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:

- Species Locations
- Proposed Turbine
- Proposed Access Road
- Permanent Disturbance Area
- Project Site Boundary
- Building
- Major Roads and Highways
- Roads
- Access Roads / Trails
- Existing Transmission Lines
- Large Structure
- Mapped Stream
- Indefinite Stream
- Water Bodies
- Mapped Wet Area
- Cleared Area

Fall Bird Species of Conservation Interest Locations

Kwilmu'kw Maw-klusuaqn Negotiation Office
Mi'kmaq Rights Initiative
Our Rights. Our Future.

Community Wind Farms Inc.

juwi

Strum
CONSULTING

Date: April 2013	Project #: 12-4329
Scale: 1:7000	Drawing #: 8.7D
Drawn By: G. Gregory	
Checked By: M. Smith	

8.8 Bats

The Nova Scotia Significant Species and Habitats database (NSDNR 2012c) indicates seven features related to bats and/or bat habitats within a 100 km radius of the Project site. All are classified in the database as "Species of Concern", and relate to Little brown myotis (6) and Tri-colored bat (1). The database identifies no records of bats within a 10 km radius of the Project site.

Moseley (2007) provided an overview of the known bat hibernacula in the caves and mines of Nova Scotia. This research indicates eight 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 (km)	Direction
The Ovens	18.29	SE
Frenchman's Cave	70.49	NNE
Miller's Creek Cave	75.8	NNE
Vault Cave	81.4	NNW
Woodville Ice Cave	83	NNE
Cheverie Cave	86.3	NNE
Centre Rawdon Gold Mine	94.03	NNE
Walton Barite Mine	98.95	NNE

Source: Moseley (2007)

The Ovens, a series of active sea caves, are considered minor bat hibernacula supporting less than 10 hibernating bats (Moseley 2007). Despite the small overall numbers of bats, all three hibernating species have been recorded at this location.

The closest hibernaculum considered to be of significance is Cheverie Cave, located over 86 km to the north-northeast. This dissolutional cave in gypsum is thought to support up to 1,000 over-wintering bats, mostly Northern long-eared bats (Moseley 2007).

The largest known hibernaculum in Nova Scotia is Hayes Cave, located in South Maitland over 117 km to the northeast (Moseley 2007). Up to 6,000 bats enter this cave in September and reside until June (Davis & 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 a 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	Endangered	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 2012; [4]NSDNR 2010

Field surveys of bat migration/habitat use were carried out from September 21st to October 11th, 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). The detector was deployed in a shrub swamp within a cleared powerline corridor, adjacent to mature, mixed-woods forest. The detector was located 260 m west of Turbine 1 and 630 m north of Turbine 2 (Drawing 8.6).

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, 1,089 files were recorded, of which only 35 files were determined to be bat generated ultrasound.

Most echolocation calls were recorded between September 21st and 23rd, and were associated with *Myotis* species bats (e.g., Little brown myotis (*Myotis lucifugus)* and Northern long-eared myotis (*M. septentrionalis*) (Table 8.16). Six of the 35 calls identified were categorized as unknown species. These calls were clearly bat generated ultrasound; however, the quality of the files was not sufficient to render a positive identification. However, most of the unknown calls were likely *Myotis* spp. due to their frequency and slope.

Table 8.16: Number of Echolocation Calls Recorded at Project Site (Sept 21st- Oct 11th)

Date	Echolocation Calls		
	***Myotis* sp.**	**Unknown**	**Total**
9/20/2012	0	0	0
9/21/2012	14	1	15
9/22/2012	5	1	6
9/23/2012	4	0	4
9/24/2012	0	0	0
9/25/2012	1	0	1
9/26/2012	0	0	0
9/27/2012	0	0	0
9/28/2012	1	0	1
9/29/2012	2	1	3
9/30/2012	1	0	1
10/1/2012	0	0	0
10/2/2012	1	0	1
10/3/2012	0	0	0
10/4/2012	0	1	1
10/5/2012	0	2	2
10/6/2012	0	0	0
10/7/2012	0	0	0
10/8/2012	0	0	0
10/9/2012	0	0	0
10/10/2012	0	0	0

Date	Echolocation Calls		
	Myotis sp.	Unknown	Total
10/11/2012	0	0	0
Total	**29**	**6**	**35**

An average of 1.6 echolocation calls per night were detected during the monitoring period. The highest recorded activity occurred on the night of September 21st during which 15 of 35 (42.8%) of echolocation calls were detected. Increased activity on this night may have been due to the presence of one bat, likely *Myotis* sp., continuously foraging in close proximity to the detector over the course of the evening. 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 that particular night.
As expected, average nightly bat activity peaked between 19:00 and 20:00 coinciding 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 to be 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.

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 breeding habitat is present at the Project site, in the form of mature forest stands (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), 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 65±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, suitable habitat is present at the Project site in the form of mid-aged to mature 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), which is present at the Project site. 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 59 km away, and the Tri-colored bat has been identified at Frenchman's Cave, approximately 70 km from the Project site.

No indication of Tri-colored bat was observed during field studies, despite the presence of apparently suitable habitat, including mature coniferous forest. However, since the breeding range of the species occurs in relatively close proximity, it is somewhat likely that this species occurs at the Project site, most likely 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.

Mitigation measures for bats are provided in Section 4 and 14.

9.0 SOCIO-ECONOMIC ENVIRONMENT

9.1 Local Demographics and Industry

The area surrounding the Project site is sparsely populated by the small community of Whynotts Settlement. The Project site is located on land within the MODL. The largest towns in the Municipality include Bridgewater (pop. 7,944), Lunenburg (pop. 2,317) and Mahone Bay (pop. 904) (Statistics Canada 2006). The nearest communities to the Project site are Oak Hill (1.6 km), Maitland (2.1 km), and Pine Grove (3.4 km).

9.1.1 Demography

Population statistics for Lunenburg County and the Town of Bridgewater from the 2011 census are summarized in Table 9.1.

Table 9.1 Population in Lunenburg County and Bridgewater

Population Statistics	**Lunenburg County**	**Bridgewater**
Population in 2011	47,313	8,310
Population in 2006	47,150	8,021
Population change from 2006-2011 (%)	0.3	3.6
Total private dwellings in 2011	25,263	4,027
Land area (square km)	2,909.90	13.79
Population density per square kilometer	16.3	602.6

Source: Statistics Canada 2011

The age distribution in Lunenburg County and the Town of Bridgewater (Table 9.2) reveal slightly older populations with a median age of 46.0 years and 44.3 years, respectively compared to the median age of the Province of Nova Scotia (41.8), and HRM (39.0) (Statistics Canada 2006).

Table 9.2: Age in Lunenburg County and Bridgewater

Age Statistics	Lunenburg County	Bridgewater
0 - 14 years	6,555 (13.9%)	1,120 (14.1 %)
15 - 64 years	31,640 (67.1%)	5,195 (65.5 %)
65+ years	8,950 (19.0%)	1,620 (20.4 %)
Total Population	**47,145 (100%)**	**7,935 (100%)**

Source: Statistics Canada 2006

Lunenburg County's average housing cost is $173,183, significantly higher than the Town of Bridgewater at $134,044 and to a lesser extent than the provincial average of $158,000 (Statistics Canada, 2006). As for median earnings for full-time, full year earners, Nova Scotians ($36,917) have lower earnings than the national median ($41,401) (Statistics Canada 2006). Lunenburg County and Bridgewater fall below the provincial median earnings of $36,917 for Full-Time, Full Year Earners (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
Lunenburg County	$173,183	$34,802
Bridgewater	$134,044	$34,190
Province of Nova Scotia	**$158,000**	**$36,917**

Source: Statistics Canada 2006

9.1.2 Health Care and Emergency Services

The Lunenburg Regional Fire and Emergency Services represent the 28 fire departments in the MODL, and the towns of Lunenburg, Bridgewater and Mahone Bay. Serving the community of Whynotts Settlement is the Oakhill and District Fire Department located on Highway 325 in Whynotts Settlement. Other nearby fire departments to the Project site include the Northfield District Fire Hall located on Highway 10 near Dayspring and the Bridgewater Fire Department on Dominion Street in Bridgewater. Bridgewater Police Service is located on Exhibition Drive, in the Town of Bridgewater.

Health services in the region are provided by the South Shore Regional Hospital located in Bridgewater.

9.1.3 Industry and Employment

Employment and unemployment rates for February 2012 in the South Shore (includes Lunenburg County) Economic Region indicate that the unemployment rate was 9.2%, which is higher than the provincial average of 8.5%) (Statistics Canada 2012). With regard to employment rates, the South Shore employment rate of 52.5% was found to be lower than the provincial rate of 57.6% (Statistics Canada 2012).

A breakdown of the labour force within Lunenburg County and Bridgewater is provided in Table 9.4. The highest proportion of workers in both Lunenburg County and Bridgewater fall into the "other services" category (18.1% and 20.6%, respectively). 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, manufacturing, and health care (Statistics Canada 2006).

Table 9.4: Labour Force by Industry in Lunenburg County and Bridgewater

Industry	Total Lunenburg County	Industry	Total Bridgewater
Total experienced labour force 15 years +	23,325	**Total experienced labour force 15 years +**	3,900
Other services	4,230	**Other services**	805
Manufacturing	3,920	**Business services**	640
Business services	3,210	**Retail trade**	575
Retail trade	2,920	**Manufacturing**	535
Health care and social services	2,480	**Health care and social services**	510
Construction	1,965	**Construction**	200
Agricultural and other resource-based industries	1,915	**Agriculture and other resource-based industries**	180
Educational services	1,200	**Educational services**	160
Finance and real estate	795	**Finance and real estate**	170
Wholesale trade	690	**Wholesale trade**	110

Source: Statistics Canada 2006

The Project site is located approximately 5 km northeast of the town of Bridgewater, which is home to a variety of businesses. A review of businesses located within 5 km of the Project site, not including the town of Bridgewater, is provided in Table 9.5.

Table 9.5: Local Businesses and Proximity to Project Site

Business	Distance and direction to Project site*
SHAID Tree Animal Shelter	0.7 km east of Project site, on Mullock Road
Lunenburg Regional Community Recycling Center	0.9 km east of Project site, on Mullock Road
Outback Muffler Shop	2.4 km southwest of Project site, on Spruce Street
Bridgewater/Dayspring Air Park	2.8 km south of Project site, on Copper Drive
BMI Ltd.	1.5 km west of Project site, on Highway 325
Performance Sports & Leasure	2 km west of Project site, on Highway 325
Osprey Lake Golf Course	2.8 km west of Project site, on Harold Whynot Road
Oakhill Pines Camp & Trailer Park	2.3 km southwest of Project site, on Oakhill Road

Business	Distance and direction to Project site*
Safeguard Chimney Sweep	2.5 km north of the Project site, on Highway 325
Wide open Wilderness Campground	2.8 km north of the Project site, on W Demone Road

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

Economic effects as a result of the Project will include job creation, increased tax revenue for MODL and investments made into the local community through the creation of a Community Sustainability Fund.

It is estimated that the Project will result in approximately $10-$12 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 the delivery of equipment and construction materials, as well as professional development, construction and operational services. A significant portion of the total investment will come from sources outside Nova Scotia, resulting in a significant capital investment into the Nova Scotia economy.

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

- Project Development- During the development phase of the Project Nova Scotian professionals will deliver a variety of services, including: civil and electrical engineering services, legal services, 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 Scotian 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 operations and maintenance 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.

The involvement of the KMKNO as a Project partner will maximize the local economic benefit to the community through job creation and utilization of local contractors. As the KMKNO is to be a majority owner of the Project, significant efforts have been made and will continue to be made to involve Mi'kmaq owned and affiliated businesses and laborers in the development, construction and operation of the Project. In addition, the proponents are working to develop an Industrial Benefit Agreement for the Project, which aims to create opportunities for Mi'kmaq contractors and labor to participate in the Project.

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),* MODL 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 $800,000.

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 $350,000 in the local community.

9.2 Land Use and Value

The property on which the proposed wind farm is to be built is privately owned "Resource Forest" land and is currently not being used for other economic activities. The Project site is surrounded by "Resource Forest", "Residential Taxable" and "Resource Farm" lands (Service NS 2013).

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. There are wildlife associations serving the area, including the South Shore Wildlife Association. The Cookville Picnic Area (Provincial Park) is also located in the area, approximately 6.5 km to the east.

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). The towns of Bridgewater, Mahone Bay, and Lunenburg in the South Shore Region were examined. Table 9.6 below shows the total trips (people who stopped for at least 30 minutes or stayed overnight) that were made to these towns 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 9.6: Communities Visited in Nova Scotia

Region/Community	Total Trips (% who stopped or stayed)	Capture Rate (%)
South Shore	**27%**	
Bridgewater	7%	24%
Mahone Bay	11%	42%
Lunenburg	13%	49%

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

The data shows that Lunenburg and Mahone Bay tend to be the popular tourist destinations along the South Shore. These quaint seaside communities are rich in charm and history offer an array of attractions for tourists. Known as the "Mainstreet of the South Shore", Bridgewater is strategically located with ample amenities to serve its role as a regional commercial centre, but is less appealing to tourists.

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 by Market & Opinion Research International (MORI) 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 ARIA was to determine the potential for historic and pre-contact period archeological resources within the Project site through background research.

There are no significant water features in or in close proximity to the Project site suggesting that it is unlikely that pre-contact archeological material has been deposited in the area. Furthermore, no areas of elevated potential for First Nations activity within the Project site exist (Davis MacIntyre & Associates Ltd. 2013). Following the pre-contact period, European settlement occurred and evidence suggests that settlers, likely from Germany, were the first to settle in the Whynotts region in the latter half of the 18th century. By the late 19th century, historical mapping indicates the presence of a school, and numerous households of which at least two were located within or adjacent to the Project site.

A 2012 field survey revealed evidence of European historic settlement in the form of historic agricultural activity, stone piles indicative of historic field clearing, stone foundations and a horse-shoe shaped stone feature. However, none of the identified features are impacted by the current design (Davis MacIntyre & Associates Ltd. 2013). The ARIA was forwarded to the NS Department of Communities, Culture and Heritage. The response letter is provided in Appendix G, confirming that no significant archaeological material will be disturbed by the Project.
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 immediate surrounding area

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 near the study area, therefore members of this band did not participate in the workshop. Active hunters from the Acadia Band travel to Sheet Harbour and Musquodobit to hunt. Due to the long distance to the study area, the majority of hunters, fishers and harvesters from the Glooscap First Nation were not currently frequenting the study area on a regular basis. 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.

The workshop held with the Millbrook First Nation identified the Whynotts Settlement study area as a particularly good fishing area due to the density of rivers, streams, lakes and ponds. Species noted were trout and bass. The region was also noted as having higher than average deer populations, visible along the 103 Highway and most roads.

It should be noted that the KMKNO is a partner in the development of this Project. There is general support for the Project, along with other potential wind farm developments; 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.

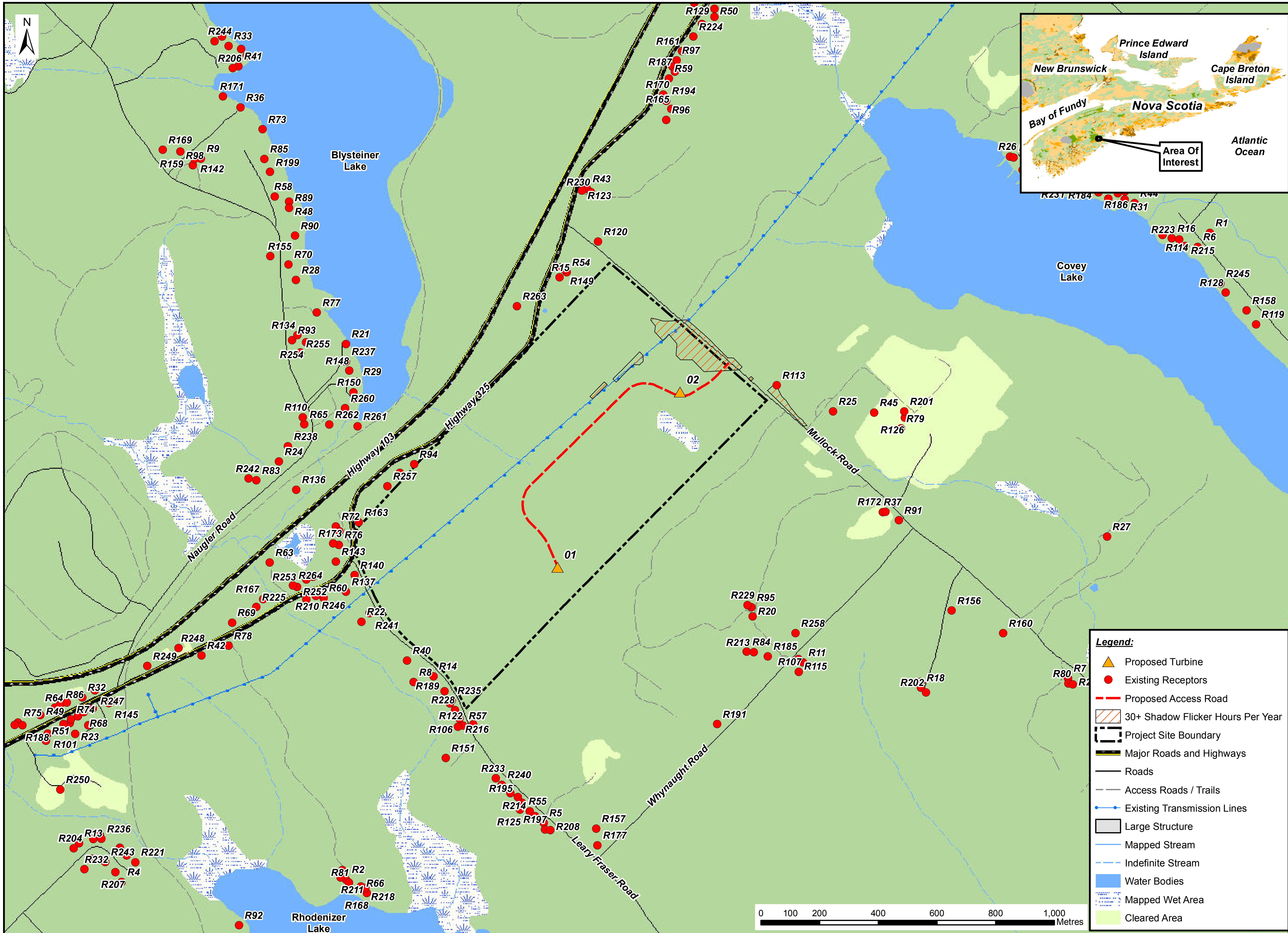
A shadow flicker assessment was completed for the proposed Project to assess the potential impact on surrounding shadow receptors. The analysis was conducted using the WindPRO version 2.8 software package. There are no municipal, provincial, or federal guidelines related to shadow flicker, but many jurisdictions (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 at residential receptors. 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. This conservative measure was taken to ensure that all potential shadow-related issues are addressed, regardless of the turbine model ultimately used for the Project.

A list of 264 potential receptors, within 2 km of the Project site (Appendix I), was developed using GIS data from the Nova Scotia Geomatics Centre and aerial imagery. In cases where topographic mapping indicated a structure that was not visible on aerial imagery, field truthing was carried out to verify that the no structure was present; if verified, the receptor was removed from the model. 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. Modeling incorporated real-case data to evaluate site-specific conditions related to shadow flicker generation. Specifically, wind speed and direction data was obtained from an on-site meteorological tower, and average daily sunshine hours for each month were calculated based on sunshine radiation measurements collected in the nearby Town of Bridgewater (COGS 2013). In addition, forest stand height was inputted into the model to determine the visibility of the turbines from receptor locations, since shadow flicker is only possible in areas where at least part of the turbine(s) is visible.

When using real-case statistics, WindPro calculates the total predicted number of shadow hours per year at each receptor by applying a reducing factor to the total number of shadow hours per year expected under worst case conditions. The reducing factor varies between months of the year and is specific for each receptor. The software, however, does not include a mechanism to predict the maximum number of minutes of shadow on the worst day based on real-case statistics. To estimate this variable, a conservative approach was taken in which the smallest reducing factor for a receptor, regardless of month, was applied to the calculated maximum number of shadow minutes per day for each receptor, based on worst case conditions. For example, if modeling determined that the highest number of shadow minutes occurred on a day in July, and the smallest reducing factor was determined to be applicable in February, the February reducing factor was applied to represent a conservative approach.

Modeling results (Appendix I) indicate that all residential receptors are predicted to comply with the industry standard of no more than 30 minutes of shadow flicker on the worst day, and no more than 30 hours of shadow flicker per year (Drawing 12.1).



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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Scale: 1:12,000	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 (Radio Advisory Board of Canada [RABC] and CanWEA, 2012). In response to this phenomenon, the 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 type and function of the system.

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, 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	Additional analysis required to determine specific interference to the CBC broadcast system. Five transmitters listed as being within the 89 km consultation zone. Two of the five were listed as active on the Industry Canada database.
Analog Television Receivers	n/a	4.5 km	Consultation may be required to evaluate the effects of the Project on analog TV reception within 4.5 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 antenna) 15 km (directional antenna)	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 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 response received.
Radar communication systems	RCMP	N/A	No response received.
VHF omnidirectional range	Nav Canada	15km	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	Natural Resources Canada (NRCan)	N/A	No response received.

Relevant correspondence from operators and reporting is provided in Appendix J. 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 245 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. One tower was identified to be within the 1 km consultation zone. This tower has a call sign of XJN809 and is owned by the local Fire Department. The next closest tower is located 3 km away from the project centre and is owned by The Town of Bridgewater Public Works and is listed as call sign VAC593.

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). Turbine visibility was calculated based upon a 5 m grid resolution to achieve the highest precision possible. 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 2,240 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.

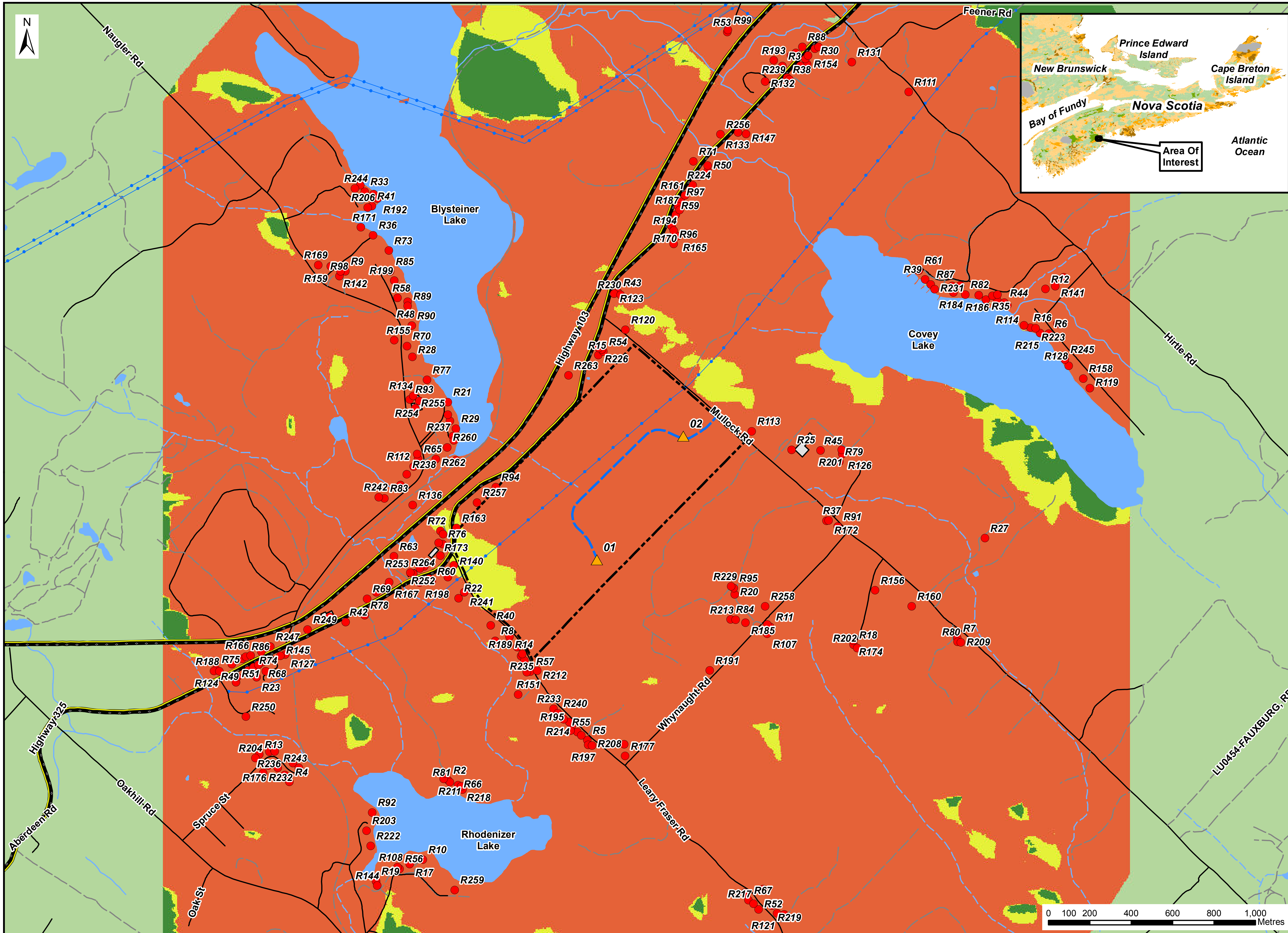
Model results indicate that no turbines will be visible from 3.3% (74 ha) of the assessment area, while both turbines will be visible from 91.8% (2,056 ha) of the area (Drawing 12.2).

Predicted View Plane

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

Photographs were collected 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 were taken from eleven locations as shown in Drawing 12.3. Simulated results are provided in Figures 12.1-12.11.



Notes:

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

Legend:

- Proposed Turbine
- Existing Receptors
- Proposed Access Road
- Project Site Boundary
- Major Roads and Highways
- Roads
- Access Roads / Trails
- Existing Transmission Lines
- Large Structure
- Mapped Stream
- Indefinite Stream
- Water Bodies

Number Of Visible Turbines

- 0
- 1
- 2

ZVI Analysis

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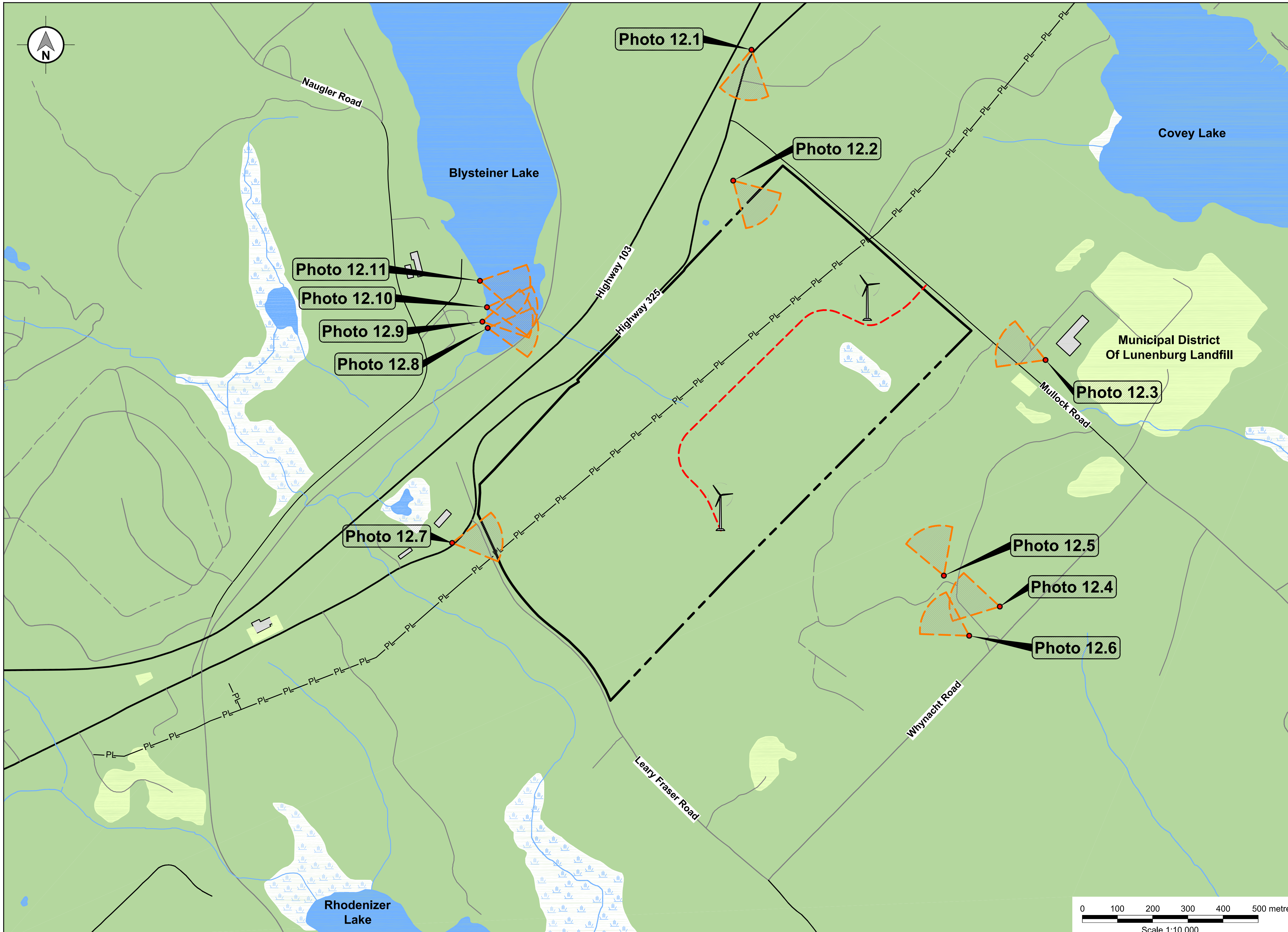
Date: April 2013	Project #: 12-4329
Scale: 1:17,000	Drawing #: 12.2
Drawn By: H. Serhan	
Checked By: M. Smith	



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 Road
- Existing Paved Road
- Existing Trail / Access Road
- Mapped Stream
- Indefinite Stream
- Mapped Water Bodies
- Mapped Wet Area
- Cleared Area

Visual Assessment Locations

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DATE: April 2013	PROJECT #: 12-4329
SCALE: 1:10,000	DRAWING #: 12.3
DRAWN BY: H. Serhan	
CHECKED BY: M. Smith	

Predicted View:

Actual View:

Figure 12.1: View looking south/southwest on Highway 325, just northeast of the junction with Mullock Road.

Predicted View:

Actual View:

Figure 12.2: A view looking the southeast from Highway 325.

Predicted View:

Actual View:

Figure 12.3: A view to the northwest from the parking lot of the Municipal District of Lunenburg Recycling Depot parking lot.

Predicted View:

Actual View:

Figure 12.4: A view to the west from Whynaughts Road.

Predicted View:

Actual View:

Figure 12.5: A view to the north from Whynaughts Road.

Predicted View:

Actual View:

Figure 12.6: A view to the northwest from Whynaughts Road.

Predicted View:

Actual View:

Figure 12.7: A view to the east from the Oakhill District Fire Department's parking lot.

Predicted View:

Actual View:

Figure 12.8: A view to the east from Lake Road 1.

Predicted View:

Actual View:

Figure 12.9: A view to the east from Lake Road 1.

Predicted View:

Actual View:

Figure 12.10: A view to the east from Lake Road 1.

Predicted View:

Actual View:

Figure 12.11: A view to the east from Lake Road 1.

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 hearing acuity and tolerance for particular noise types (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, 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 Monitoring

Ambient sound monitoring was completed to establish pre-construction sound levels at a two locations at the Project site. Locations were selected to be in close proximity to potential receptors (Drawing 12.4). Average sound levels over the duration of the sampling period were measured to be 50.7 and 56.0 dBA. Sound levels are likely influenced by existing sound generated by traffic on the nearby 103 and 325 highways, as well as along Leary Fraser Road and Mullock 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. In cases where topographic mapping indicated a structure that was not visible on aerial imagery, field truthing was carried out to verify that the no structure was present; if verified, the receptor was removed from the model. 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;

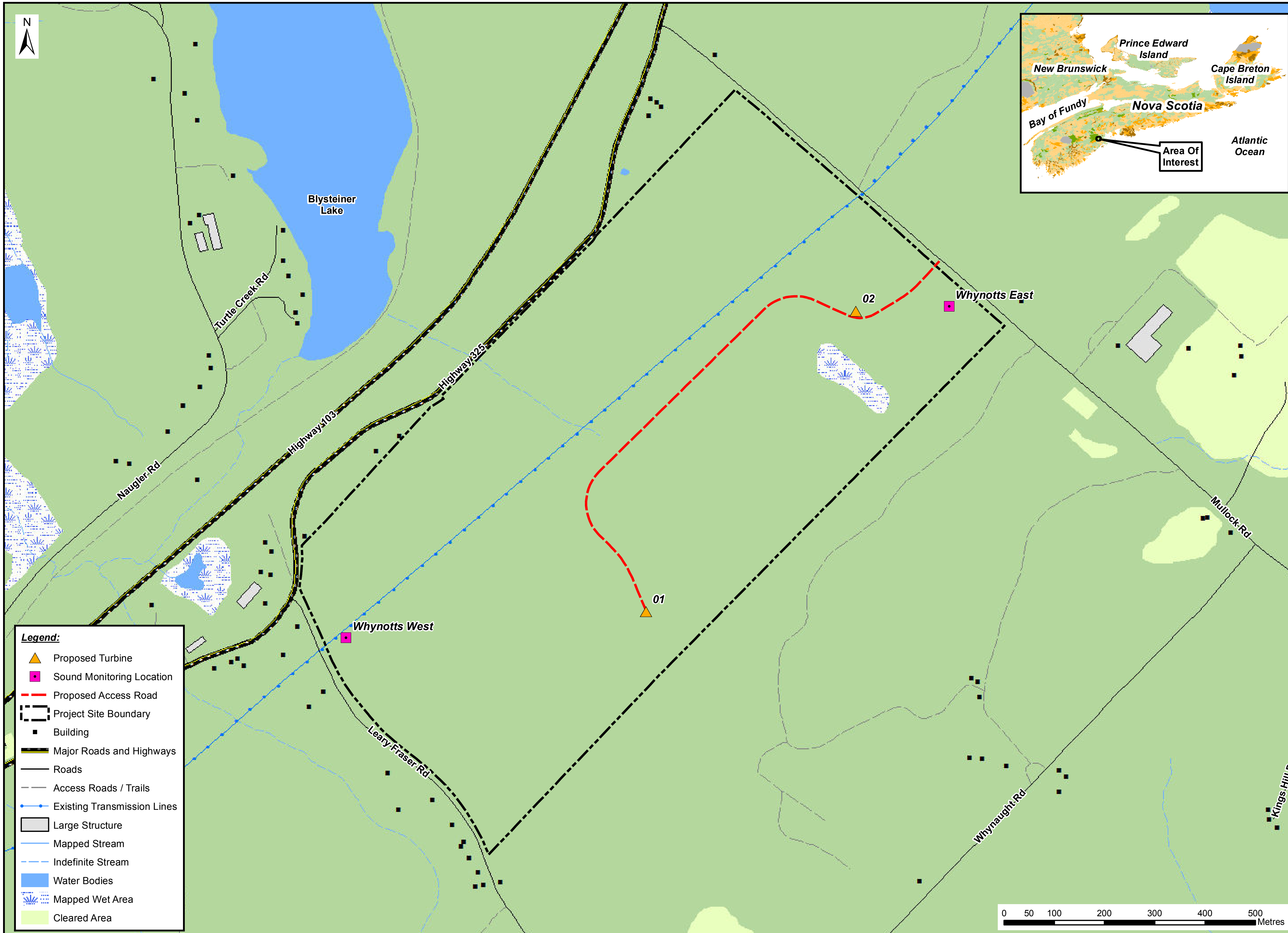
- UTM coordinates for the wind turbines;
- Generic 1/1 Octave band sound power level data for the wind turbines, as calculated by WindPro;
- UTM coordinates for receptors;
- A wind speed of 8 m/s, the speed at which the highest sound power level output is achieved (based on test data from the manufacturer); 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. This conservative measure was taken to ensure that all potential noise-related issues are addressed, regardless of the turbine model 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 264 receptors were identified within a 2 km radius of the proposed turbine locations. Modeling results identified one receptor with a predicted sound level exceeding 40 dBA (42.8 dBA). However, further investigation revealed that this structure is associated with a commercial property, and therefore, does not constitute a dwelling or potential residence. Results indicate that all residential receptors comply with 40 dBA. Detailed results are provided in Appendix K.

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



Notes:

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

Sound Monitoring Locations

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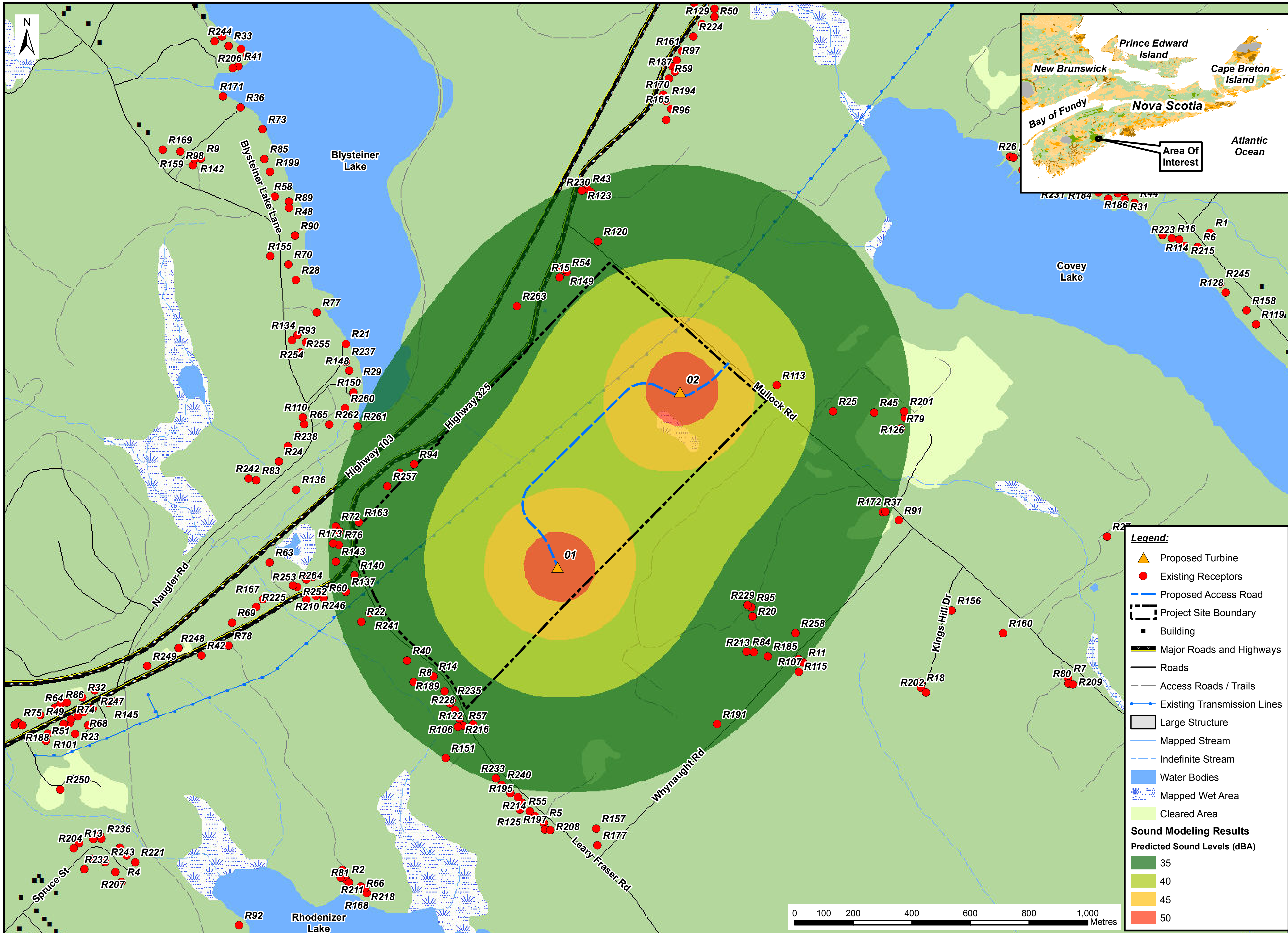
Date: April 2013	Project #: 12-4329
Scale: 1:7000	Drawing #: 12.4
Drawn By: H. Serhan	
Checked By: M. Smith	



Notes:

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

Sound Modeling Results

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Date: April 2013	Project #: 12-4329
Scale: 1:12,000	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 MODL staff and local residents, as well as provincial and federal government staff. 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 community events and the website is provided below.

Table 13.1: 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 km with a link to an online survey (completed by 11 people).
October 13, 2011	Municipality	Meeting with MODL staff (Jeff Merrill, Doug Reid) to provide Project information.
January 16, 2012	NSE EA Branch	Meeting with NSE staff to introduce the Project.
March 12, 2012	CWS NSDNR	Bird monitoring protocol provided to CWS and NSDNR.
April 24, 2012	CWS	Received written feedback from CWS regarding the bird monitoring program.
June 1, 2012	Community Municipality	Open House event held at Oakhill Fire Hall – attended by approximately 30 members of the public, as well as Frank Fawson (MODL councillor).
June 13, 2012	NSDNR	Phone conversation with DNR staff to discuss bat monitoring and timing.
June 14, 2012	Province	Meeting with Pam Birdsall, MLA, to provide Project update.
June 14, 2012	Municipality	Meeting with MODL staff (Jeff Merrill, Doug Reid) to provide Project update.
June 27, 2012	NSE EA Branch	Meeting with NSE Staff and Eric Christmas to discuss issues relating to noise and shadow flicker.
July 10, 2012	Municipality	Meeting with MODL staff (Jeff Merrill, Doug Reid, Dave Waters) to provide Project update.

Date	Stakeholder	Activity
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.
September 29, 2012	Municipality	Meeting with Frank Fawson (MODL councillor) to provide Project update.
October 15, 2012	NSDNR	Email update to NSDNR regarding bird and bat monitoring.
November 15, 2012	NSDNR	Email regarding species status.
November 28, 2012	NS Communities, Culture and Heritage	Acceptance letter of the ARIA.
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 11, 2013	Municipality	Meeting with MODL staff (Jeff Merrill, Doug Reid) 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.
April 4, 2013	NSE EA Branch NSDNR	Met with NSE and NSDNR staff to discuss the Project.
April 11, 2013	Community	Wind 101 information session (see below).
May 11, 2013	Community	Wind farm tour (see below).
May 16, 2013	Community	2nd Open house (see below).

Community Events

One community open house event was held in Whynotts Settlement on June 1, 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 11, 2012 at the Oakhill Fire Department, which was attended by 50 people. 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. A sign-up sheet was available at the presentation for those wishing to take a wind farm tour 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 16th at 7:00 pm, located at the Oakhill Fire Department.

Website
A website for the Project was developed in August 2012 and can be accessed at: www.whynottswindfarm.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. The website also contains a Mi'kmaq language page.

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 Indian Brook First Nation, the Native Council of Nova Scotia, the Union of Nova Scotia Indians, the Unama'ki Institute of Natural Resources, and the Acadia First Nation. Meetings have been held with most of the 13 Mi'kmaq bands represented by the KMKNO. A meeting with the Native Council of Nova Scotia is scheduled for May 2013.

The KMKNO is the COMFIT eligible community partner for the Project, and as such, has been highly involved in Project activities to date. The KMKNO has been actively involved in all phases of Project development and has attended partnership and Project meetings on a regular basis. juwi and CWFI have worked closely with the Mi'kmaq Benefits Committee of the KMKNO in the development of a mutually beneficial Industrial Benefit Agreement for the Project, which aims to create opportunities for Mi'kmaq contractors and labor to participate in all phases of the Project, including development, construction and operations.

14.0 EFFECTS ASSESSMENT

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

- 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	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	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	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 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.

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 Species of Conservation Interest

It is widely acknowledged that wind energy development can have a suite of potential direct and indirect impacts 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 impacts 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 impacts 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 impacts 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 impacts related to the construction phase have been reported for large mammals in two cases [e.g., Rocky Mountain Elk (*Cervus elaphus*) (Walter *et al*. 2006) and wolves (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 & 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).

Impacts to 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 footprint of a wind energy facility is generally estimated to be just 5 to 10% of the Project site (Arnett *et al.* 2007), there is the potential that significant habitat elements for certain fauna SOCI may altered/removed during site preparation activities, such as clearing, for turbine pads and access roads. 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 1.24% of the total Project site area and habitat types at the Project site are common in the surrounding landscape, 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 & Frissell 2000, Eigenbrod *et al.* 2008), avoidance of adjacent habitat, increased access for hunters/poachers (Brody & 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 & 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 aquatic fauna SOCI and 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 resulting in increased vulnerability to predators and potentially 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. Coarse woody material also provides habitat for aquatic invertebrates. 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 4.0).

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 terrestrial and aquatic fauna SOCI during this phase of the Project are not expected to be significant in magnitude or 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 fish SOCI. 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 fish passage can be mitigated through thoughtful planning and the incorporation of standard mitigation and BMPs (refer to Section 4.0).

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 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 SOCI revealed several species that have the potential to occur at the Project site. Addressing the potential impacts of the Project on these species will require species-specific mitigation techniques, as described below:

American marten:
- Where possible, Project activities should avoid mature, mixed wood forest, as well as areas featuring a high amount of coarse woody debris and/or large yellow birch (*Betula alleghaniensis*) trees.

Blanding's turtle:
- Since Blanding's turtle make use a variety of aquatic and terrestrial habitats, particularly when travelling, it is difficult to implement specific habitat avoidance measures other than standard wetland avoidance. Project personnel, therefore, will be made aware of the potential presence of Blanding's turtle at the site and be provided with an identification guide, and if individual(s) are observed, NSDNR will be contacted to develop a specific mitigation plan.

Eastern ribbonsnake:
- Project activities will incorporate standard wetland avoidance/mitigation measures and will limit work in forested riparian areas, which may constitute potential over-wintering sites.

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) (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.

Southern Flying Squirrel:
- Project activities should be planned to avoid large, mast-bearing trees, as well as large trees with natural cavities, where possible.

Wood turtle:
- Based on recommendations outlined in the document '<u>Protecting and Conserving Wood Turtles: A Stewardship Plan for Nova Scotia</u>' (MacGregor & Elderkin 2003), and the "<u>NS Transportation and Public Works Generic Environmental Protection Plan for the Construction</u>

of 100 Series Highways" (2007), the following general procedures will be implemented to ensure the protection of Wood turtles:
  - Any turtles found will be relocated outside of the construction zone (an identification guide will be provided to site personnel), 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.

Fish Species (Atlantic Salmon, Atlantic Whitefish, Atlantic Sturgeon):
- The siting, design, installation and decommissioning of all crossing structures will incorporate ongoing consultation with DFO and NSE 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 & 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, impacts 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 impacts, 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 impacts 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 & 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 & 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 & 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 & 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 & Boertmann 2008). The tolerance to Project related disturbance may be species specific but may also be related to the availability of alternative habitat (Kingsley & 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 impacts 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 & 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 bats 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 & 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). Field studies at the Project site did not identify migratory bat species, so high levels of bat mortality resulting from Project operations are unlikely.

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 & Barclay 2011). Although bats exhibit species-specific responses to environmental variables (Baerwald & 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. The Project is located approximately 86 km from the nearest known significant hibernacula, so Project activities will not elicit sensory disturbance responses in hibernating bats.

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 a rotating turbine (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.
- Placement of Project infrastructure in habitats significant to bat species, including hibernacula and open bodies of water, will be avoided. In addition, alteration to wetland habitat will be avoided and minimized to the extent possible.
- 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 (Tables 14.4 to 14.6) identify and evaluate the significance of residual effects for each phase of the Project on each VEC. 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	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.	*General Mitigation Measures* • Implementation of the EPP. • Minimize of the footprint of physical disturbance • Avoid sensitive habitats during Project siting. • Implementation of Safe Work Practices and strict adherence to speed limits and warning signs to avoid traffic collisions. • Maintain of a buffer around sensitive habitats such as watercourses and wetlands, wherever possible. • Minimize vegetation clearing, wherever possible. • Prompt restoration of cleared areas post-construction. • Maintain efficient timelines to complete project activities within the shortest amount of time possible. *Species-specific Mitigation* • Avoid mature, mixed wood forest, and areas with a high amount of coarse woody debris and/or large yellow birch (American marten). • Project personnel will be made aware of the potential presence of Blanding's turtle at the site, and if individual(s) are	Scope: Local Duration: Short-term Frequency: Once Magnitude: Negligible-Low	No residual effect anticipated	Not applicable

Environmental Component	Potential Effect	Mitigation Summary	Significance Criteria	Residual Effects	Significance of Residual Effect
		observed, NSDNR will be contacted to develop specific a mitigation plan (Blanding's turtle). • Incorporate standard wetland avoidance/mitigation measures and limit work in forested riparian areas (Eastern ribbonsnake). • 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 cease until the migrating group has left the Project site. • Avoid large, mast-bearing trees, as well as large trees with natural cavities (Southern flying squirrel). • Leave adequate, permanent buffers of vegetation around important Wood turtle habitat. • 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. • Any wood turtles found will be relocated outside of the construction zone (as per			

Environmental Component	Potential Effect	Mitigation Summary	Significance Criteria	Residual Effects	Significance of Residual Effect
		guidelines outlined in MacGregor and Elderkin 2003, and NSTPW 2007). • Any sightings of wood will be reported to the NS Wood Turtle Recovery Team at 1-866-727-3447. • All watercourses on the Project site will be treated as salmonid bearing during all phases of the Project. • All in-stream work will be conducted “in-the-dry” and adhere to timing windows (fish species). • Crossing structures will be designed and installed in consultation with DFO and NSE to ensure fish passage is facilitated (fish species).			
Avifauna and Bats	• Habitat loss/Alteration • Mortality • Sensory disturbance.	• Implementation of the EPP. • Conduct vegetation clearing 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. • 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,	Scope: Local Duration: Short-term Frequency: Once Magnitude: Low	No residual effect anticipated	Not applicable

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Environmental Component	Potential Effect	Mitigation Summary	Significance Criteria	Residual Effects	Significance of Residual Effect
		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	Potential Effect	Mitigation Summary	Significance Criteria	Residual Effects	Significance of Residual Effect
SOCI	• Sensory Disturbance • Habitat alteration and/or degradation. • 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. *Species-specific Mitigation* • In-stream maintenance activities will be conducted "in-the-dry", and adhere to timing windows (fish species).	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 disturbance.	• Implementation of the EPP. • To the extent possible, plan operation and maintenance activities to minimize time on-site. • Avoid routine vegetation clearing during breeding and nesting	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 site and	Low-Medium

Environmental Component	Potential Effect	Mitigation Summary	Significance Criteria	Residual Effects	Significance of Residual Effect
		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.		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	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. • Limit access to existing roads only. • Avoidance of known significant habitat, where possible. • Herbicides will not be utilized in the removal of vegetation during decommissioning activities. *Species-specific Mitigation* • In-stream decommissioning work will be conducted “in-the-dry” and adhere to timing windows	Scope: Local Duration: Short-term Frequency: Once Magnitude: Negligible	No residual effect anticipated	Not applicable

Environmental Component	Potential Effect	Mitigation Summary	Significance Criteria	Residual Effects	Significance of Residual Effect
		(Atlantic salmon). Stream banks will be promptly re-stabilized and re-vegetated post-decommissioning (Atlantic salmon).			
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 to educate and train 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 • 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 • Appropriate safety protocol.

Fire	Fire during construction due to materials and machinery	• Appropriate safety protocol • Fire prevention plan • Evacuation plan • 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 collision mortality for 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 Whynotts 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	MODL
Provincial	
EPP/Sediment and Erosion Control Plan	NSE
Watercourse Alteration Approval	NSE
Wetland Alteration Approval (not expected to be required)	NSE
Notification of Blasting (if required)	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
Notification of Project (awaiting response)	RCMP

Approval/Notification/Permit Required	Government Agency
Aeronautical Obstruction Clearance	Transport Canada
Final design, location and height of turbines	NRCan
Lighting design for navigational purposes	NAV 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 impacts 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 1,320 households with local, clean renewable energy and will contribute to reaching Nova Scotia's renewable energy commitments.

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