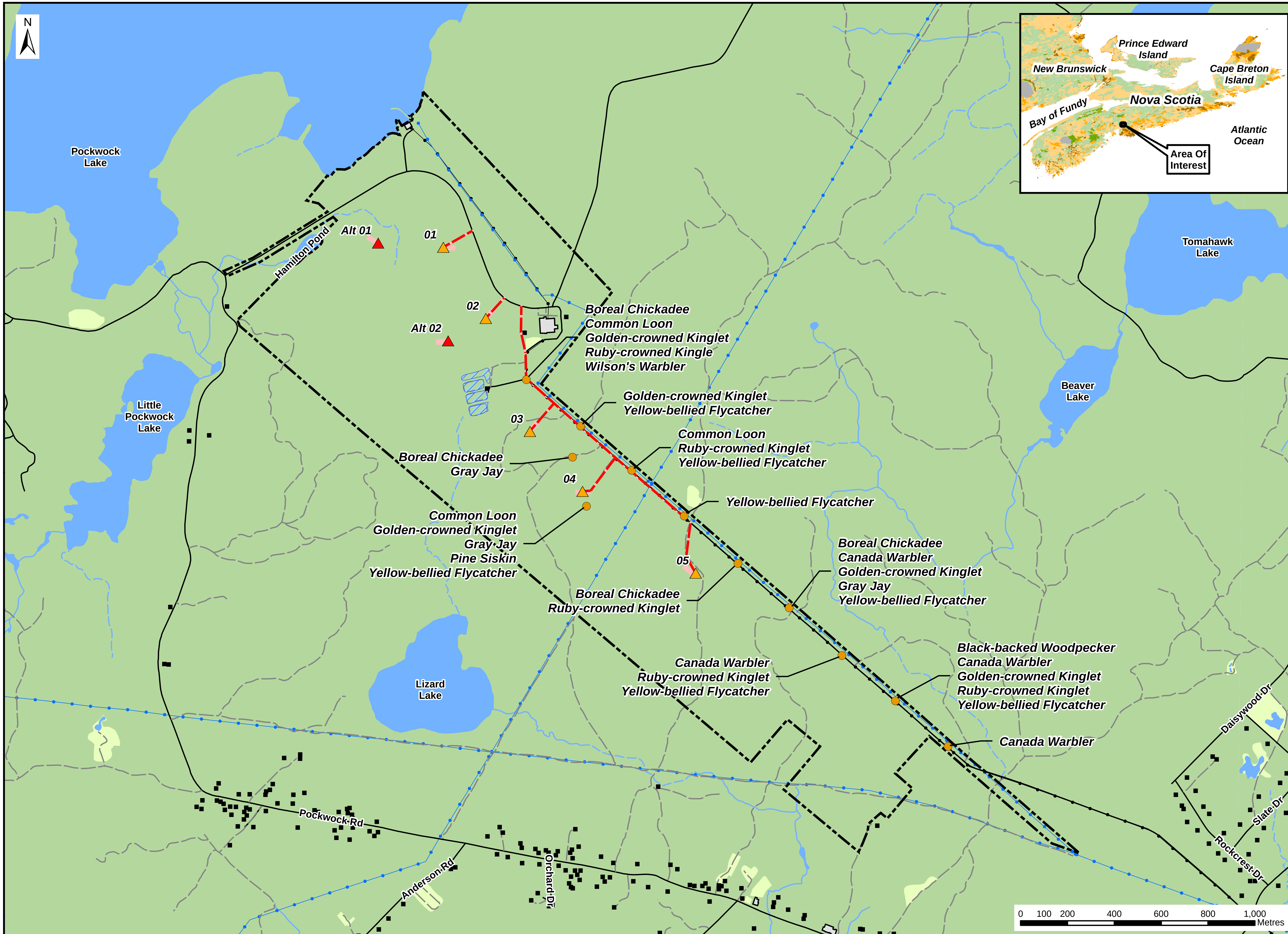


Notes:

1. Reference: Digital Topographic Mapping By Nova Scotia Geomatics Centre.
2. Projection: NAD83(CSRS), UTM Zone 20 North.
3. GPS Points Taken Are Typically To +/-5m Accuracy.

Legend:

- Proposed Turbine
- Alternate Turbine
- Species Location
- Proposed Access Road
- Permanent Disturbance Area
- Project Site Boundary
- Building
- Public Roads
- Access Roads / Trails
- Existing Pipeline
- Existing Transmission Lines
- Large Structure
- Mapped Stream
- Indefinite Stream
- Water Bodies
- Mapped Reservoir
- Cleared Area

Breeding Bird Species of Conservation Interest Locations

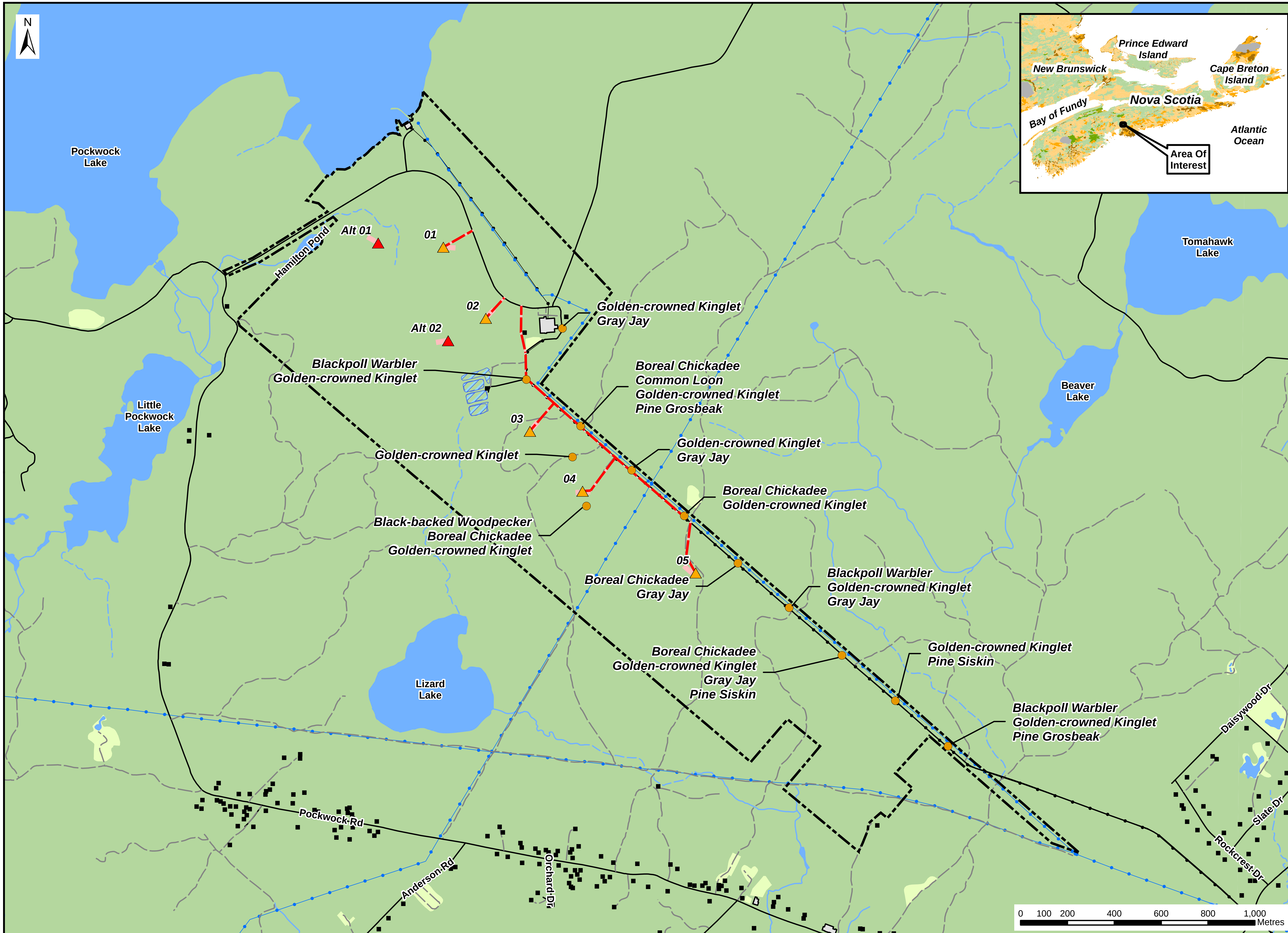
Chebucto WindField
Community Owned. Naturally.

Community Wind Farms Inc.

juwi

Strum
CONSULTING

Date: April 2013	Project #: 12-4326
Scale: 1:15,000	Drawing #: 8.7C
Drawn By: H. Serhan	
Checked By: M. Smith	



Notes:

1. Reference: Digital Topographic Mapping By Nova Scotia Geomatics Centre.
2. Projection: NAD83(CSRS), UTM Zone 20 North.
3. GPS Points Taken Are Typically To +/-5m Accuracy.

Legend:

- Proposed Turbine
- Alternate Turbine
- Species Location
- Proposed Access Road
- Project Site Boundary
- Permanent Disturbance Area
- Building
- Public Roads
- Access Roads / Trails
- Existing Pipeline
- Existing Transmission Lines
- Large Structure
- Mapped Stream
- Indefinite Stream
- Water Bodies
- Mapped Reservoir
- Cleared Area

Fall Bird Species of Conservation Interest Locations

Chebucto WindField Community Owned. Naturally.

Community Wind Farms Inc.

juwi

Strum CONSULTING

Date: April 2013	Project #: 12-4326
Scale: 1:15,000	Drawing #: 8.7D
Drawn By: H. Serhan	
Checked By: M. Smith	

8.8 Bats

The Significant Species and Habitats database (NSDNR 2012c) indicates that 17 features relating to bats and/or bat habitat within a 100 km radius of the Project site, most of which pertain to observations of Little brown myotis and bat hibernacula. Other bat species observed within this radius include Tri-colored bat (*Perimyotis subflavus*) and Northern long-eared myotis (*Myotis septentrionalis*). Moseley (2007) provided an overview of the known bat hibernacula in the caves and mines of Nova Scotia. This research indicates 16 known hibernacula within a 100 km radius of the Project site (Table 8.14).

Table 8.14 Known Bat Hibernacula within 100 km of the Project site

Hibernacula	Distance from Project Site	Direction
Frenchman's Cave	24.44	NW
Miller's Creek Cave	31.39	NNW
Woodville Ice Cave	31.85	N
Centre Rawdon Gold Mine	35.25	NNE
Cave of the Bats	39.44	NE
Gayes River Gold Mine	48.59	NE
Cheverie Cave	49.56	NNW
Walton Barite Mine	51.68	N
Peddlar's Tunnel	52.68	N
Black Brook	52.8	NE
Minasville Ice Cave	55.33	N
Hayes Cave	56.1	NNE
The Ovens	59.42	SW
Lake Charlotte Gold Mine	68.45	E
Lear Shaft	80.21	NNE
Vault Cave	99.6	NW

Source: Moseley (2007)

Frenchman's Cave is considered a small hibernaculum which supports 10-50 over-wintering bats, although all three of the hibernating species have been recorded at this site (Moseley 2007).

The closest hibernaculum considered to be of significance is the Centre Rawdon Gold Mine, located approximately 35 km to the north/northeast. This abandoned mine adit is thought to support approximately 650 over-wintering bats, although species composition is largely unknown (Moseley 2007).This site has also been identified as a swarming site for bats in late summer (Randall 2011).

The largest known hibernaculum in Nova Scotia is Hayes Cave, located in South Maitland approximately 56 km to the north-northeast (Moseley 2007). Up to 6,000 bats enter this cave in September and reside until June (Davis and Browne 1996). Due to the importance of this hibernacula to the bat population of Nova Scotia, public access to Hayes Cave is currently restricted.

Table 8.15 presents bat species recorded within 100 km radius of the Project site, according to ACCDC.

Table 8.15 Bat Species Recorded within a 100 km radius of the Project Site

Common Name	**Scientific Name**	***SARA* Status[1]**	**NS *ESA* Status[2]**	**COSEWIC Status[3]**	**NSDNR Status[4]**
Hoary bat	*Lasiurus cinereus*	Not Listed	Not Listed	Not Listed	Undetermined
Northern long-eared myotis	*Myotis septentrionalis*	Not Listed	Not Listed	dangered	Yellow
Tri-colored bat	*Perimyotis subflavus*	Not Listed	Not Listed	Endangered	Yellow

Source: ACCDC 2011

[1] Government of Canada 2012; [2] NS *ESA* 2007; [3] COSEWIC 2012a; [4] NSDNR 2010

Field surveys of bat migration/habitat use were carried out from September 19th to October 3rd, 2012 using an AnaBat SD2 Detector (Titley Electronics, Columbia, Missouri) deployed at the Project site. Field survey methodology and timing was designed in consultation with NSDNR (M. Elderkin, pers. comm.).

Bats are known to engage in feeding activities in close proximity to bodies of water where insects are prevalent (Furlonger *et al*. 1987). As such, the detector was deployed in a clearing adjacent to a small holding pond, part of the water treatment facility infrastructure (Drawing 8.6). The detector was located 707 m south of Turbine 1, 332 m south of Turbine 2, 202 m northwest of Turbine 3, 588 m northwest of Turbine 4, and 931 m northwest of Turbine 5.

Due to their similarity, calls of Nova Scotia's two resident *Myotis* species (Little brown myotis and Northern long-eared myotis) can be difficult to reliably distinguish from one another (O'Farrell *et al*. 1999; Broders 2011), so these calls were not identified to species.

In total, 554 files were recorded, of which only 14 files were determined to be bat generated ultrasound.

Most echolocation calls were recorded between September 23rd and 28th, and were associated with *Myotis* species bats (e.g., Little brown myotis and Northern long-eared myotis) (Table 8.16). Only one call was categorized as unknown species. This call was clearly bat generated ultrasound; however, the quality of the file was not sufficient to render a positive identification.

Table 8.16 Number of Echolocation Calls Recorded at Project site (Sept 18th – Oct 3rd, 2012)

Date	Echolocation Calls		
	Myotis spp.	Unknown	Total
9/18/2012	0	0	0
9/19/2012	0	0	0
9/20/2012	0	0	0
9/21/2012	1	0	1
9/22/2012	0	0	0
9/23/2012	4	0	4
9/24/2012	1	0	1
9/25/2012	1	0	1
9/26/2012	0	0	0
9/27/2012	2	0	2
9/28/2012	4	0	4
9/29/2012	0	0	0
9/30/2012	0	0	0
10/1/2012	0	1	1
10/2/2012	0	0	0
10/3/2012	0	0	0
Totals	**13**	**1**	**14**

An average of 0.9 echolocation calls per night were detected during the monitoring period. The highest recorded activity occurred on the nights of September 23rd and September 28th, with four calls detected on each night. Increased activity may have been due to the presence of one bat, likely *Myotis* sp., continuously foraging in close proximity to the detector during the nights of September 23rd and September 28th. It is not necessarily an indication of bat abundance but may indicate that there was an abundance of insects in the area surrounding the detector on those particular nights.
As expected, average nightly bat activity peaked between 19:00 and 20:00 which coincides with sunset and resultant bat emergence due to insect availability.

Bat species that were identified during field surveys or that have been recorded within a 100 km radius of the Project site were screened against the criteria outlined in the document "Guide to Addressing Wildlife Species and Habitat in an EA Registration Document" (NSE 2009b) to develop a list of priority species. These priority species include:

- Little brown myotis – "Endangered" (COSEWIC), "Yellow" (NSDNR);
- Northern long-eared myotis – "Endangered" (COSEWIC), "Yellow" (NSDNR); and
- Tri-colored bat – "Endangered" (COSEWIC),"Yellow" (NSDNR).

Little brown myotis
During the spring and summer, Little brown myotis can be found feeding on small aerial insects over water bodies and at the edges of forest clearings during the evening and night (Barclay 1991). During the day, the Little brown myotis will roost in buildings, trees, under rocks, in wood piles, and in caves, congregating in

tight spaces to roost at night (Fenton and Barclay 1980). As a non-migratory species, Little brown myotis are known to congregate in large hibernation groups, known as hibernacula, from September to early or mid-May in abandoned mines or caves (Fenton and Barclay 1980; Moseley 2007).

Little brown myotis is the most common species in Nova Scotia, and is probably ubiquitous in the province (Broders *et al*. 2003). According to the ACCDC database, no observations of Little brown myotis were recorded within 100km of the Project site. Until recently however, no bat species were considered of conservation concern in Nova Scotia, so these observations of Little brown myotos may have gone un-reported to the ACCDC. Multiple known hibernacula are known to occur within a 100 km radius of the Project site, including the largest known hibernacula in the province.

A number of echolocation calls emitted by *Myotis sp.* were detected at the Project site, most of which were likely generated by Little brown myotis. In addition, suitable habitat is present at the Project site, including open wetland habitat, and open clearings adjacent to forest edges (Drawing 8.5). It is therefore highly likely that this species occurs at the Project site, either during the early summer breeding season or during late-summer movements to hibernacula.

Potential effects of the Project on bat species, as well as proposed mitigation measures, are discussed in more detail in Section 14.2.3.

Northern-long eared myotis

The Northern-long eared myotis often feeds shortly after sunset near water bodies and open areas near forest edges (Gill 2006). During the day, Northern long-eared myotis show a preference for roosting in trees, the characteristics of which have been shown to vary according to the reproductive status of bred females (Garroway and Broders 2008). Females appear to prefer shade tolerant deciduous trees over coniferous trees, whereas males roost solitarily in coniferous or mixed-stands in mid-decay stages (Broders and Forbes 2004). Northern long-eared myotis are also non-migratory and are typically associated with the Little brown myotis during hibernation, in caves or abandoned mines (Moseley 2007). Hibernation in this species is thought to begin as early as September and can last until May (as cited in Caceres and Barclay 2000).This species is widely distributed in the eastern United States and Canada, and is commonly encountered during swarming and hibernation (Caceres and Barclay 2000).

Although once considered uncommon throughout Nova Scotia (Moseley 2007), Northern long-eared myotis is likely ubiquitous in the forested regions of the province (Broders *et al*. 2003). ACCDC data indicates that the closest Northern long-eared myotis sighting to the Project site was 21±10 km away; in addition, this species has been identified at several known hibernacula within a 100 km radius of the Project site.

A number of echolocation calls emitted by *Myotis sp.* were detected at the Project site, of which a proportion was likely from Northern long-eared myotis. In addition, multiple areas of suitable habitat are present at the Project site, including open wetland habitat, open clearings adjacent to forest edges, and mid-aged coniferous forest stands (Drawing 8.5). It is therefore highly likely that this species occurs at the Project site, either during the breeding season/summer or during late-summer movements to hibernacula.

Potential effects of the Project on bat species, as well as proposed mitigation measures, are discussed in more detail in Section 14.2.3.

Tri-colored bat (Eastern pipistrelle)
Tri-colored bats, formerly known as the Eastern pipistrelle, forage over water bodies, tree canopies and in open areas (Quinn and Broders 2007; Poissant and Broders 2009). This species requires clumps of *Usnea* lichen for roosting; a habitat feature typically associated with mature spruce and balsam fir trees (Farrow 2007). This species is non-migratory, and generally hibernates alone, or in small numbers, in caves or abandoned mines where it appears to show a preference for small side passages, rather than main passages (Fujita and Kunz 1984; Moseley 2007). Individuals show strong fidelity to specific hibernacula, although in Nova Scotia only 10 hibernating individuals have ever been recorded (Quinn and Broders 2007).

The species occurs throughout most of eastern North America, with Nova Scotia representing the northeastern extent of its range (Fujita and Kunz 1984). Within Nova Scotia the species has a restricted breeding distribution focused in the interior of the southwest region of the province (Farrow and Broders 2011). Research conducted at Kejimkujik National Park found the Tri-colored bat to be locally abundant, and results indicate that this population may represent the only breeding population of the species in Canada (Broders *et al*. 2003). In the summer months, the Tri-colored bat is concentrated in a geographic area bounded by Wolfville to the west, Halifax to the northeast, and Shelburne to the southeast (Quinn and Broders 2007). ACCDC data indicates that the closest observation of this species to the Project site was 21±10 km away, and the Tri-colored bat has been identified at Frenchman's Cave, less than 30 km from the Project site.

No indication of Tri-colored bat was observed during field studies, despite the presence of apparently suitable habitat including open wetland habitat, cleared areas in close proximity to forest edges, and mature coniferous forest. However, since the species is known to occur in close proximity, it is somewhat likely that this species occurs at the Project site, most likely during late-summer movements to hibernacula.
General mitigation measures for Project-related effects to bats are provided in Section 4.0. Where required, species-specific mitigation is provided in Section 14.

9.0 SOCI-ECONOMIC ENVIRONMENT

9.1 Local Demographics and Industry
The Project site is located on land within the HRM, which is home to many long established communities including Halifax, Dartmouth, Bedford, Sackville and others. The area is also home to the Acadia First Nation community, with the Halifax office located on Hammonds Plains Road. The HRM reported a population of 390,096 in 2011 (Statistics Canada 2011). The nearest population centres to the Project site are Hammonds Plains (3.3 km), Upper Tantallon (8.4 km) and Bedford (14.7 km).

<u>9.1.1 Demography</u>
Population statistics for HRM and Hammonds Plains from the 2011 census are summarized in Table 9.1.

Table 9.1 Population in HRM and Hammonds Plains

Population Statistics	HRM	Hammonds Plains
Population in 2011	390,308	11,556
Population in 2006	372,810	10,286
Population change from 2006-2011 (%)	4.7	12.34

Source: Government of Nova Scotia 2013

The age distribution in HRM and Hammonds Plains reveal slightly younger populations, both with a median age of 39.9 years, compared to the median age of Nova Scotia (43.7 years) (Statistics Canada 2011). A breakdown of age distribution in HRM and Hammonds Plains is outlined in Table 9.2.

Table 9.2: Age in HRM and Hammonds Plains

Age Statistics	HRM	Hammonds Plains
0 – 14 years	59,605 (15.3 %)	440 (23.9%)
25 - 64 years	279, 465 (71.6 %)	1,250 (67.9%)
65+ years	51,025 (13.1 %)	150 (8.2 %)
Total Population	**390,095 (100 %)**	**1,840 (100%)**

Source: Statistics Canada 2011

The average housing cost in Hammonds Plains is $277,856, which is more than HRM at $212,942, and significantly higher than the provincial average of $158,000 (Statistics Canada 2006). HRM and Hammonds Plains are both above the provincial earning median ($24,030) with median earnings for individuals of $28,526 and $39,290 respectively (Statistics Canada 2006) (Table 9.3).

Table 9.3: Household Costs and Median Earnings for Full-Time, Full Year Earners

Jurisdictions	Average Housing Cost	Median Earnings (Individual)
HRM	$212,942	$28,526
Hammonds Plains	$277,856	$39,290
Province of Nova Scotia	**$158,000**	**$24,030**

Source: Statistics Canada 2006

9.1.2 Health Care and Emergency Services

Halifax Regional Fire and Emergency has 59 fire stations across the region. The nearest stations to the Project site are located on Pockwock Road (1.5 km to the south) and Hammonds Plains Road (4.5 km to the southeast) (HRM 2013).

Emergency health services in the region include the Cobequid Community Health Center located in Lower Sackville, the QEII Infirmary located in Halifax, and the IWK Health Centre located in Halifax.

9.1.3 Industry and Employment

Employment and unemployment rates for February 2012 in Halifax County (includes Hammonds Plains) Economic Region indicate that the unemployment rate was 6.3%, which is lower than the provincial average of 8.5% (Statistics Canada 2012). With regard to employment rates, the Halifax County employment rate of 65.2% was found to be higher than the provincial rate of 57.6% (Statistics Canada, 2012).

A breakdown of the labour force within HRM is provided in Table 5.3. The highest proportion of workers in HRM falls into the "other services" category (25.0%). While Statistics Canada does not specifically list tourism as an industry, it likely falls under the "other services" heading. The high proportion of workers listed as working within "other services" and "retail trade" is reflective of the tourism industry. Other significant industries include business services, health care and social services (Statistics Canada 2006).

Table 9.3: Labour Force by Industry in HRM

Labour Force	Total (HRM)
Total experienced labour force 15 years +	210,080
Other services	52,485
Business services	43,480
Retail trade	25,045
Health care and social services	24,480
Educational services	16,355
Finance and real estate	13,540
Construction	11,580
Manufacturing	11,015
Wholesale trade	8,630
Agriculture and other resource-based industries	3,475

Source: Statistics Canada 2006

A review of businesses located within 10 km of the Project site is outlined in Table 9.4.

Table 9.4: Local Businesses and Proximity to Project Site

Business	Proximity to the Project Site*
The Fax and Printer Guy Inc.	Approximately 4.0 km southeast of the Project site
Heirloom Roses	Approximately 4.3 km southeast of the Project site
Cape Cod Wood Sidings	Approximately 4.9 km southeast of the Project site
Glenn Arbour Golf Course	Approximately 5 km east of the Project site
Hatfield Farms	Approximately 5.3 km southeast of the Project site
Acadian Fish N' Chips	Approximately 5.9 km southeast of the Project site
Pampered Paws Inn Inc.	Approximately 6.0 km southeast of the Project site
Swoon Fine Art and Antiques	Approximately 6.3 km southeast of the Project site
Voyageur Lakes Kids Academy	Approximately 6.4 km southeast of the Project site
Edible Matters Restaurant	Approximately 6.5 km southeast of the Project site
St. Margaret's (Recreation) Centre	Approximately 7.0 km south of the Project site
Esso Hammonds Plains Metro	Approximately 7.1 km southeast of the Project site

Business	Proximity to the Project Site*
Pin High Golf Course	Approximately 7.5 km southeast of the Project site
Rona Building Center	Approximately 7.5 km south of the Project site
Goodlife Fitness	Approximately 7.5 km south of the Project site
Dairy Queen Restaurant	Approximately 7.5 km south of the Project site
McDonalds Restaurant	Approximately 7.5 km south of the Project site
Scotiabank	Approximately 7.5 km south of the Project site
Personal Image Hair Studio	Approximately 7.5 km south of the Project site
A & W Automotive	Approximately 7.5 km southeast of the Project site
Lefty's Restaurant and Lounge	Approximately 7.5 km south of the Project site
The UPS Store	Approximately 7.5 km south of the Project site
KFC Restaurant	Approximately 7.5 km south of the Project site
Wilson's Gas Stop	Approximately 7.5 km south of the Project site
Sobeys	Approximately 7.5 km south of the Project site
Tim Horton's Restaurant (2 Locations)	Approximately 7.5 km south of the Project site Approximately 9.3 km southeast of the Project site
Atlantic Play Land	Approximately 7.8 km southeast of the Project site
Tomomi Yoga Studio	Approximately 9.1 km southeast of the Project site
Boutiliers Lawn and Garden	Approximately 9.1 km southwest of the Project site
Pilot House Café and Cottages	Approximately 9.1 km south of the Project site
Canadian Tire	Approximately 9.3 km southwest of the Project site
Credit Union Atlantic	Approximately 9.3 km southwest of the Project site
Train Station Bike & Bean Cafe	Approximately 9.4 km southwest of the Project site
Upper Tantallon Irving	Approximately 9.4 km southwest of the Project site
Glow de Soleil Tanning Salon	Approximately 9.4 km southwest of the Project site
Acadian Maple Products	Approximately 9.4 km southwest of the Project site
Atlantic Superstore	Approximately 9.5 km south of the Project site
Mariposa Natural Market and Cafe	Approximately 9.5 km southwest of the Project site
Rebel Space Indoor Playground and Cafe	Approximately 9.5 km south of the Project site

*All distances measured from center of Project site, using direct route

Economic effects as a result of the Project will include job creation, increased revenue for the communities surrounding the Project site and the HRM, and investment in the local community through the creation of a Community Sustainability Fund.

It is estimated that the Project will result in approximately $19-$21 million in investments into the province of Nova Scotia. It is estimated that the Project will result in millions of dollars in contracts with Nova Scotian companies for delivery of equipment and construction materials, as well as professional development, construction and operational services. A significant portion of the total investment (through both debt and equity) will come from sources outside Nova Scotia, resulting in a significant capital investment into the Nova Scotia economy.

Since 2001, CWF has been incorporated as a Community Economic Investment Fund (CEDIF), a government program that encourages investment into local businesses by offering Nova Scotian investors significant tax incentives. With a CEDIF as a project partner, Nova Scotia investors will own 25% of the Project and share in profits generated. The Project will thus contribute to increasing the amount of capital invested in Nova Scotia and ensure long-term economic benefit to the community.

Job Creation
Elements of job creation during the lifespan of the Project include:

- Project Development- During the development phase of the Project Nova Scotia professionals will deliver a variety of services, including: civil and electrical engineering services, legal and financial services, environmental & biological survey services, archaeological services, land and community relations services, website development, and many others. As the Project is one of many COMFIT projects being developed in the province it is difficult to precisely estimate the number of full-time-equivalent jobs that are created through the development of this Project alone. It is known, however, that dozens of professionals within Nova Scotia will render their services as part of the development of the Project.
- Construction - Though the construction phase of the Project is relatively short, it will require significant manpower for realization. Much of the construction employment will come through contracting and subcontracting of Nova Scotia construction firms. This will likely include significant elements of civil and electrical construction. During the construction phase, it is estimated that 50 people will be temporarily employed by the Project. Many of these people will be employed through Nova Scotia construction firms which are part of the project.
- Operations and Maintenance - Operational wind projects require long-term operations and maintenance professionals to be located either on-site or within short driving distance of the Project. Technical maintenance of the turbines requires three technicians at all times for safety purposes. In addition to the three technicians there will be a team of two individuals representing the owner as site managers and facilitating the maintenance of all balance of plant equipment. It is generally anticipated that a team of two operations and maintenance technicians can maintain regular O&M service on approximately a dozen turbines. Once constructed, it is anticipated that the Project will be one of several projects which share long-term operations and maintenance teams to ensure project performance. The jobs associated with operations and maintenance are long-term, steady, stable, and high-paying jobs.

In addition to the direct investments that the Project would bring to Nova Scotia's economy, a suit of auxiliary economic benefits can also be expected. It has previously been demonstrated that investments in wind power developments can result in significant indirect ancillary benefits to local communities. Workers that are directly involved with the development would contribute to local economies by redistributing wealth to a variety of goods and services such as hotels, restaurants, and grocery stores (USDE 2008).

Tax Revenue
As outlined in the *Wind Turbine Facilities Municipal Taxation Act (2006),* the HRM will receive tax revenues per MW on an annual basis and as such, the royalty will annually increase as the Consumer Price Index (CPI) rises. Property taxes to be paid to the municipality over the lifespan of the Project are estimated at $1.6 million.

Investment in the Local Community
Through investments into a Community Sustainability Fund, the proponent is committed to sharing the economic benefits of the Project with the surrounding community. The fund will contribute 1% of the annual revenues to the local community development association to be used for the betterment of the community. It is estimated that over the lifetime of the Project the Community Sustainability Fund will invest more than $700,000 in the local community.

9.2 Land Use and Value

Presently, the properties surrounding the Project site are assessed as resource and commercial taxable and are owned by the Halifax Water (Service Nova Scotia 2012).

Potential effects on property values is often a primary concern of neighboring residents due largely to anecdotal reports from appraisers of drastic declines in property values following the nearby installation of a wind energy facility (as reviewed in Gulden 2011). Despite these concerns, a number of rigorous and statistically defensible studies have concluded that wind energy developments have had no significant effect on surrounding property values.

The most comprehensive study to date on the impact of wind farms on property values was completed by Hoen *et al*. (2009). This research analyzed data on nearly 7,500 sales of single family homes situated within 10 miles of 24 existing wind farms in the United States. Eight different hedonic pricing models failed to generate statistically significant evidence that property values for houses located within 10 miles of wind farms are influenced by the developments. Subsequent research by the same laboratory but employing further analyses confirmed these results (Hoen *et al.* 2010).

Carter (2011) analyzed home transactions in a rural landscape surrounding small (1-4 turbines) wind energy developments, while employing a hedonic model to statistically control for variables affecting all real estate transactions such as square footage, age of home, and school zone. This study concluded that proximity to the wind farms did not impact average selling price of homes; in fact, in one case, homes closer to a wind farm sold for significantly higher than those elsewhere.

A study by Hinman (2010) tracked property transactions in communities located close to a 240-turbine wind farm for an eight year period that spanned pre-development and operation stages. Hinman (2010) found that before project approval, property values in the area decreased. This was attributed to a fear of the unknown effects that the development would have; an effect known as *anticipation stigma*. However, once the development became operational, property values recovered. This recovery was attributed to a greater understanding of the operational effects of the development. Anticipation stigma, however, was not detected in a similar study in Colorado (Laposa and Mueller 2010), in which it was concluded that the announcement of a large wind energy development did not significantly reduce the selling prices of homes surrounding the proposed development.

Although there is some evidence of a "valley" in property values in the interim between wind farm announcement and operation (Hoen 2011), research has consistently demonstrated that, in a variety of spatial settings and across a wide temporal scale, sale prices for homes surrounding wind energy facilities are not significantly different from those attained for homes sited away from wind energy facilities.

9.3 Recreation and Tourism

Existing outdoor recreation in the area includes hunting, fishing, ATVing, and hiking. The water main road that runs along the northeastern boundary of the Project site is frequently accessed by locals who make use of it for various outdoor activities (e.g., walking, cycling, ATV use). Many recreational activities such as fishing, boating and ATV use are restricted within the boundaries of the PWA. There are provincial parks and wilderness areas with proximity to the Project site. Most notably are the proposed Blue Mountain Birch Cove Lakes Park (located approximately 8.5 km southeast of the Project site), and the Jerry Lawrence Provincial Park (located approximately 10.5 km southwest of the Project site). A large parcel of land adjacent to the northeast Project site boundary is owned by the Melvin Land Tract Protection Society, where development is restricted.

The 2011 Nova Scotia Visitor Exit Survey Community Report outlines the total trips (stopped or stayed) to communities in Nova Scotia, to particular tourist regions, as well as capture rates of communities within tourist regions (Nova Scotia Department of Economic and Rural Development and Tourism 2011). Table 9.5 shows the total trips (people who stopped for at least 30 minutes or stayed overnight) that were made to Sackville, Bedford and Halifax, as well as their capture rate (the percentage of parties that stopped in a specific community compared to other communities within the region) out of the total number of parties who visited the tourism region.

Table 9.5: Communities Visited in Nova Scotia

Region/Community	Total Trips (% who stopped or stayed)	Capture Rate (%)
HRM	**79%**	
Bedford	18%	22%
Halifax	68%	87%
Sackville	10%	12%
Peggy's Cove	16%	60%
Mahone Bay	11%	42%
Lunenburg	13%	49%

Source: Nova Scotia Department of Economic and Rural Development and Tourism 2011

The data shows tourism in Sackville and Bedford is not a major economic driver. Comparatively, Halifax is by far the more popular destination. Nova Scotia's South Shore offers numerous tourist experiences, including destinations such as Peggy's Cove, Mahone Bay, and Lunenburg. These destinations boast significant capture rates. Tourists traveling from Halifax to these destinations via Highway 103, or could travel by the proposed Project site via the Hammonds Plains Road.

It is difficult to determine with certainty how tourists will react to a wind development. Wind farms are objects of fascination for many and thus can generate tourism for the local community. Some wind farms have upwards of 60,000 visits a year and the benefits of even drawing a fraction of that amount of visitors to a community can be felt by many businesses including shops, restaurants and hotels (CanWEA 2006). Pincher Creek, Alberta developed a 19 MW wind farm in 1993, since that time tourism revenue from visitors from as far away as Russia has generated $5,000 in annual sales of clothing and souvenirs branded with the "Naturally Powerful Pincher Creek" logo (CanWEA 2006).

A 2002 study from MORI (Market & Opinion Research International) interviewed tourists visiting Argyll and Bute, Scotland and asked them about their attitudes towards the presence of wind farms in the area. Of those who knew about the surrounding wind farms (40% of those interviewed), 43% felt that wind farms had a positive effect on the area, 43% felt it made no difference, and 8% felt it had a negative effect (MORI 2002).

10.0 CULTURAL AND HERITAGE RESOURCES

10.1 Archeological Resource Impact Assessment

Davis MacIntyre & Associates Limited conducted an ARIA for the Project. The purpose of the assessment was to determine the potential for historic and pre-contact period archeological resources near the Project site through background research.

The assessment suggests that there is no evidence of First Nation settlement in close proximity to the Project site. Following the Pre-contact period, European settlement occurred in the Pockwock area during the mid-19th century, and included homesteads, a school house and a mill. However historical mapping evidence suggests that the settlement was occurring beyond the boundaries of the Project site (Davis MacIntyre & Associates Ltd. 2013).

A field survey completed during 2012 revealed that the only cultural activities existing within the Project site is modern day logging. In addition, undulating land was observed throughout, indicating a lack of historic agricultural practices. No evidence of archeological sites were observed; therefore all areas of the Project site surveyed provide a low archeological potential (Davis MacIntyre & Associates Ltd. 2013). The ARIA was forwarded to the NS Department of Communities, Culture and Heritage.

Procedures related to potential discovery of archaeological items or sites during construction/decommissioning will be described in the EPP.

11.0 MI'KMAQ RESOURCES

A MEKS is being completed by NEXUS Coastal Resource Management and is currently in progress. The purpose of the study is to document the collective ecological knowledge held by the Mi'kmaq and identify any concerns regarding the Project's impact on the Mi'kmaq's use of land, resources and special places within the study area. The study area defined for the MEKS includes the Project site and the area immediately surrounding the site.

The methodology for the MEKS was developed in accordance with the protocol adopted by the Assembly of Nova Scotia Mi'kmaq Chiefs. A desktop review was conducted to gather all relevant information pertaining to the project study area, historical Mi'kmaq knowledge and Mi'kmaq resource use. Workshops with local Mi'kmaq knowledge holders enabled the collection of local site-specific knowledge of historical and current Mi'kmaq use of natural resources. A field survey will be conducted in June 2013 to identify and locate general habitats, plant species and other related resources that may be of importance to the Mi'kmaq community. The final report will provide complete analysis and presentation of field data from the June field surveys.

Conversations with individuals from the Acadia First Nation led to the understanding that there has been little recent harvesting activity in the area near the Project site, therefore members of this band did not participate in the workshop. Active hunters from the Acadia Band travel to Sheet Harbour and Musquodoboit to hunt. Participants from Millbrook First Nation and Glooscap First Nation did not provide information of Mi'kmaq use or harvesting of plants and wildlife in the Pockwock study area. It is, however, important to acknowledge that the current absence of Mi`kmaq from an area should not be mistaken for an absence of interest (current and future) of the area and its resources. There is general support for the wind development in the province; many workshop participants support the development of non-carbon based or 'green' energy sources.

Based on the preliminary results, future planning and collaboration between the proponent and local Mi'kmaq communities will be maintained throughout the development of the Project through the application of Mi'kmaq Ecological Knowledge, in keeping with the principles and statements of the United Nations Declaration of the Rights of Indigenous Peoples.

The MEKS is provided in Appendix H.

12.0 OTHER CONSIDERATIONS

12.1 Shadow Flicker

Shadow flicker can occur when rotating blades cast flickering shadows during times of direct sunlight. The magnitude of shadow flicker is determined by the position and height of the sun, wind speed and direction, geographical location, time of year, cloud cover, turbine hub height and rotor diameter, and proximity to the turbine (CanWEA 2011).

For shadow flicker to occur, the following criteria must be met:

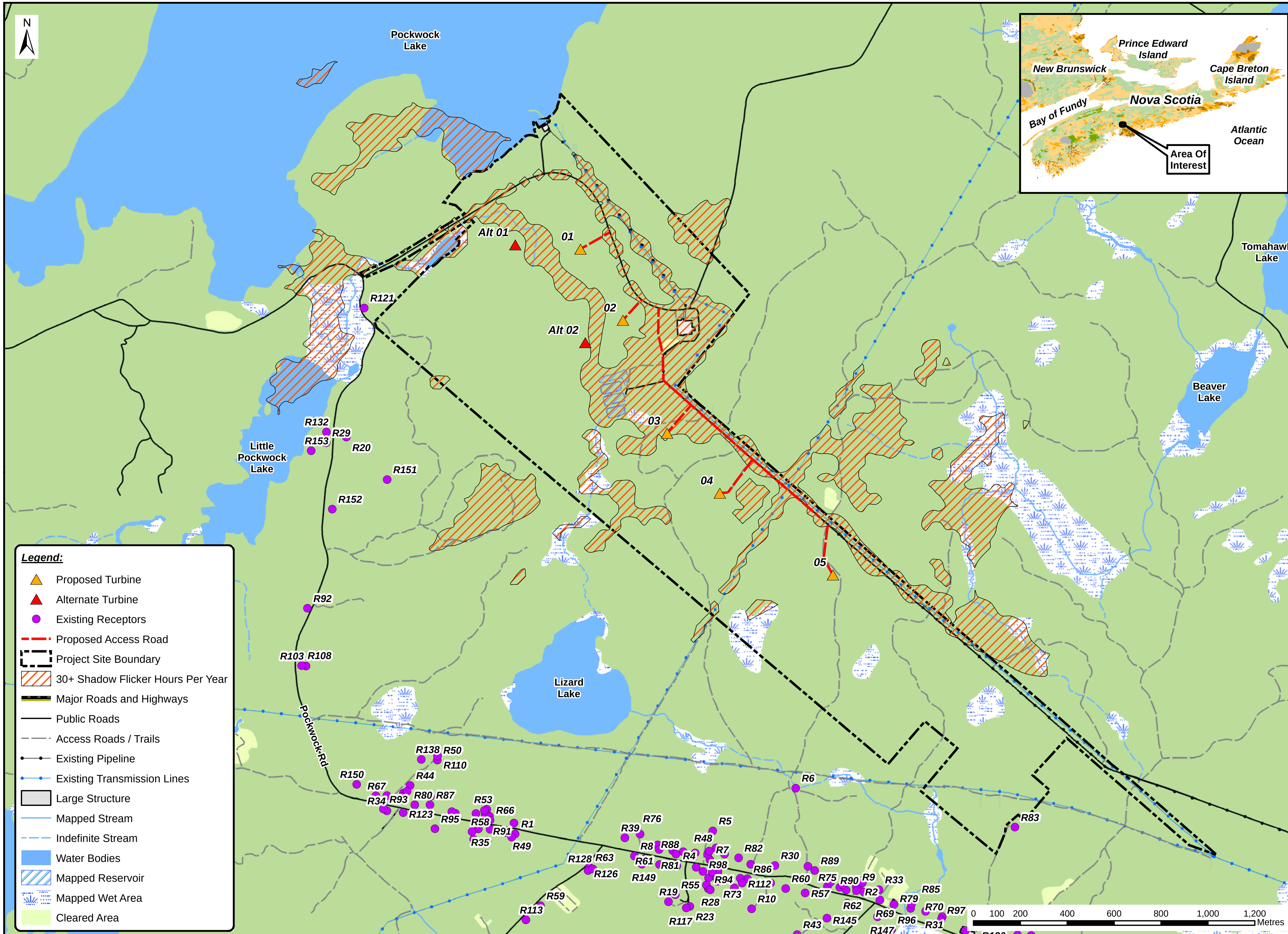
1. The sun must be shining and not be obscured by clouds/fog.
2. The source turbine must be operating.
3. The wind turbine must be situated between the sun and the shadow receptor.
4. The wind turbine must be facing directly towards, or away from, the sun such that the rotational plane of the blades (rotor plane) is perpendicular to the azimuth of incident sun rays. For this to occur, the wind direction would have to be parallel to the azimuth of the incident sun rays throughout the day.
5. The line of sight between the turbine and the shadow receptor must be clear. Light-impermeable obstacles, such as vegetation, tall structures, etc., will prevent shadow flicker from occurring at the receptor.
6. The shadow receptor has to be close enough to the turbine to be in the shadow.

A shadow flicker assessment was completed for the proposed Project to assess the potential impact on surrounding shadow receptors. The analysis was conducted using the WindPRO version 2.8 software package using worst case scenario conditions, including constant sunshine and receptor windows oriented perpendicular to the rotational axis of the turbines. There are no municipal, provincial, or federal guidelines related to shadow flicker, but many jurisdictions (including NSE) have adopted the industry standard of no more than 30 hours of shadow flicker per year, or no more than 30 minutes of shadow flicker on the worst day of the year. These guidelines were used in the shadow flicker assessment for the Project and do not apply to commercial receptors.

As a final agreement has not been reached with a turbine supplier, all turbine models under consideration were modeled separately. In addition, all seven possible turbine locations were modeled simultaneously, though only five locations will be selected. This conservative measure was taken to ensure that all potential shadow-related issues are addressed, regardless of the turbine model and layout ultimately used for the Project.

A list of 156 existing receptors, within a 2 km radius of the proposed turbine locations was developed using GIS data from the Nova Scotia Geomatics Centre and aerial imagery. For modeling purposes, the receptor list is considered to be conservative as no distinction has been made between habitable dwellings and barns, sheds, or outbuildings. Vegetation effects were incorporated into the model using data from the Nova Scotia Forest Inventory (NSDNR 2012a). Specifically, forest stand height was included to determine if any part of the turbine will be visible from the receptor location. If vegetation obscures the visibility of turbines from a receptor, shadow flicker will not occur at that location.

Modeling results (Appendix I) identified no receptors that are predicted to exceed 30 hours of shadow flicker per year or 30 minutes of shadow flicker on the worst day of the year (Drawing 12.1). Therefore, all structures are predicted to comply with industry standards.



Notes:

1. Reference: Digital Topographic Mapping By Nova Scotia Geomatics Centre.
2. Projection: NAD83(CSRS), UTM Zone 20 North.

Shadow Flicker Modeling Results

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Date: April 2013	Project #: 12-4326
Scale: 1:15,000	Drawing #: 12.1
Drawn By: G. Gregory	
Checked By: M. Smith	

12.2 Electromagnetic Interference (EMI)

The rotating blades and support structures of wind turbines can interfere with various types of electromagnetic signals emitted from telecommunication and radar systems (RABC and CanWEA, 2012). In response to this phenomenon, the Radio Advisory Board of Canada (RABC) and CanWEA developed guidelines for assessing the EMI potential from a wind turbine development. These guidelines outline a consultation based assessment protocol that establishes areas, called “consultation zones”, around transmission systems, based on the system’s type and function.

The EMI study for this Project was completed in accordance with the RABC/CanWEA published guidelines. Location information and frequency details were obtained from the Technical and Administrative Frequency Lists (TAFL) database, which is administered by Industry Canada, and from email communications with the Royal Canadian Mounted Police (RCMP), Department of National Defense (DND), Canadian Coast Guard, Environment Canada, NAV CANADA, Natural Resources Canada (NRCan), and Industry Canada. Results are provided in Table 12.1.

Table 12.1: Radar Transmission Array Interference Consultation Results

Signal Source	Operator	Required/ Suggested Consultation Zone Radius	Consultation Results
Television - Broadcast and Reception			
Analog Television Broadcast (Private)	n/a	2 km	None required – interference unlikely.
Analog TV Broadcast (Public)	CBC	89 km	None required – interference unlikely.
Analog Television Receivers	n/a	14 km	Consultation may be required to evaluate the effects of the Project on analog TV reception within 14 km radius. However, analog signal transmission has been predominantly replaced. The majority of TV broadcast operators have converted their analog NTSC TV stations to the ATSC North American digital standard, as required by a decision of the CRTC (Public Notice CRTC 2007-53).
Radio - Broadcast and Reception			
AM Radio (Private)	n/a	5 km (omnidirectional antennae) 15 km (directional antennae)	None required – interference unlikely.
AM Radio (Public)	CBC	5 km	None required – interference unlikely.
FM Radio (Private)	n/a	2 km	None required – interference unlikely.
FM Radio (CBC)	CBC	5 km	No receivers located within consultation n zone.
Regulatory Agencies			

Signal Source	Operator	Required/ Suggested Consultation Zone Radius	Consultation Results
Air defense and air control radar systems	DND	100 km	No objections or concerns.
DND Radio Communications	DND	n/a	No objections or concerns.
Maritime vessel traffic system radars	Canadian Coast Guard	60 km	No objections or concerns.
Radar communication systems	RCMP	N/A	No response received.
VHF omnidirectional range	Nav Canada	15 km	No response received.
Primary air traffic control surveillance radar		80 km (primary surveillance) 10 km (secondary surveillance)	
Weather radar	EC	50 km	No objections or concerns.
Seismic monitoring stations	NRCan	N/A	No response received.

Relevant correspondence from operators and reporting is provided in Appendix J.

No objections were received from operators. Once the finalized layout is confirmed, the above agencies will be provided with the updated information, as appropriate.

Point to Point Systems

The CanWEA/RABC Guidelines recommend a consultation zone within a 1 km radius around the transmit and receive sites for point to point type radio systems, and a cylinder around the transmission path, with a diameter determined as a function of the Fresnel zone. A total of 296 search results were identified as point to point radio systems. These results were paired using the call sign field, where call signs were not available pairing was completed based on Owner and TX/RX frequency pairing. Two towers were identified to be within the 1 km consultation zone. These towers operate under call signs of VEP895 and VON883 and are owned by Halifax Water Commission. These towers are assumed to communicate with one another based on TX/RX frequencies and the Owner. These towers are suspected to provide communication link between the pumping station and the treatment plant. The signal path runs generally parallel to the proposed site.

12.3 Visual Landscape

Zone of Visual Influence (ZVI)
The visibility of wind turbines from a given location is influenced by local topography as well as obstacles which could obscure sightlines. Turbine visibility was modeled using the WindPRO version 2.8 software package. Model inputs included proposed turbine locations (including alternative locations), local elevation data, as well as forest stand height from the Nova Scotia Forest Inventory (NSDNR 2012a). For the purposes of the model, a turbine was deemed visible if any part could be seen from given location, including any part of the rotating blade above the tower and hub assembly. An assessment area of 3,258 hectares was defined to encompass a 2 km buffer around the proposed turbine locations.

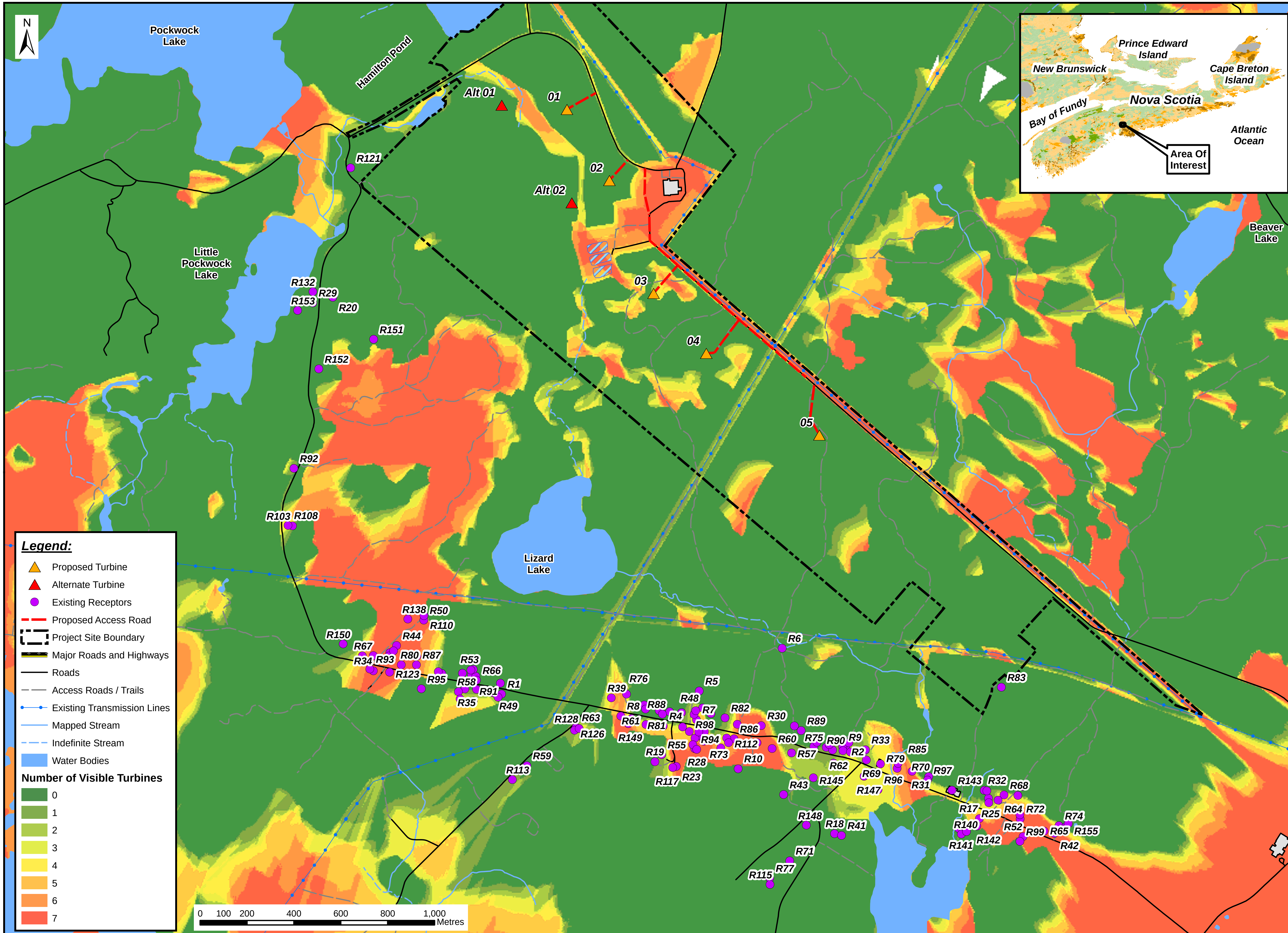
As a final agreement has not been reached with a turbine supplier, modeling was conducted using the tallest (hub height + ½ rotor diameter) turbine model under consideration, as this model extends farthest into the air and is therefore more likely to be visible.

Model results indicate that no turbines will be visible from 56.6% (1,845 ha) of the assessment area, while seven turbines will be visible from 21.8% (710 ha) of the area (Drawing 12.2).

Predicted View Plane
Representative photos were taken from vantage points within the community to represent the existing and future visual landscape.

Photographs were collected in April and May 2012 with magnetic bearings and a GPS waypoint recorded at each photo location. Geographical Information System (GIS) software was used to plot the photo locations and construct bearing lines to assist in the construction of a 3D view, generated using the GIS. A 3D surface was then constructed using the provincial Digital Elevation Model (DEM) points from the Nova Scotia Topographic Database (NSTDB), which supports 5 m contour intervals. The proposed turbine location and specifics regarding the height of the turbine were used to develop the view plane. Each selected viewing site was created using the viewer location (photo GPS point, elevation and bearing line) resulting in an accurate 3D view. The resulting computer generated view was then merged with the digital photographs using a scaled image of the proposed turbine.

Photos taken from four locations near the Project site (Drawing 12.3) were used to create simulated images of the view plane, as shown Figures 12.1-12.4.



Notes:

1. Reference: Digital Topographic Mapping By Nova Scotia Geomatics Centre.
2. Projection: NAD83(CSRS), UTM Zone 20 North.

ZVI Analysis Results

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Date: April 2013	Project #: 12-4326
Scale: 1:15,000	Drawing #: 12.2
Drawn By: H. Serhan	
Checked By: M. Smith	

Notes:

1. Reference: Digital Topographic Mapping By Nova Scotia Geomatics Centre.
2. Projection: NAD83(CSRS), UTM Zone 20 North.

Legend:

- Proposed Turbine Location
- Viewpoint Location
- Direction of View
- Project Site Boundary
- Proposed Access Road
- Existing Paved Road
- Existing Trail / Access Road
- Existing Transmission Lines
- Mapped Stream
- Indefinite Stream
- Mapped Water Bodies
- Mapped Wet Area
- Cleared Area

Visual Assessment Locations

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DATE: April 2013	PROJECT #: 12-4326
SCALE: 1:20,000	DRAWING #: 12.3
DRAWN BY: H. Serhan	
CHECKED BY: M. Smith	

Predicted View:

Actual View:

Figure 12.1: Looking northeast into the Project site, from Pockwock Road.

Predicted View:

Actual View:

Figure 12.2: Looking north into the Project site, from Pockwock Road.

Predicted View:

Actual View:

Figure 12.3: Looking northwest into the Project site, from Pockwock Road.

Predicted View:

Actual View:

Figure 12.4: Looking northwest into the Project site from White Hills Run.

12.4 Sound

Sound from wind turbines comes from two general sources: the mechanical equipment, and the sound from the interaction of the air with the turbine parts, primarily the blades (NSDE 2008). In modern turbine designs, much of the mechanical noise is mitigated through the use of noise insulating materials. Aerodynamic noise, however, is a product of the turning of turbine blades and is thus an unavoidable aspect of wind power operations. Turbines can emit noises of different frequencies, and an individual's perception of the noise can depend on their hearing acuity and their tolerance for particular noise types (Committee on Environmental Impacts of Wind Energy Projects, NRC 2007). Furthermore, the propagation of sound from the turbine source to a receptor, such as a residential dwelling, is influenced not only by the sound power level emitted from the turbine, but also by local factors such as distance to the receptor, topography, vegetation and weather conditions (Hau 2006). For example, increases in wind speed result in increases in ambient, natural noise (from vegetation movement) that can mask the sounds emitted from the turbine(s) (NRC 2007).

Ambient Sound Assessment

Ambient sound monitoring was completed to establish pre-construction sound levels at two locations at the Project site. Locations were selected to be in close proximity to potential receptors, as shown in Drawing 12.4. Average sound levels over the duration of the sampling period were measured to be 38.7 and 43.3 dBA. Sound levels are likely influenced by existing sound generated by traffic on Hammonds Plains Road and Pockwock Road.

Details of the assessment including methodology, full results and discussion are provided in Appendix K.

Acoustic Assessment

An acoustic assessment was conducted for the Project to predict sound pressure levels at identified receptors within a 2 km radius of the proposed turbine locations. The assessment was completed using the WindPro v. 2.8 software package. For the purposes of this model, receptors included all structures identified in the provincial topographic mapping, as well as any additional identifiable structures based on aerial imagery. The model followed ISO 9613-2 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method and calculations, and was based on the following input information:

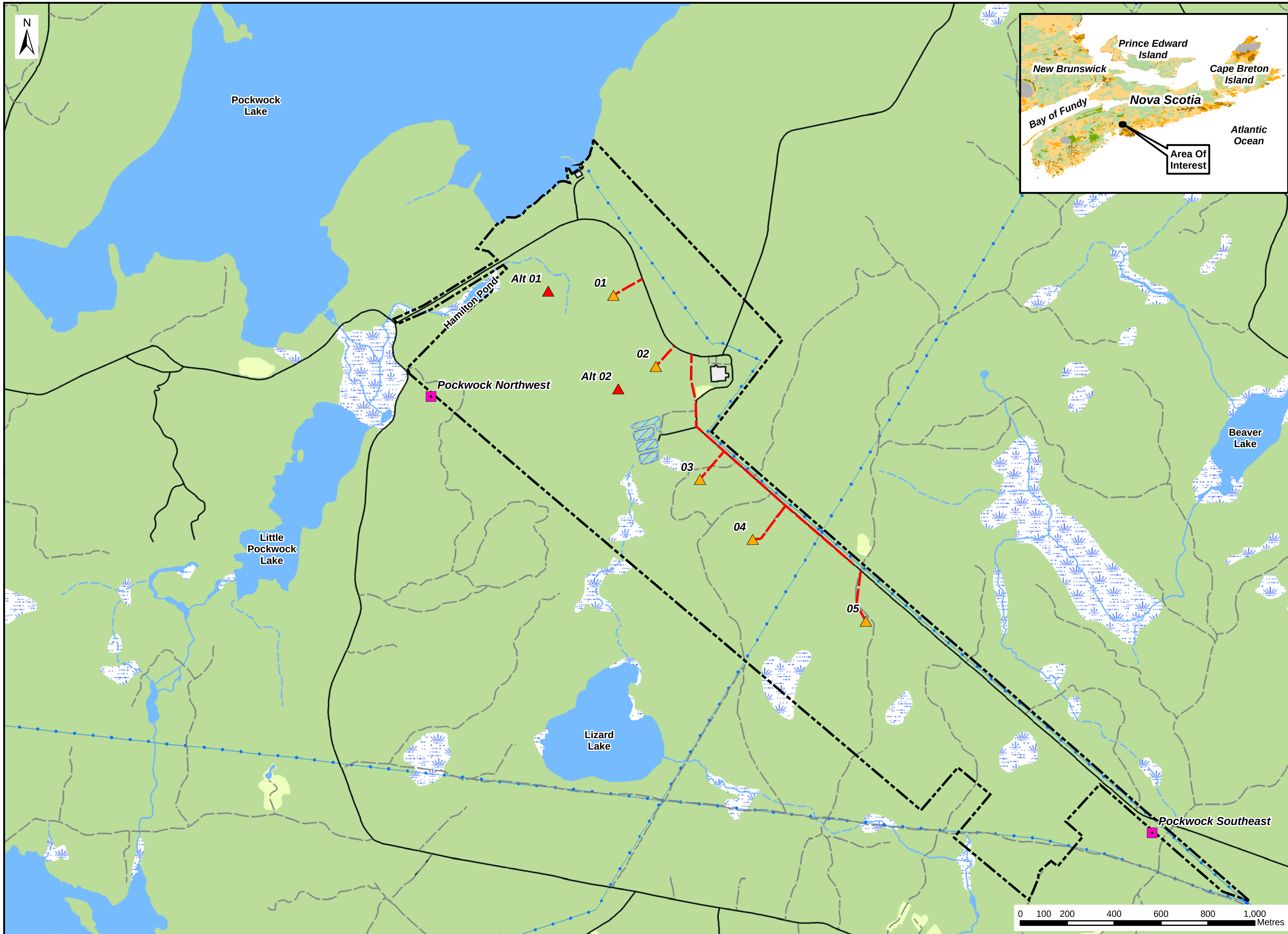
- UTM coordinates for the wind turbines;
- Generic 1/1 Octave band sound power level data for the wind turbines, as calculated by WindPro;
- UTM coordinates for receptors within a 2 km radius of the Project site;
- A wind speed of 8 m/s, the speed at which the highest sound power level output is achieved (based on test data from the manufacturer); and
- Topographic data for the surrounding area.

As a final agreement has not been reached with a turbine supplier, all turbine models under consideration were modeled separately. In addition, all seven possible turbine locations were modeled simultaneously, though only five locations will be selected. This conservative measure was taken to ensure that all potential noise-related issues are addressed, regardless of the turbine model and layout ultimately used for the Project. The most conservative results (e.g. the turbine model producing the loudest overall sound pressure level at receptors) are presented in this report.

Nova Scotia has no specific sound guidelines for wind farms; however, through the EA process, NSE requires that predicted noise levels at identified residential receptors (as well as daycares, hospitals and schools) not exceed 40 dBA. As this guideline is intended to be protective of human sleep disturbance, 40 dBA does not apply to commercial receptors. Mapping illustrating the predicted sound levels relative to receptors is provided in Drawing 12.5

A total of 156 existing structures were identified within a 2 km radius of the proposed turbine locations. Modeling results indicated that predicted sound levels will not exceed 40 dBA at any receptor. Excessive noise resulting from turbine operation is therefore not expected to be an issue at any existing dwellings/residences. Detailed results are provided in Appendix K.

A literature review related to infrasound is provided in Appendix C.



Notes:

1. Reference: Digital Topographic Mapping By Nova Scotia Geomatics Centre.
2. Projection: NAD83(CSRS), UTM Zone 20 North.

Legend:

- Proposed Turbine
- Alternate Turbine
- Sound Monitoring Location
- Proposed Access Road
- Project Site Boundary
- Major Roads and Highways
- Roads
- Access Roads / Trails
- Existing Transmission Lines
- Mapped Stream
- Indefinite Stream
- Water Bodies
- Mapped Reservoir
- Mapped Wet Area
- Cleared Area

Sound Monitoring Locations

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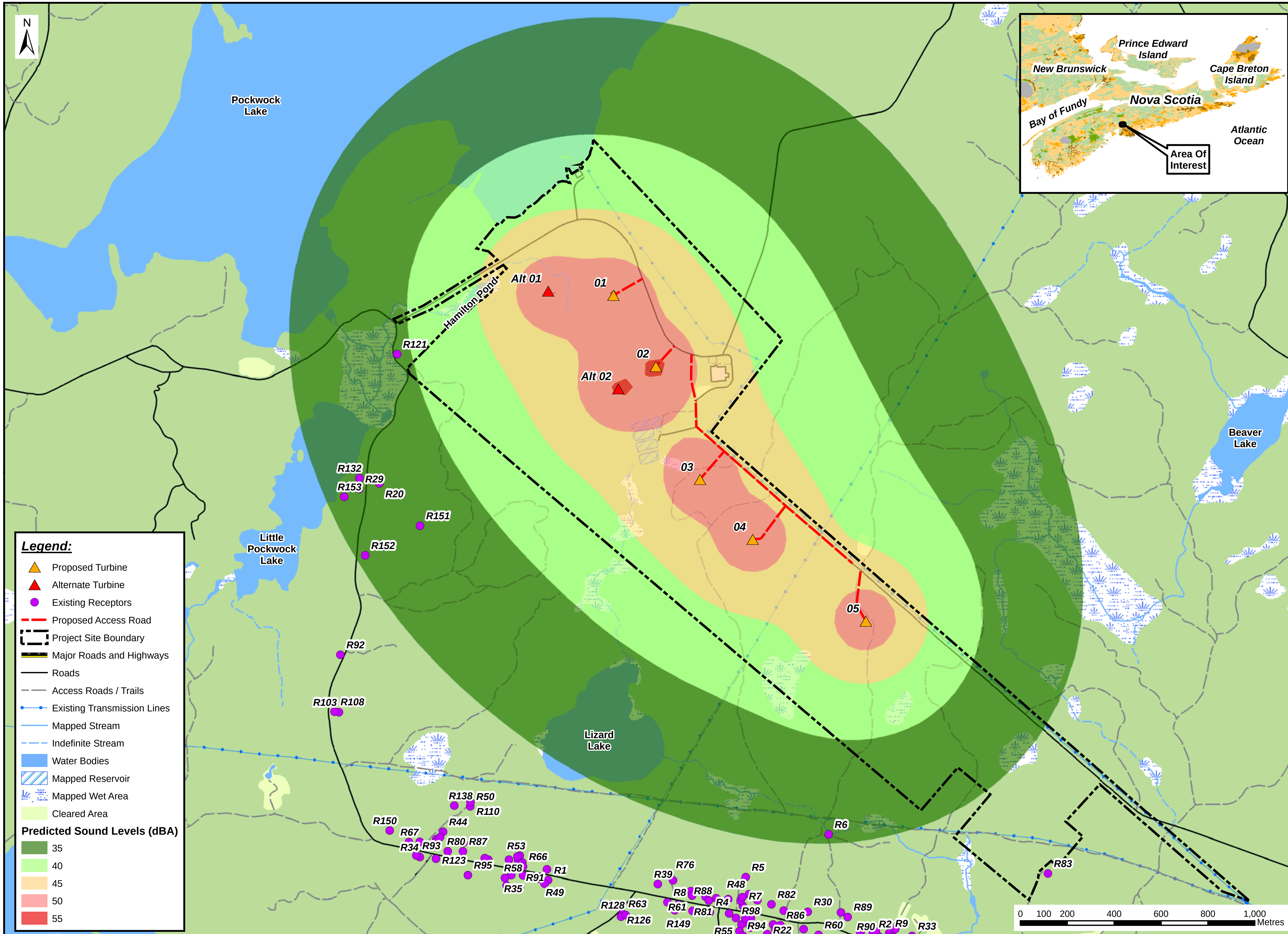
Date: April 2013	Project #: 12-4326
Scale: 1:15,000	Drawing #: 12.4
Drawn By: G. Gregory	
Checked By: M. Smith	



Notes:

1. Reference: Digital Topographic Mapping By Nova Scotia Geomatics Centre.
2. Projection: NAD83(CSRS), UTM Zone 20 North.

Sound Modeling Results

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Date: April 2013	Project #: 12-4326
Scale: 1:15,000	Drawing #: 12.5
Drawn By: G. Gregory	
Checked By: M. Smith	

13.0 CONSULTATION AND ENGAGEMENT

13.1 Public Consultation

As Communications Coordinator, Mr. Keith Towse (CWFI) coordinates meetings, addresses community concerns, and acts as a liaison between the community and the Project team.

The Project team has met several times with HRM, the Upper Hammonds Plains Community Development Association (UHPCDA), and local residents. A summary of the consultation for this Project is provided in Table 13.1. Specific concerns identified by the public are provided in Appendix L. Detailed information on the community events and website is provided below.

Table 13.1: Public Consultation Meetings and Events

Date	Stakeholder	Activity
September 15, 2011	NSE EA Branch	Early environmental discussions to better understand critical issues and permitting regime
September 2011	Community	Distributed information leaflet to residential properties within 1.5 km with a link to an online survey.
October 21, 2011	Community	Meeting with UHPCDA to provide Project update.
November 8, 2011	Municipality	Meeting with HRM staff (Trevor Creaser) to provide Project information.
November 9, 2011	Halifax Water	Discuss watershed issues
January 16, 2012	NSE EA Branch	Meeting with NSE staff to introduce the Project.
February 21, 2012	Halifax Water	Discussion of environmental/watershed issues
March 12, 2012	CWS NSDNR	Bird monitoring protocol provided to CWS and NSDNR.
March 23, 2012	Halifax Water	Discussion of project environmental issues
April 10, 2012	Community	Meeting with UHPCDA to provide Project update
April 10, 2012	Community	Project information sent to all landowners within 2 km of the Project boundaries to support planning application for MET tower.
April 24, 2012	CWS	Received written feedback from CWS regarding the bird monitoring program.

Date	Stakeholder	Activity
May 29, 2012	Community Municipality Province	Open house event held at at Upper Hammonds Plains Community Centre. Attended by approximately 40 members of public, Matt Whynott (MLA), Peter Lund (HRM Councilor).
June 13, 2012	NSDNR	Phone conversation with DNR staff to discuss bat monitoring and timing.
June 27, 2012	NSE EA Branch	Meeting with NSE Staff and Eric Christmas to discuss issues relating to noise and shadow flicker
September 26, 2012	Halifax Water	Meeting to discuss facilities locations environmental results
September, 26, 2012	NSDE	Meeting with Barry Francis to discuss development of Mi'kmaq Supply Chain
September, 28, 2012	NSDE	Meeting to discuss general update of project and partnership developments
October 15, 2012	NSDNR	Email update to NSDNR regarding bird and bat monitoring.
November 14, 2012	Community Municipality	Meeting with UHPCDA to provide Project update. Attended by Matt Whitman (newly elected HRM councilor).
November 15, 2012	NSDNR	Email regarding species status.
December 5-7, 2012	NSDNR	Provided moose monitoring protocol to NSDNR staff and incorporated feedback into protocol.
January- February 2013	Community	Individual meetings with all residents within 2 km of Project site to provide Project update.
February 12, 2013	Community	Meeting with UHPCDA to provide Project update.
February 14, 2013	NSE EA Branch	Met with NSE staff to discuss the Project.
February 18, 2013	NSDNR	Received feedback on moose protocol update.
February, 20, 2013	Halifax Water	Meeting to discuss facilities locations and environmental results
March 5, 2013	Halifax Water & Consultant	Meeting with engineering team from Halifax Water and their consultant (Stantec) to discuss micrositing to avoid planned environmental infrastructure
April 4, 2013	NSE EA Branch NSDNR	Met with NSE and NSDNR staff to discuss the Project.

Date	Stakeholder	Activity
April 4, 2013	Community	Wind 101 information session (see below).
April 25, 2012	Community	Project information sent to all landowners within 2 km of the Project boundaries to support planning application for project.
May 11, 2013	Community	Wind farm tour (see below).
May 15, 2013	Community	2nd Open house (see below).

Community Events
One community open house event was held in Upper Hammonds Plains on May 29, 2012 from 7-9 pm to inform the public about the Project and to hear local comments and concerns. The open house featured posters that provided information about the Project and associated studies that were underway. Copies of the posters and newsletter from the open house are provided in Appendix L. Attendees had the opportunity to speak one-on-one with Project team members and submit written comments and/or questions.

The proponent hosted a Wind 101 information session that was presented by Dr. Lukas Swan (Dalhousie University) on April 4, 2012 at the Upper Hammonds Plains Community Centre. The purpose of the session was to provide the community with general information about local energy/electricity use and production, wind energy, and wind project development. Approximately 60 people attended the session. A sign-up sheet was available at the presentation for those wishing to take a tour of a wind farm on May 11, 2013.

The Project Team will continue to help address any concerns raised by local citizens over the duration of the Project's development and has planned another open house event for May 15th at 6:00 to 9:00 pm, located at the Upper Hammonds Plains Community Centre.

Website
A website for the Project was developed in August 2012 and can be accessed at: at: www.pockwockwindfarm.ca. The website provides an overview of the Project, provides access to the featured posters presented at the first community open house, shares information on upcoming meetings, and Project news, as well as allows interested public to pose questions to the Project team.

13.2 Aboriginal Engagement
Preliminary Project details were submitted to the Kwilmu'kw Maw-klusuaqn Negotiation Office (KMKNO), the Confederacy of Mainland Mi'kmaq, the Shubenacadie (Indian Brook) Band, the Native Council of Nova Scotia, the Union of Nova Scotia Indians, the Unama'ki Institute of Natural Resources, and the Acadia First Nation.

14.0 EFFECTS ASSESSMENT

Based on the discussion in Section 7, the following have been identified as VECs:

- Terrestrial and aquatic fauna SOCI;
- Avifauna; and

- Bats.

To ensure all relevant issues and concerns related to the proposed Project are identified, an interaction matrix was used to evaluate the interactions between the Project phases and the VECs (Table 14.1). The potential for accidents and malfunctions is also considered for each Project phase.

Table 14.1: Interaction Matrix

Project Phases/Activities	**Terrestrial and Aquatic Fauna SOCI**	**Avifauna**	**Bats**
Site Preparation and Construction			
Land Surveys for Placement of Roads, Turbines and Associated Works			
Geotechnical Investigations	X	X	
Placement of Sedimentation and Erosion Control Measures			
Clearing of Trees and Grubbing Areas for Construction	X	X	X
Access Road Upgrading and Construction (including watercourse crossings)	X	X	X
Laydown Area and Turbine Pad Construction	X	X	X
Transportation of Turbine Components			
Turbine Assembly	X	X	X
Grid Connection			
Removal of Temporary Works and Site Restoration	X		
Commissioning			
Operation & Maintenance			
General Operation and Maintenance	X	X	X
Vegetation Management		X	
Decommissioning			
Dismantling and Removal of Turbines from Project Site	X	X	X
Removal of Turbine Foundations to Below Grade and Reinstatement of Topsoil	X	X	X
Removal of On-site Roads and Reinstatement of Lands	X	X	X
Removal and Disposal of Collection System, Conductor and Poles	X	X	X
Removal of All Other Equipment and Stabilization of Lands	X	X	X

14.1 Environmental Effects Analysis Methodology

The completion of the environmental effects analysis involves consideration of the following elements:

- Description of potential negative environmental effects;
- Mitigation measures;
- Residual effects;
- Significance of residual environmental effects; and
- Monitoring or follow up programs.

This EA is structured to include proposed mitigation to reduce or eliminate potential adverse environmental effects. The determination of significance of adverse environmental effects is based on post-mitigation (residual) effects, rather than unmitigated potential effects. The significance of residual effects of the Project will be determined using the criteria, based on federal and provincial EA guidance (Table 14.2).

The expectation for, and significance of, residual effects determines the need for a monitoring and/or follow-up program.

Table 14.2: Criteria for Identification and Definition of Environmental Impacts

Attribute	Options	Definition
Scope (Geographic Extent)	Local	Effect restricted to area within 1 km of the Project site
	Regional	Effect extends up to several km from the Project site
	Provincial	Effect extends throughout Nova Scotia
Duration	Short-term	Effects last for less than 1 year
	Medium-term	Effects last for 1 to 10 years
	Long-term	Effects last for greater than 10 years
Frequency	Once	Occurs only once
	Intermittent	Occurs occasionally at irregular intervals
	Continuous	Occurs on a regular basis and regular intervals
Magnitude	Negligible	No measurable change from background in the population or resource; or in the case of air, soil, or water quality, if the parameter remains less than the standard, guideline, or objective
	Low	Effect causes <1% change in the population or resource (where possible the population or resource base is defined in quantitative terms)
	Moderate	Effect causes 1 to 10% change in the population or resource
	High	Effect causes >10% change in population in resource

The potential level of impact after mitigation measures are applied (e.g. residual effects) was identified based on the criteria and definitions provided in the Natural Resources Canada (NRCan) document, "Environmental Impact Statement Guidelines for Screenings of Inland Wind Farms Under the Canadian Environmental Assessment Act" (NRCan 2003), as shown in Table 14.3.

Table 14.3: Definition of Significant Residual Environmental Impact

Significance Level	Definition
High	Potential effect could threaten sustainability of the resource and should be considered a management concern. Research, monitoring, and/or recovery initiatives should be considered.
Medium	Potential effect could result in a decline in resource to lower-than-baseline but stable levels in the study area after project closure and into the foreseeable future. Regional management actions such as research, monitoring, and/or recovery initiatives may be required.
Low	Potential effect may result in slight decline in resource in study area during life of the project. Research, monitoring, and/or recovery initiatives would not normally be required.
Minimal/None	Potential effect may result in slight decline in resource in study area during construction phase, but should return to baseline levels.
Not Applicable	If residual effects are not expected, significance levels are not applicable.

14.2 Effects Assessment

Effects and mitigation measures related to each VEC are described below. Potential effects of the Project on the identified VECs are further analyzed in Tables 14.4 to 14.6 to identify and evaluate the significance of residual effects, based on the criteria listed above. Mitigation measures are also summarized.

14.2.1 SOCI

It is widely acknowledged that wind energy development can have a suite of potential direct and indirect effects on terrestrial fauna (Arnett *et al.* 2007; Kuvlesky, Jr. *et al.* 2007). General construction activities within and adjacent to watercourses and water bodies, can affect aquatic fauna and habitat. The extent and magnitude of these effects can vary with the stage of the Project but are present for all phases.

During the site preparation and construction phases of wind energy projects, potential effects to SOCI will be related to:

- sensory disturbance;
- habitat loss/alteration and/or fragmentation;
- effects on fish passage/migration; and
- mortality.

Sensory Disturbance

Sensory disturbance to terrestrial fauna SOCI may occur from a variety of anthropogenic sources. For wind energy projects, disturbance effects are typically most significant during the construction phase, which involves increased presence of on-site personnel, vehicles, and heavy equipment (Helldin *et al.* 2012). Avoidance effects related to the construction phase have been reported for large mammals in two cases [e.g., Rocky Mountain Elk (*Cervus elaphus*) and wolves (Walter *et al.* 2006; Álvares *et al.* 2011)], but in both cases the effects were temporary and subsided once construction was completed. It is expected that avoidance or displacement effects related to the site preparation and construction phases of the Project will not persist in the long-term.

It is also important to distinguish wind energy facility roads from high-use highways in regards to sensory disturbance. Many of the documented effects of roads are related to avoidance due to traffic noise (Forman and Alexander 1998). The magnitude of such effects will be greatly reduced in the context of this wind energy development, as road traffic will be minimal (maintenance vehicles during operations) and limited.

Sensory disturbance during the operations and maintenance phase of the Project will be limited to the presence of on-site personnel conducting maintenance on Project infrastructure. Although literature on the topic is sparse, most evidence suggests that in general, terrestrial wildlife are not adversely effected by operating wind turbines. It was determined that a population of elk in Oklahoma, for example, did not change their home range or experience reduced dietary quality within an operating wind power development (Walter *et al.* 2006). It is therefore unlikely that ungulates in the Project site, including White-tailed deer and potentially Mainland moose, will be affected. Likewise, small mammal communities at wind energy developments do not appear to be affected by turbine operations (de Lucas *et al.* 2005).

Effects to terrestrial fauna SOCI during the decommissioning phase of the Project will be similar to those experienced during the site preparation/construction phase (Helldin *et al.* 2012). Namely, sensory disturbance due to the increased presence of on-site personnel and the operation of heavy equipment may elicit temporary displacement/avoidance behaviours in mobile wildlife species.

Sensory disturbance impacts related to aquatic SOCI are not expected.

Habitat Loss/ Alteration
Although the permanent Project footprint of a wind farm is just 5 to 10% of the Project site, there is the potential that significant habitat elements for certain terrestrial fauna SOCI may altered/removed during site preparation activities, such as clearing, for turbine pads and access roads (Arnett *et al.* 2007). However, the effects may be negligible if the habitat is in adequate supply in the general area surrounding the Project site (Arnett *et al.* 2007). Since the permanent Project footprint represents <1% of the Project site area and habitat types at the Project site are common in the surrounding landscape, particularly in the nearby PWA, the effects of habitat loss/alteration on terrestrial fauna SOCI will be minimized.
.
The construction of roads has a variety of well-documented, adverse effects including fragmentation of otherwise continuous segments of suitable habitat and restriction of movement of individuals between habitat patches (Trombulak and Frissell 2000, Eigenbrod *et al.* 2008), avoidance of adjacent habitat, increased access for hunters/poachers (Brody and Pelton 1989; Helldin *et al.* 2012),) which can potentially result in increased mortality of certain wildlife species while also facilitating the expansion of interspecific competitors (Beazley *et al.* 2004) and exotic species (Trombulak and Frissell 2000). The road network for this Project will have a small footprint due to the overall size of the Project, which will significantly reduce the magnitude of any potential effects.

Effects to Atlantic salmon and its habitat during the site preparation and construction phases the Project are primarily related to the construction and upgrading of access roads, and the installation of crossing structures where roads intercept watercourses. Vegetation clearing along banks and land adjacent to watercourses could result in significant habitat degradation for fish and other aquatic biota if appropriate mitigation techniques are not employed. The alteration or removal of riparian vegetation may result in bank instability and erosion, leading to sedimentation of the water body and a degradation of water quality. Removal of overhanging vegetation from stream banks decreases shade/cover for fish and may result in increased localized water temperatures. Likewise, the removal of instream cover, such as coarse woody material or edge habitat (e.g. undercut banks) may have a similar effect on fish habitat. Alterations to channel morphology and interference with sediment transport may also lead to Atlantic salmon habitat modification/degradation (MTO 2009). Many effects to Atlantic salmon habitat can be mitigated through thoughtful planning and the incorporation of standard mitigation and BMPs (refer to Section 4).

The potential effects of the Project on fauna SOCI habitat during the operational phase are likely to be minimal. Aside from surface disturbance and the possible removal of regenerated vegetation, decommissioning will not include additional habitat loss/alteration. Therefore, the effects to fauna SOCI during this phase of the Project are not expected to be significant in magnitude nor long-term in duration.

Effects to Passage/Migration

Lack of consideration for fish migration/passage during the design of crossing structures and/or appropriate installation techniques may also lead to a number of effects to Atlantic salmon. These effects typically manifest as modifications or barriers to fish movement through the affected watercourse. Barriers to fish passage include velocity barriers, alteration of the stream gradient and insufficient flow/depth (MTO 2009).

Many effects to Atlantic salmon passage can be mitigated through thoughtful planning and the incorporation of standard mitigation and BMPs (refer to Section 4).

Mortality

Increased vehicle and heavy equipment traffic during all phases of the Project may result in collisions with terrestrial wildlife. It is expected that these collision events will be minimized by the implementation of safe work practices (e.g., strict adherence to speed limits, obeying all warning signs). Collisions, should they occur, will be infrequent and will not have a significant effect on population levels.

General Mitigation Measures

The following specific mitigative measures will be implemented to avoid and mitigate any potential effects on fauna SOCI:

- Minimization of the footprint of physical disturbance by:
  - Designing and constructing access roads to avoid environmentally sensitive habitats, where possible, and ensuring the most efficient means to access turbines is achieved.
  - Maintenance of a buffer around sensitive habitats such as watercourses and wetlands, where possible.
  - Minimizing routine vegetation clearing:
    - clearing of land only if required for construction area footprint;
    - restoration of areas of disturbance where possible, post construction; and
    - siting construction compounds in/on non-sensitive areas.
- Completion of a comprehensive schedule and determination of timelines to efficiently complete Project activities within the shortest time frames possible.

Species-Specific Mitigation

Desktop and field analyses for fauna SOCI revealed several species that have the potential to occur at the Project site. Addressing the potential effects of the Project on these species will require species-specific mitigation techniques, as described below:

Fisher:

- Project activities will be planned to minimize disturbance to Fisher habitat at the Project site, particularly in mature, mixed wood stands featuring large, hollow trees (suitable for denning) and areas of continuous canopy cover (Gilbert *et al.*1997).

Mainland moose:

- Pre-construction snow-tracking surveys revealed no evidence of Mainland moose at the Project site. The EPP for the Project will require Project personnel to report any Mainland moose sightings to NSDNR.

Monarch:

- Should large congregations of Monarchs be found at the Project site, Project activities in the area should cease until the migrating group has left the Project site. This is most likely to occur in late summer, prior to the fall migration.

Wood turtle:

- Based on recommendations outlined in the document 'Protecting and Conserving Wood Turtles: A Stewardship Plan for Nova Scotia' (MacGregor and Elderkin 2003), and the NS Transportation and Public Works Generic Environmental Protection Plan for the Construction of 100 Series Highways (2007), the following general procedures will be implemented to ensure the protection of Wood turtles:
    - Any turtles found (identification booklet to be provided to site personnel) will be relocated outside of the construction zone, along the same habitat corridor in the direction of travel the turtle was originally oriented and preferably upstream within the same riparian habitat corridor (< 400 m).
    - Any sightings of wood turtle will be reported to the NS Wood Turtle Recovery Team at 1-866-727-3447.
    - Adequate, permanent buffers of vegetation will be left around important Wood turtle habitat. If necessary (e.g., in the event that Wood turtles are confirmed at the site), an appropriate mixture of shrubs and trees shall be planted to create a buffer.

Atlantic salmon:

- The siting, design, installation and decommissioning of all crossing structures will incorporate ongoing consultation with DFO, NSE and Halifax Water, and will avoid areas of sensitive habitat and ensure that fish passage is maintained.
- Additional mitigation for the protection of fish habitat will be ensured through the NS watercourse alteration permitting process.

14.2.2 Avifauna

The effects of a wind farm on birds are variable and depend on factors such as the development design, topography of the area, habitats affected, and the bird community in the wind farm area (Drewitt and Langston 2006). Although some effects are related to construction (e.g. habitat alteration), most potential effects on avifauna are mainly related to operation and may include:

- habitat loss/alteration;
- mortality resulting from direct collision; and
- sensory disturbance.

Habitat Loss/Alteration

Habitat alterations resulting from the site preparation and construction phases of wind energy developments have the potential to impact bird populations either directly or indirectly (Arnett *et al.* 2007). However, effects are considered less severe than those from other energy extraction developments such as oil and gas exploration because the disturbance is limited to the construction footprint (turbine pads, roads, associated buildings, etc.) (Kuvlesky *et al.* 2007). The magnitude of these effects, however, may be magnified if the disturbed area contains sensitive plant communities that provide important habitat to local bird populations (Kuvlesky *et al.* 2007). Altered landscapes can potentially lead to displacement of species with sensitive habitat requirements (Arnett *et al.* 2007). Site clearing and preparation may involve the removal of key habitat features, such as standing deadwood, mature trees, or shrub cover required as foraging and/or breeding habitat for certain bird species.
Mature forest, for example, is present at the Project site and its removal may displace bird species into other mature stands in the general area. Surface disturbance is greater in the construction phase than in the operational phase because large right of ways need to be created to accommodate large construction equipment and transport vehicles (Arnett *et al.* 2007). It can therefore be assumed that effects associated from direct habitat alteration are greatest in the short-term, except when key habitat features are permanently removed. Depending on the availability of nearby alternative habitat, habitat alterations associated with wind energy infrastructure may have detrimental effects on local bird populations. The landscape of the Project site and immediately surrounding area features forest stands that would appear to provide suitable alternative habitat to bird species displaced due to habitat alteration at the Project site.

Collision Mortality

The most overt potential effect of the Project on birds is direct mortality resulting from collision with Project infrastructure, namely turbine blades, during the operational phase. Most evidence suggests that mortality levels resulting from turbine collisions are low (EC *et al.* 2012) although many studies do not adequately incorporate carcass removal by scavengers into mortality estimates. In a review of night migrant fatalities at wind farm sites in North America, Kerlinger *et al.* (2010) found fatality rates of less than one bird/turbine/year to approximately seven birds/turbine/year, even with corrections made for scavenger removal and searcher efficiency. Furthermore, multi-bird fatality events, in which more than three birds were killed at a turbine site in a single night, were found to be rare and may have been related to lighting and/or inclement weather (Kerlinger *et al.* 2010).

Collision risk is greater on or near areas used by large numbers of foraging or roosting birds or in important migratory flyways (Drewitt and Langston 2006). In Canada, passerines account for 70% of all fatalities, with most occurring during the fall migration season (EC *et al.* 2012). The probability of raptor collision with wind turbines depends on the species, turbine height, and local topography (de Lucas *et al.* 2008). Collision risk can therefore be greatly reduced by incorporating knowledge of the avifauna into the design and placement of wind power infrastructure.

Evidence cited by Erickson *et al.* (2001), NAS (2007) and Manville (2009) in NWCC (2010), demonstrates that although only general estimates are available, the number of birds killed at wind energy developments is substantially lower than then estimated annual bird casualty rates from a variety of other anthropogenic factors including vehicles, buildings, and windows, power transmission lines, communication towers, toxic chemicals (including pesticides), and feral and domestic cats (NWCC 2010). In summary, available research suggests that the probability of large-scale fatality events occurring at wind farms is extremely low (Kerlinger *et al.* 2010).

Sensory Disturbance

Sensory disturbance to birds can occur during the construction, operational, and decommissioning phases of wind power projects, and can be caused by the increased presence of personnel, vehicle movement, operation of heavy equipment, and the operation of the turbines themselves (Drewitt and Langston 2006). It is thought that disturbance to birds may have a greater population impact than collisions, although research is lacking in this area (Kingsley and Whittam 2005). Primary concerns with regards to sensory disturbance are related to displacement and potential effects on key physiological processes such as breeding.

Some studies have shown that birds will exhibit avoidance behaviours post-construction, leading to a variable degree of displacement from previously used habitat (reviewed in Drewitt and Langston 2006) which essentially amounts to habitat loss. In most cases, such displacement is on the scale of tens to hundreds of metres, which can lead to localized changes in bird densities (Leddy *et al.*1999; Pearce-Higgins *et al.* 2009). However, while birds may avoid specific sites, the evidence does not suggest that birds abandon the general area as a whole. Other research indicates that the presence of wind turbines has no effect on the distribution of the bird community (Devereux *et al.* 2008) and birds may habituate to the presence of operating wind turbines (Madsen and Boertmann 2008). The tolerance to Project related disturbance may be species specific but may also be related to the availability of alternative habitat (Kingsley and Whittam 2005). Thus, careful site selection of turbines to avoid any unique habitat types will alleviate some disturbance and/or displacement effects, especially during the operational phase of the Project.

General Mitigation Measures

The following mitigative measures will be implemented to avoid and mitigate any potential effects on avifauna:

- Where possible, clearing of site vegetation will be conducted outside of the breeding and nesting season for birds (April to August). If this is not possible, a mitigation plan will be developed in consultation with NSDNR and CWS prior to clearing activities.
- Use of lighting during construction will be limited to minimum levels.
- Use of lighting on turbine hubs and blades will be limited to minimum levels while still meeting requirements of Transport Canada.
- There will be no general lighting at the Project site. Lighting will only be used when technicians are working on-site.

- Where possible, placement of Project infrastructure in habitats significant to bird species (as identified during avian surveys) will be avoided. These include wetlands, mature forests, and areas with large, hollow trees.
- Post-construction monitoring will be implemented under direction from NSE and in consultation with CWS and NSDNR to monitor for significant mortality trends.

14.2.3 Bats

The installation of wind turbines has the potential to impact bats both directly and indirectly (Arnett *et al.* 2007). Although some effects are related to construction (e.g. habitat alteration), most potential effects on bats are mainly related to operation and may include:

- habitat loss/alteration;
- mortality resulting from direct collision and/or barotrauma; and
- sensory disturbance.

The significance of these effects at the population level depends on a number of biotic and abiotic variables, including the number of individuals affected and the stability of the population, season, physiologic condition of the individuals affected, and weather factors.

Habitat Loss/Alteration

Habitat alterations, including vegetation clearing and soil disruption (NRC 2007) resulting from the site preparation and construction phases, may impact bats (Arnett *et al.* 2007). The removal of trees during the site clearing and preparation phases can be especially detrimental, particularly to those bat species which use trees as roosting habitat (Arnett *et al.* 2007).

Some studies, however, suggest that habitat changes related to wind power developments may in fact create benefits to bats by increasing cleared areas and creating access roads, both of which can be used by bats as foraging habitat (as cited in Arnett *et al.* 2007; Kunz *et al.* 2007a). In relation to this, small-scale disturbances, including creating small cutblocks or small scale access roads through forested habitat, have been shown to stimulate an increase in bat activity relative to previous years (Grindal and Brigham 1998). It is important to note, however, that increased edge habitat due to forest clearing may subsequently increase the risk of mortality by virtue of attracting bats to the area of the operating turbine (Kunz *et al.* 2007b).

Mortality

Mortality of bats is a potential effect during the operational phase of wind energy projects, Necropsy of recovered carcasses found that the cause of death for baths killed at wind-energy facilities is an indiscernible combination of direct collision with the turbine blades and barotrauma (Grodsky *et al.* 2011), although more recent pathological research has found that traumatic injury is the major cause of bat mortality at wind farms and that post-mortem artifacts may manifest themselves as pulmonary barotrauma lesions (Rollins *et al.* 2012). Barotrauma is characterized by a drop in atmospheric pressure along the top of a rotating turbine blade, which causes thoracic, abdominal, and pulmonary injury to bats when passing through the low pressure area (Baerwald *et al.* 2008). Much of the established literature has not attempted to elucidate the causes of bat mortality but has instead reported on the magnitude of mortalities. In Canada, EC reports that bat fatalities outnumber bird fatalities

(EC *et al.* 2012). This causes concern as bats are long-lived and have low reproductive rates (Arnett *et al.* 2007).

Research suggests that migratory tree-roosting species suffer the highest fatalities at wind farms (Kunz *et al.* 2007a; Kuvlesky *et al.* 2007; Cryan and Barclay 2009), although deaths of Tri-colored bats constituted 25.4% of total bat fatalities at wind facilities in the eastern United States (as cited in Arnett *et al.* 2007). Migratory species, including Hoary bat, Eastern red bat, and Silver-haired bat, accounted for 71% of 2,270 bat fatalities recorded at wind energy facilities across Canada between 2006 and 2010 (EC *et al.* 2012). Most bat fatalities are reported in the late summer months (Johnson 2005) coinciding with the start of swarming and autumn migration (Arnett *et al.* 2007: EC *et al.* 2012). Periods of high mortality may therefore be linked with the timing of large-scale insect migrations when bats feed at altitudes consistent with wind turbine heights (Rydell *et al.* 2010). It has been found that bat fatalities increase exponentially with wind tower height, with turbine towers 65 m or taller having the highest fatality rates (Barclay *et al.* 2007). This hypothesis is also supported by the findings of Horn *et al.* (2008), who reported that bats were not being struck by turbine blades when flying in a straight line en route to another destination, but were struck while foraging in and around the rotor-swept zone of the turbine.

Temporal variation in bat activity and subsequent fatality rates can be influenced by weather variables, as well as the characteristics of the facility (Baerwald and Barclay 2011). Although bats exhibit species-specific responses to environmental variables (Baerwald and Barclay 2011), in general they appear to be more active when wind speeds are low, which increases the risk of collisions with rotating turbine blades (Arnett *et al.* 2007) and mortality resulting from barotrauma.

Sensory Disturbance

Increased human presence may also disturb roosting bats (Arnett *et al.* 2007), but it is unknown if this disturbance is sufficient to disrupt normal behaviour or physiology. Sensory disturbance to bats is most likely during the site preparation/construction and decommissioning phase of the Project, during which the presence of on-site personnel and equipment will be the highest. During hibernation, bats are sensitive to human presence, and human intrusion into hibernacula can lead to increased arousals leading to a premature depletion of fat reserves (Thomas 1995). Siting wind-energy facilities away from hibernacula is therefore recommended in the design phases of these projects.

It is unknown if noise associated with the operational phase of wind energy projects has any measureable effect on bats, although it is thought that bats may become acoustically disoriented by the low-frequency noise emitted from rotating turbines (Kunz *et al.* 2007a). Bats have been shown, experimentally, to avoid foraging in areas with intense, broadband noise (Schaub *et al.* 2008), however this research was not conducted in the context of wind-energy development and other studies indicate that bats have been shown to forage in close proximity to operational turbines (Horn *et al.* 2008).

General Mitigation Measures

The following specific mitigative measures will be implemented to avoid and mitigate any potential effects on bats:

- Use of lighting during construction and on turbine hubs and blades will be limited to minimum levels while still meeting requirements of Transport Canada.

- Where possible, placement of Project infrastructure in or directly adjacent to habitats significant to bat species will be avoided. These include hibernacula, wetlands, and lands directly adjacent to open bodies of water.
- Post-construction monitoring will be implemented under direction from NSE and in consultation with CWS and NSDNR to monitor for significant mortality trends.

14.3 Environmental Effects Analysis

The following tables (14.4 to 14.6) identify and evaluate the significance of residual effects for each phase of the Project on each VEC: Fauna SOCI, Avifauna, and Bats. Accidents and malfunctions are also analyzed. As most of the mitigation is the same for avifauna and bats, these VECs are considered together in order to decrease repetition.

Table 14.4: Environmental Effects Analysis – Construction Phase

Environmental Component (VEC)	Potential Effect	Mitigation Summary	Significance Criteria	Residual Effects	Significance of Residual Effect
SOCI	• Sensory disturbance • Habitat loss/alteration/ degradation and/or fragmentation. • Effects to fish passage/migration. • Mortality.	• Implementation of the EPP. • Minimize of the footprint of physical disturbance to the extent possible. • Avoid disturbing sensitive habitats during construction. • Prompt restoration of cleared areas post-construction. • Maintain efficient timelines to complete Project construction activities within the shortest amount of time possible. • Herbicides will not be utilized in the removal of vegetation during decommissioning activities. • Avoid known significant habitat, where possible. *Species-specific Mitigation* • Minimize disturbance to mature, mixed wood stands featuring large, hollow trees (Fisher). • The EPP for the Project will require Project personnel to report any Mainland moose sightings to NSDNR. • Should large congregations of Monarchs be found at the Project site, Project activities in the area should	Scope: Local Duration: Short-term Frequency: Once Magnitude: Negligible-Low	No residual effect anticipated	Not applicable

Environmental Component (VEC)	Potential Effect	Mitigation Summary	Significance Criteria	Residual Effects	Significance of Residual Effect
		cease until the migrating group has left the Project site. • Leave adequate, permanent buffers of vegetation around important Wood turtle habitat. • Report any Wood turtle sightings to the Wood Turtle Recovery Team. • In the event that Wood turtles are confirmed at the site, an appropriate mixture of shrubs and trees will be planted to create a buffer. • Relocate any wood turtles outside of the construction zone (as per guidelines outlined in MacGregor and Elderkin 2003, and NSTPW 2007). • Conduct in-stream construction activities in consultation with DFO and/or NSE to ensure that fish passage is maintained (Atlantic salmon). • Additional mitigation for the protection of fish habitat will be ensured through the NS watercourse alteration permitting process.			
Avifauna and Bats	• Habitat loss/Alteration • Mortality • Sensory	• Implementation of the EPP. • Conduct vegetation clearing outside of the breeding and nesting season for birds (April to August).	Scope: Local Duration: Short-term Frequency: Once Magnitude: Low	No residual effect anticipated	Not applicable

Environmental Component (VEC)	Potential Effect	Mitigation Summary	Significance Criteria	Residual Effects	Significance of Residual Effect
	disturbance.	• If this is not possible, a mitigation plan will be developed in consultation with NSDNR and CWS prior to clearing activities. • Limit the use of lighting during construction to minimum acceptable levels. • Avoid placement of Project infrastructure in habitats significant to bird and bat species. These include wetlands, hibernacula, mature forests, land directly adjacent to open water and areas with large, hollow trees.			
Accidents and Malfunctions	• Accidental spill/release. • Failure of erosion and sediment /control measures.	• Implementation of the EPP, including the spill prevention plan and contingency plans (as necessary).	Scope: Local Duration: Short-term Frequency: Once Magnitude: Negligible-Low	No residual effect anticipated	Not applicable

Table 14.5: Environmental Effects Analysis – Operation/Maintenance Phase

Environmental Component (VEC)	Potential Effect	Mitigation Summary	Significance Criteria	Residual Effects	Significance of Residual Effect
SOCI	• Sensory Disturbance • Collision Mortality	• Implementation of the EPP. • Implementation of Safe Work Practices and strict adherence to speed limits and warning signs to avoid traffic collisions. • Minimize road traffic to the extent possible. • Implement efficient timelines to complete Project activities within the shortest possible time frame. • To the extent possible, plan operation and maintenance activities to avoid sensitive habitats and minimize time on-site. • Herbicides will not be utilized in the removal of vegetation during maintenance activities. *Species-specific Mitigation* • Conduct In-stream maintenance activities "in-the-dry", and adhere to timing windows (Atlantic salmon). • Conduct in-stream maintenance activities in consultation with DFO and/or NSE to ensure that fish passage is maintained (Atlantic salmon). •	Scope: Local Duration: Long-term Frequency: Intermittent Magnitude: Negligible	No residual effect anticipated	Not applicable
Avifauna and Bats	• Mortality from collision (avifauna and bats) or barotrauma (bats). • Sensory	• Implementation of the EPP. • To the extent possible, plan operation and maintenance activities to minimize time on-site. • Avoid routine vegetation clearing during	Scope: Local Duration: Long-term Frequency: Continuous Magnitude: Low	It is expected that birds and bats will avoid the immediate area of the turbines (but not the Project	Low-Medium

	disturbance.	breeding and nesting season. • Avoid all unnecessary lighting at the Project site. Lighting will only be used when technicians are working on-site. • Limit lighting on turbine hubs and blades to minimum levels while still meeting requirements of Transport Canada. • Implement post-construction monitoring under direction of NSE and in consultation with CWS and NSDNR to monitor for significant mortality trends.		site and surrounding area), which will reduce the number of bird collisions. Bird and bat fatalities due to turbine collisions are not expected to be significant.	
Accidents and Malfunctions	• Accidental release. • Failure of erosion and sediment control measures.	• Implementation of the EPP, including the spill prevention plan and contingency plans (as necessary).	Scope: Local Duration: Short-term Frequency: Once Magnitude: Negligible-Low	No residual effect anticipated	Not applicable

Table 14.6: Environmental Effects Analysis – Decommissioning Phase

Environmental Component (VEC)	Potential Effect	Mitigation Summary	Significance Criteria	Residual Effects	Significance of Residual Effect
SOCI	• Sensory Disturbance. • Habitat alteration and/or degradation • Mortality.	• Implementation of the EPP. • Minimize of the footprint of physical disturbance to the extent possible. • Avoid disturbing sensitive habitats during decommissioning. • Prompt restoration of cleared areas post-construction. • Maintain efficient timelines to complete Project activities within the shortest amount of time possible. • Herbicides will not be utilized in the removal of vegetation during decommissioning activities. • Limit access to existing roads only. • Avoidance of known significant habitat, where possible. *Species-specific Mitigation* • Conduct in-stream decommissioning activities in consultation with DFO and/or NSE (Atlantic salmon). • Conduct in-stream decommissioning work "in-the-dry" and adhere to timing windows (Atlantic salmon). • Reinstate natural stream channel conditions in former stream crossing locations (Atlantic salmon). • Promptly re-stabilize and re-vegetate stream banks post-decommissioning (Atlantic salmon).	Scope: Local Duration: Short-term Frequency: Once Magnitude: Negligible	No residual effect anticipated	Not applicable

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Avifauna and Bats	• Sensory disturbance.	• Implementation of the EPP • Limit access to existing roads only. • Limit time on site. • Avoid decommissioning activities during breeding/nesting season, to the extent possible. • Restore vegetation promptly following decommissioning. • Limit the use of lighting during decommissioning to minimum acceptable levels	Scope: Local Duration: Short-term Frequency: Once Magnitude: Negligible	No residual effect anticipated	Not applicable
Accidents and Malfunctions	• Accidental release. • Failure of erosion and sediment control measures.	• Implementation of the EPP, including the spill prevention plan and contingency plans (as necessary).	Scope: Local Duration: Short-term Frequency: Once Magnitude: Negligible-Low	No residual effect anticipated	Not applicable

14.4 Follow-up Measures

A potential residual effect for avifauna and bats was noted in Table 14.5. The potential effect of collisions and/or fatalities to avifauna and bats will be addressed in post-construction monitoring programs that will be implemented to assess the effects of the operation of the proposed wind farm.

Monitoring programs are scheduled to begin in 2015.

15.0 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

Environmental factors that have the potential to have damaging effects on wind turbines include:

- Extreme wind (typically associated with hurricanes);
- Hail;
- Ice storms/ ice formation;
- Heavy snow;
- Lightning; and
- Fire.

The primary mitigative measure employed during the construction and operation of the Project will be educating and training site personnel. Environmental and safety orientations will be conducted prior to the start of construction and all staff will be informed of the potential effects of the environment on the Project. Staff responsible for the operation and maintenance of the Project will be trained on the design and operation of the turbine, including applicable operating procedures, safety protocols and evacuation plans.

Modern wind turbines are equipped with a number of mechanisms to reduce damage caused by extreme weather and are designed to shut down when certain thresholds are detected (CanWEA 2011). Further, best practices and industry standards will be applied to the operation of the Project to manage risks of damage from extreme events. Table 15.1 demonstrates potential effects resulting from environmental events and the mitigation associated with each.

Table 15.1 Effects of Environmental Events and Associated Mitigation

Environmental Event	Effect	Mitigation
Hurricane/Extreme winds	Damage to blades.	• Turbine design equipped to shut down.
Hail	Damage to blades.	• Turbine maintenance according to best practices and industry standards.
Ice storms	Ice formation. Potential ice throw.	• Turbine design equipped to shut down; • Appropriate safety protocol; • Restrict use of Project site; and • Signage to indicate potential falling

		ice.
Heavy snow	Damage to turbines.	• Turbine design equipped to shut down.
Lightning strike	Potential fire during operation. Damage to electrical systems.	• Turbine design equipped with built-in grounding system; and • Appropriate safety protocol.
Fire	Fire during construction due to materials and machinery	• Appropriate safety protocol; • Fire prevention plan; • Evacuation plan; and • Local training of first responders.

16.0 CUMULATIVE EFFECTS ASSESSMENT

Concerns are often raised about the long-term changes that may occur not only as a result of a single action but of the combined effects of each successive action on the environment (Hegmann *et al.*1999).

The cumulative effects assessment focuses only on adverse effects of the Project remaining after the application of mitigation measures (e.g., only residual effects). For this Project, the only VECs identified to have a potential residual effect are avifauna and bats (i.e., collision mortality). Therefore, known or anticipated activities within a 20 km radius of the Project site were reviewed to identify the potential for cumulative effects on avifauna and bats.

A search for existing or proposed wind farm developments was completed within the 20 km radius of the Project site. No other planned wind farm developments were identified within 20 km of the Project site and no future expansion is planned for the Chebucto Pockwock Community Wind Project. Therefore the potential for cumulative effects related to avifauna and bat mortality is considered not significant.

17.0 OTHER APPROVALS

In addition to the EA Approval, several other permits and/or approvals may be required prior to the start of construction (Table 17.1).

Table 17.1: Potential Future Approvals

Approval/Notification/Permit Required	Government Agency
Municipal	
Building Permit	HRM
Development Permit	HRM
Provincial	
EPP/Sediment and Erosion Control Plan	NSE
Watercourse Alteration Approval	NSE
Wetland Alteration Approval	NSE
Notification of Blasting (if required)	NSE
Access Road/Wood Removal Within Pockwock PWA	NSE
Transmission Line Within the Pockwock PWA	NSE
Work within Highway Right-of-Way (if required)	NSTIR
Access Permit	NSTIR
Use of Right-of-Way for Pole Lines	NSTIR
Electricity Standard Approval	NSDE
Elevator/Lift License	Nova Scotia Department of Labour and Advanced Education
Overweight/ Special Move Permit	Service Nova Scotia
Federal	
Blasting Near Watercourses Approval (if required)	DFO
Land-use Clearance	Nav Canada
Notification of Project (awaiting response)	RCMP
Final design, location and height of turbines	NRCan
Lighting design for navigational purposes	Nav Canada
Aeronautical Obstruction Clearance	Transport Canada

18.0 CONCLUSIONS

In accordance with "A Proponent's Guide to Wind Power Projects: Guide for preparing an Environmental Assessment" (NSE 2012a), the studies, regulatory assessments, and VEC evaluations described within this document have been considered both singularly and cumulatively.

The results indicate that there are no significant environmental concerns or negative effects that may result from the Project that cannot be effectively mitigated or monitored.

Best practices and standard mitigation methods will be implemented during all phases of the Project, to ensure methods and practices are comprehensive and are adhered to. Furthermore, an EPP will be developed and communicated to all employees working on the Project.

The proposed capacity of the turbines will produce enough energy to power 3,300 households with local, clean renewable energy and will contribute to reaching Nova Scotia's renewable energy commitments.

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