis (northern long-eared bat and little brown bat), we did not identify sequences to the species level, as their calls are too similar to be reliably separated. Identifications were accomplished using frequency-time graphs in ANALOOK software (C. Corben, www.hoarybat.com). An anabat echolocation file that approximates a call sequence, defined as a continuous series of greater than two calls (Johnson et al., 2004), was used as the unit of activity.

7.0 Acoustic Detection Results

Echolocation surveys were conducted on the site from 19 July 2010 until 9 October 2010 (Table 2). A total of 3008 bat-produced ultrasonic sound files were recorded (2845 on the ground and 163 on the tower). The average number of bat passes recorded on the ground-based detector from 19 July until 25 August 2010 was 75 per night. For context, in 129 nights of monitoring along 5 forested edges from June-August

1999 in the Greater Fundy National Park Ecosystem, the average number of sequences per night was 27 (SD = 44) (Broders unpublished data). The level of activity found at the Hampton Mountain site was therefore higher than the nightly magnitude of activity found during the summer in southern New Brunswick. Most of the recorded sequences (>99%) were attributable to the two common *Myotis* species found throughout Nova Scotia. Although, as stated, there was no attempt to identify these sequences to species because of the difficulty in achieving defensible identifications, several of the recorded echolocation sequences that had characteristics of both northern long-eared and little brown bat. This is supportive of our expectation that both species are present in the area. We recorded a number of echolocation sequences that were attributable to tricolored bats and 1 sequence on each of the ground- and tower- based systems that was attributable to either silver-haired bat or big brown bat.

Table 1: Number of Anabat echolocation files recorded on the ground- and tower- based bat detectors at the proposed wind farm site at Hampton Mountain, 2010..

	Ground-based system				Tower- based system		
Evening of	Myotis spp.	Silver-haired/Big brown bat	Tri-colored bat	Evening of	Myotis spp.	Silver-haired/Big brown bat
19-Jul-10	116	0	2	7-Sep-10	17	0
20-Jul-10	149	0	0	8-Sep-10	8	0
21-Jul-10	60	0	1	9-Sep-10	18	1
22-Jul-10	82	0	1	10-Sep-10	5	0
23-Jul-10	117	0	1	11-Sep-10	1	0
24-Jul-10	66	0	1	12-Sep-10	5	0
25-Jul-10	54	0	0	13-Sep-10	12	0
26-Jul-10	17	0	0	14-Sep-10	4	0
27-Jul-10	48	0	0	15-Sep-10	8	0
28-Jul-10	31	0	0	16-Sep-10	2	0
29-Jul-10	50	0	0	17-Sep-10	4	0
30-Jul-10	53	0	0	18-Sep-10	6	0
31-Jul-10	22	0	0	19-Sep-10	6	0
1-Aug-10	59	0	0	20-Sep-10	0	0
2-Aug-10	81	0	1	21-Sep-10	3	0
3-Aug-10	38	0	0	22-Sep-10	2	0
4-Aug-10	8	0	0	23-Sep-10	3	0
5-Aug-10	2	0	0	24-Sep-10	0	0
6-Aug-10	96	0	0	25-Sep-10	0	0
7-Aug-10	96	0	0	26-Sep-10	3	0
8-Aug-10	82	0	0	27-Sep-10	2	0
9-Aug-10	98	0	0	28-Sep-10	7	0
10-Aug-10	119	0	1	29-Sep-10	32	0
11-Aug-10	100	0	0	30-Sep-10	5	0
12-Aug-10	136	0	1	1-Oct-10	0	0
13-Aug-10	167	0	1	2-Oct-10	2	0
14-Aug-10	180	0	2	3-Oct-10	1	0
15-Aug-10	195	0	2	4-Oct-10	2	0
16-Aug-10	36	0	2	5-Oct-10	2	0
17-Aug-10	47	0	0	6-Oct-10	1	0
18-Aug-10	119	0	0	7-Oct-10	0	0
19-Aug-10	70	0	0	8-Oct-10	1	0
20-Aug-10	66	0	0	Nightly Average	5.0625	
21-Aug-10	87	0	0			
22-Aug-10	30	0	0			
23-Aug-10	13	1	0			
24-Aug-10	36	0	0			
25-Aug-10	2	0	0			
Nightly Average	74.4		0.42			

8.0 Discussion

Most of the echolocation call sequences recorded for this project were attributable to the two *Myotis* species known to occur in Nova Scotia, the little brown bat and the northern long-eared bat. This was expected as these species are the most common species in the province and are two of only three bat species with significant populations in the province (Broders et al., 2003). Although we did not distinguish the calls of Myotis species, the majority of the sequences recorded at all locations likely represent the little brown bat because the northern long-eared bat has low intensity calls and is thus not recorded as well as the little brown bat (Broders et al., 2004; Miller and Treat, 1993). Further, the northern long-eared bat is a recognized forest interior species (Henderson et al., 2008; Jung et al., 1999a), and is less likely to use open areas for foraging and commuting (Henderson and Broders, 2008). We also, as expected, recorded a number of sequences that were attributable to the tri-colored bat. This species is likely only abundant in southwest Nova Scotia and the proposed development area is on the periphery of the species range (Broders et al., 2003; Farrow, 2007a). The incidence of 2 echolocation sequences that attributable to either silver-haired or big brown bat is not too surprising. There are a number of records of migratory bats in the province but it is believed that the province does not have a significant population of either (Broders et al., 2003). In our survey we did not record any sequences that were attributable to hoary bat or red bat. Current data would suggest that these species do not occur in the area in large numbers but it will be not be surprising for these species to occur in the area irregularly, especially during the migration season.

Myotis bats are relatively new to the list of bat fatalities at wind turbine sites. The first large scale wind developments were located in western North America typically in agricultural and open prairie landscapes (reviewed in Johnson, 2005). Fatalities of these non-migratory species were largely absent from these sites. It is likely that this reflects the location of these wind development sites in open non-forested landscapes. These species may be under represented in the bat communities in these open areas due to an association with forested landscapes. More recently however, evidence of Myotis fatalities from wind turbines have been noted at sites in eastern North America (reviewed in Arnett et al., 2008; Jain et al., 2007b; Johnson, 2005). Therefore, although documented fatalities of Myotis are fewer than for migratory species there is still some risk to these species.

Other than bat mortality directly as a result of turbines, there is also a high likelihood that disruption of the forest structure (removal and fragmentation of trees for road building and deployment of turbines, etc.) for the development will degrade the local environment for colonies/populations that reside in the area during the summer. This can occur by the elimination of roost trees, the isolation of trees left standing, as well as the elimination or degradation of foraging areas. This negative aspect will almost certainly occur and will add to the cumulative effect of loss of bat habitat that is occurring throughout the range of these species.

9.0 Recommendations

- **Minimize project footprint** – Minimize the direct loss of bat habitat resources (e.g., wetlands, riparian areas, mature deciduous-dominated forest stands) and minimize the extent of bat habitat affected.

- **Retain undeveloped key bat habitat** - Undeveloped bat habitat should be identified and retained in the project area to continue to support existing summer colonies/populations. Retention of these bat habitat resources should be in a spatial manner that provides connectivity in the project area and larger landscape to ensure foraging and roosting areas remain well connected. Consideration of the potential of fragmentation to bat habitat resources should also be given to the development of road networks and transmission lines in the project.
- **Follow up on effects and adaptive management** – Conduct a post-construction monitoring program to document any bat fatalities. Ideally this should be conducted for an entire season (April to October), but especially during the fall migration season from mid-August to late-September to fully understand and characterize the temporal patterns of fatalities. Should fatalities be found, these should be assessed with respect to spatial distribution of fatalities, turbine lighting, weather conditions and other site specific factors which can then be analyzed and operations adjusted in an adaptive management framework. In this manner, mitigation can be focused on any identified high risk areas/infrastructure to minimize any more such fatalities. These data are also essential for assessing potential risks at future developments in the region. Results of these surveys should to be reported.
- **Return to pre-project state upon decommissioning** – The project area should be returned to the state that existed prior to the development of the site. This should include planning to ensure the continuity of forest stand succession to provide and maintain appropriate roost trees well in the future as

existing trees die off. By incorporating the retention of current young forest stands in the project site, this will provide mature trees for bat roosting resources in the future.

- **Remain up to date with current research** - There is presently an abundance of on-going research aimed at determining the impacts of wind energy developments on populations of bats. Other studies are focusing on a number of potential mitigation methods, including the effects of weather on activity patterns and collisions, various mitigation treatments (Baerwald et al.) or possible deterrents (including acoustic and radar emissions). As these are active areas of research it is essential that the most current guidelines and studies are used to guide management and development plans for wind projects.

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