8.2.2 Surficial Geology

The surficial geology of the Project site is characterized as a stony till plain otherwise referred to as ground moraine, with bedrock outcrops visible in thin till areas (Drawing 8.1). The stony, sandy matrix material is derived from both local and distant sources. Till thickness ranges from 2 – 20 m, creating a flat to rolling topography with many surface boulders (Stea *et al.* 1992).

8.2.3 Bedrock Geology

Bedrock geology varies across the Project site with Middle-Late Devonian Granodiorite in the south and Cambrian – Ordovician aged metamorphic rocks of the Goldenville Formation in the center of the site, and the Halifax Formation to the north (Keppie 2000) (Drawing 8.2). Granite bedrock in this region is typically composed of a quartz-feldspar-biotite granite which intruded the lower metamorphic rocks. The Goldenville Formation is composed of alternate bands of quartzite and slate. The younger Halifax Formation is present in a syncline forming a uniform succession of rusty weathering, banded slates and argillites, commonly interbedded with relatively narrow bands of siltstones and chloritic, dense quartzites (Trescott 1969).

According to the NSE Well Log Database (NSE 2011a), there are no drilled wells within a 1 km radius of the Project site. However, 26 wells were identified within 2 km of the Project site, ranging in depths from 25.9 m to 176.6 m. The majority of wells were drilled through slate (17), with quartzite (5), shale (3), and sandstone (1) also encountered. Surficial material was predominately clay ranging from 0.9 m to 45.7 m in thickness, with gravel and boulders also observed.

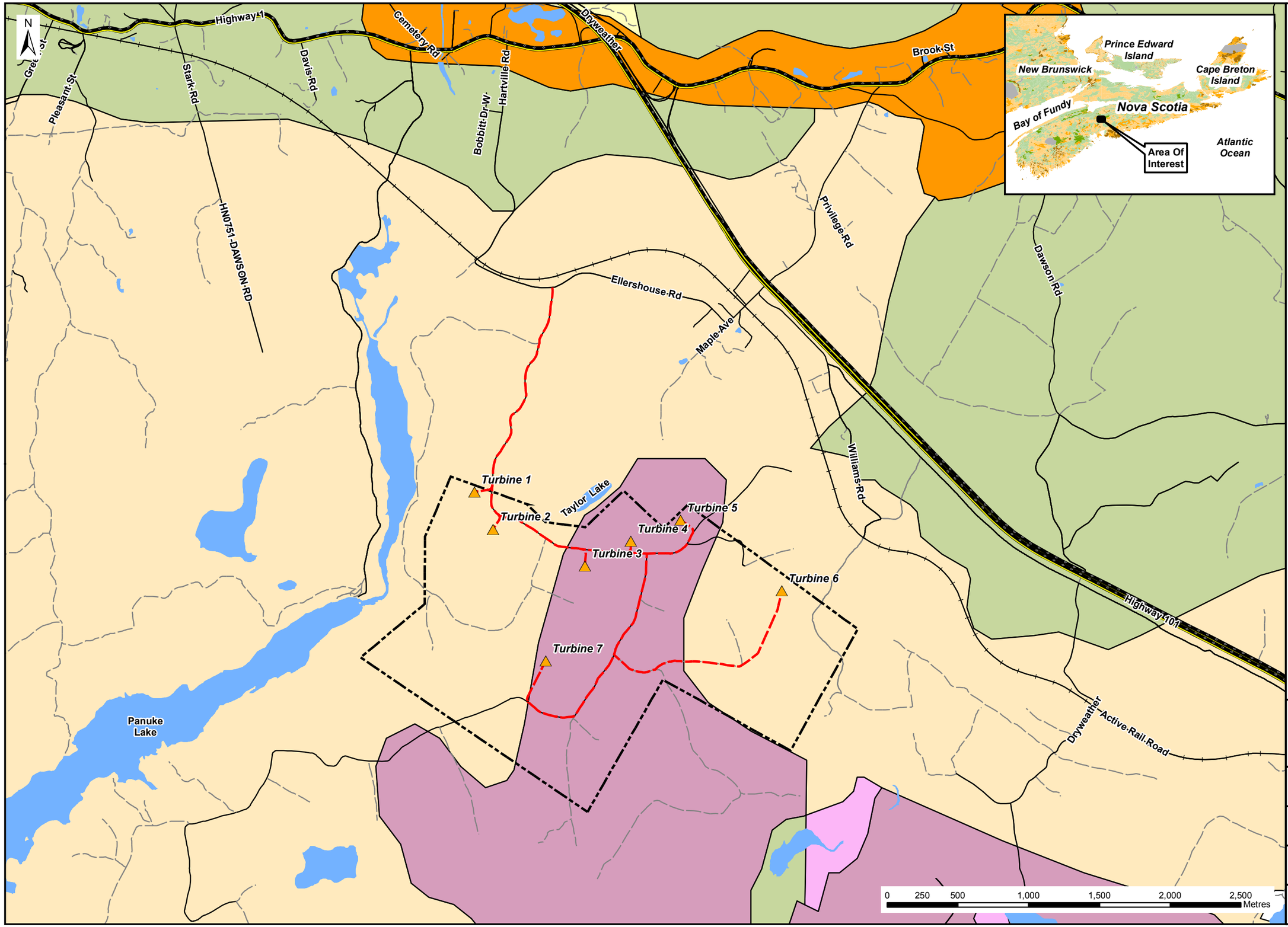
Bedrock containing sulphide bearing minerals (*e.g.*, pyrite, pyrrhotite) can potentially generate acid run-off if fresh surfaces are exposed to oxygen and water. The physical disruption of such bedrock leads to oxidation of iron-sulphide minerals and the generation of ARD (Fox *et al*. 1997). Construction activities in the presence of ARD can result in the acidification of surface and groundwater and promote the mobilization and leaching of toxic contaminants into the environment, including heavy metals. The likelihood of ARD to occur will be determined following the results of the geotechnical evaluation.

Based on a review of local surficial and bedrock geology, and in consideration of anticipated site use and development associated with the Project, the likelihood of encountering bedrock mineralogy that would be harmful to human health or the environment is low. Radon is present in some bedrock types similar to granite at this Project site; however, radon gas released from bedrock quickly becomes air borne and presents no risk. Though some radioactive shows have been recorded in bedrock similar to the type at the Project site, no shows or radioactive mineralogy above ambient levels are known within the boundaries of the Project site.

8.2.3 Hydrogeology and Groundwater

Groundwater Quantity

Water supplies near the Project site are generally derived from individually drilled or dug wells. A summary of the pertinent (within 2 km of the Project site) well properties included in NSE Well Log Database (NSE 2011a) is presented in Table 8.1.



Notes:

1. Reference: Digital Topographic Mapping by Nova Scotia Geomatics Centre. Nova Scotia Department of Natural Resources Map ME 1992-3, Surficial Geology Map of the Province of Nova Scotia, 1:500,000, by R. R. Stea, H. Conley and Y. Brown, 1992. Digital Product Compiled by R. R. Stea and B. E. Fisher.
2. Projection: NAD83(CSRS), UTM Zone 20 North.

Legend:

- Proposed Turbine
- Proposed Access Road
- Project Study Area
- Active Railroad
- Major Roads and Highways
- Public Roads
- Access Roads / Trails
- Water Bodies

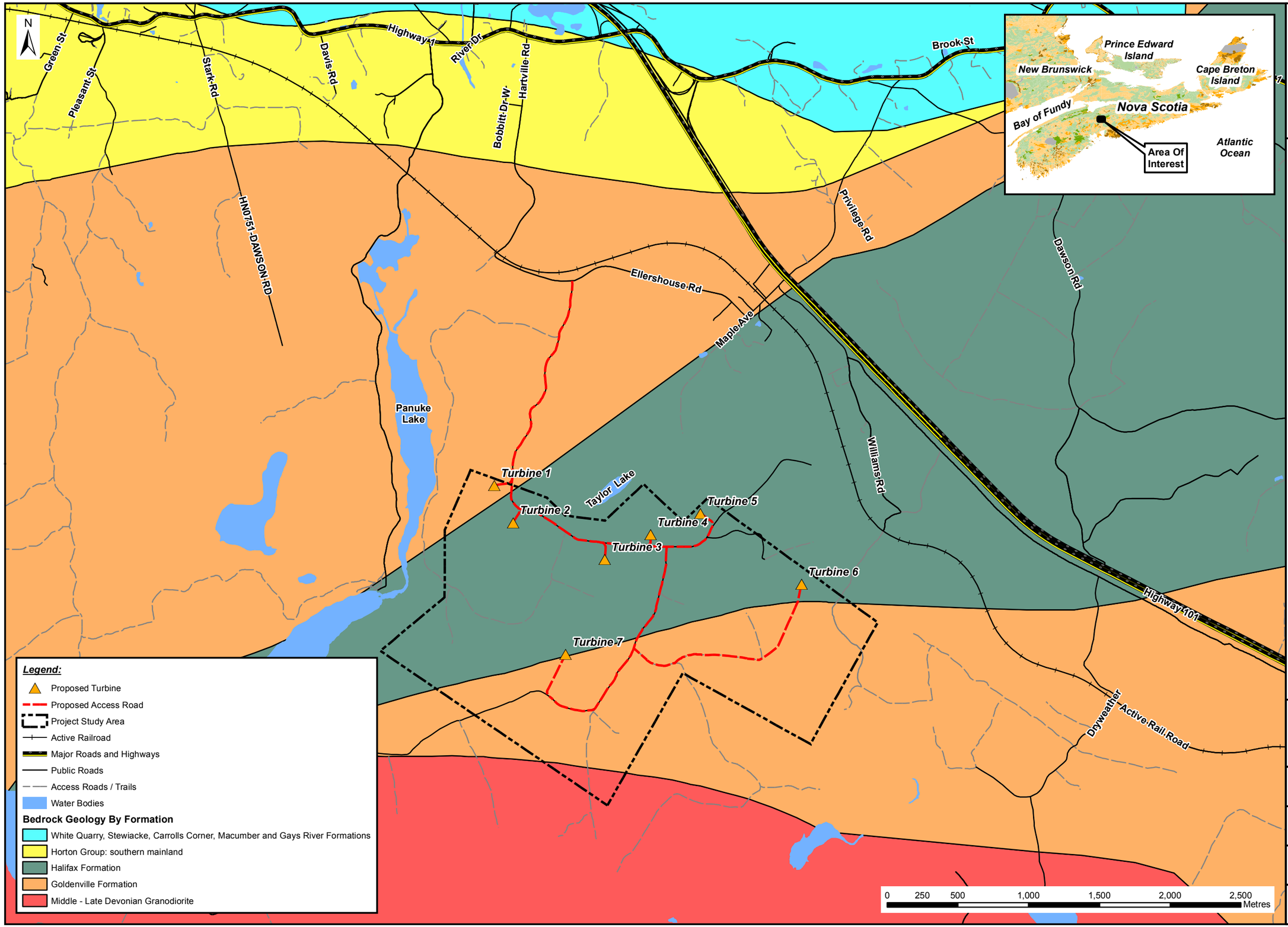
Surficial Geology By Unit

- Alluvial Deposits
- Bedrock
- Kame Fields and Esker Systems
- Organic Deposits
- Silty Till Plain
- Stony Till Plain

Surficial Geology

Strum CONSULTING

Date: Nov. 2013	Project #: 12-4583
Scale: 1:15,000	Drawing #: **8.1**
Drawn By: H. Serhan	
Checked By: M. Smith	



Notes:

1. Reference: Digital Topographic Mapping by Nova Scotia Geomatics Centre. Nova Scotia Department of Natural Resources, Minerals and Energy Branch. Map ME 2000-1, Geological Map of the Province of Nova Scotia, Compiled by J. D. Keppie.
2. Projection: NAD83(CSRS), UTM Zone 20 North.

Bedrock Geology

Strum CONSULTING

Date: Nov. 2013	Project #: 12-4583
Scale: 1:15,000	Drawing #: 8.2
Drawn By: H. Serhan	
Checked By: M. Smith	

Table 8.1: Summary of Drilled Well Records

	Drilled Date (yr)	Well Depth (m)	Casing Length (m)	Estimated Yield (Lpm)	Water Level (m)	Overburden Thickness (m)	Water Bearing Fractures (m)
Minimum	1968	25.9	3.7	2.3	1.5	0.9	7.0
Maximum	2007	176.8	45.7	36.3	12.2	45.7	176.8
Average	1993	57.2	11.6	16.8	4.7	9.5	46.3
Geomean	1989	47.2	9.0	20.4	3.0	7.0	36.6
Number of well records	26	26	26	26	18	25	25

Source: NSE 2011a

Based on short term driller's estimates for the wells in Table 8.1, the average yield is approximately 16.8 Lpm (4.4 gpm) and average well depth is approximately 57.2 m (187.6 ft). These measurements represent very short term yields estimated by the driller at the completion of well construction. Fracture depths ranged from 7.0 m (23.0 ft) to 176.8 m (580.0 ft). The closest drilled well to the Project site is located along Williams Road, approximately 1.2 km from the nearest turbine location (Turbine 3).

The NSDNR Pump Test Database (NSDNR 2011a) provides longer term yields for select wells throughout the province. One regional well, drilled through the Halifax Formation located within 6 km of the Project site, indicates a long term safe yield (Q_{20}) of 95 Lpm (25 gpm) and an apparent transmissivity of 10.32 m^2/day.

NSE maintains the Nova Scotia Groundwater Observation Well Network (NSE 2011b). The nearest observation well to the Project site is located approximately 32 km northwest, in Wolfville. This well was drilled to a depth of 17.7 m through sandstone bedrock of the Wolfville Formation and has been monitored since 1970. Since 2010, the average water level elevation has been approximately 1.3 m above sea level. The average depth to water in this well since 2010 has been approximately 3.9 m below top of casing.

Groundwater Quality

Groundwater in slate, quartzite and granite are usually calcium bicarbonate waters low in dissolved solids and hardness. Groundwater within the metamorphic bedrock of the Goldenville and Halifax Formations are often slightly acidic and sometimes contain iron, manganese, and occasionally arsenic (Trescott 1969).

Mitigation measures for potential effects to the geophysical environment are provided in Section 4.0.

8.3 Freshwater Environment

The Project site lies within the Avon River Watershed (1DE). The Avon River flows northerly and rises on the South Mountain, which is located to the southwest of Windsor. Near the rural community of Martock, the river enters a broad glacial river valley where it becomes tidal, creating an estuary for its remaining route to the Minas Basin several kilometres downriver from the Town of Hantsport. Tributaries to the Avon River include the Herbert, Cogmagun, Kennetcook, and St. Croix.

Prominent water bodies in watershed include Card Lake, Panuke Lake, Falls Lake, Big St. Margaret's Bay Lake, and Mockingee Lake. The closest water body to the Project site is Taylor Lake, located approximately 550 m from the turbine 3.

A total of twelve lakes within Hants County are included in the Nova Scotia Lake Inventory Program (NSE 2012b), which determines the baseline biophysical attributes of lakes throughout the province. Cameron Lake, Cochran Lake, Five Mile Lake, and Panuke Lake are all located within 10 km of the Project site. However data from these sampling events were completed between 10 and 30 years ago, therefore are considered outdated.

No lakes or water bodies are present within the Project site boundaries (Drawing 8.3). One watercourse was observed along the access road approximately 300 m south of where it meets Ellerhouse road (Drawing 8.4A-D). The characteristics of this watercourse are presented in Table 8.2.

Table 8.2 Watercourse Characteristics

Feature ID	Bankfull Width (m)	Water Depth (cm)		Substrate	Drainage Direction
		Bank Full	Wetted		
Watercourse 1	3.0	60	12	Cobble, Pebble	East to west

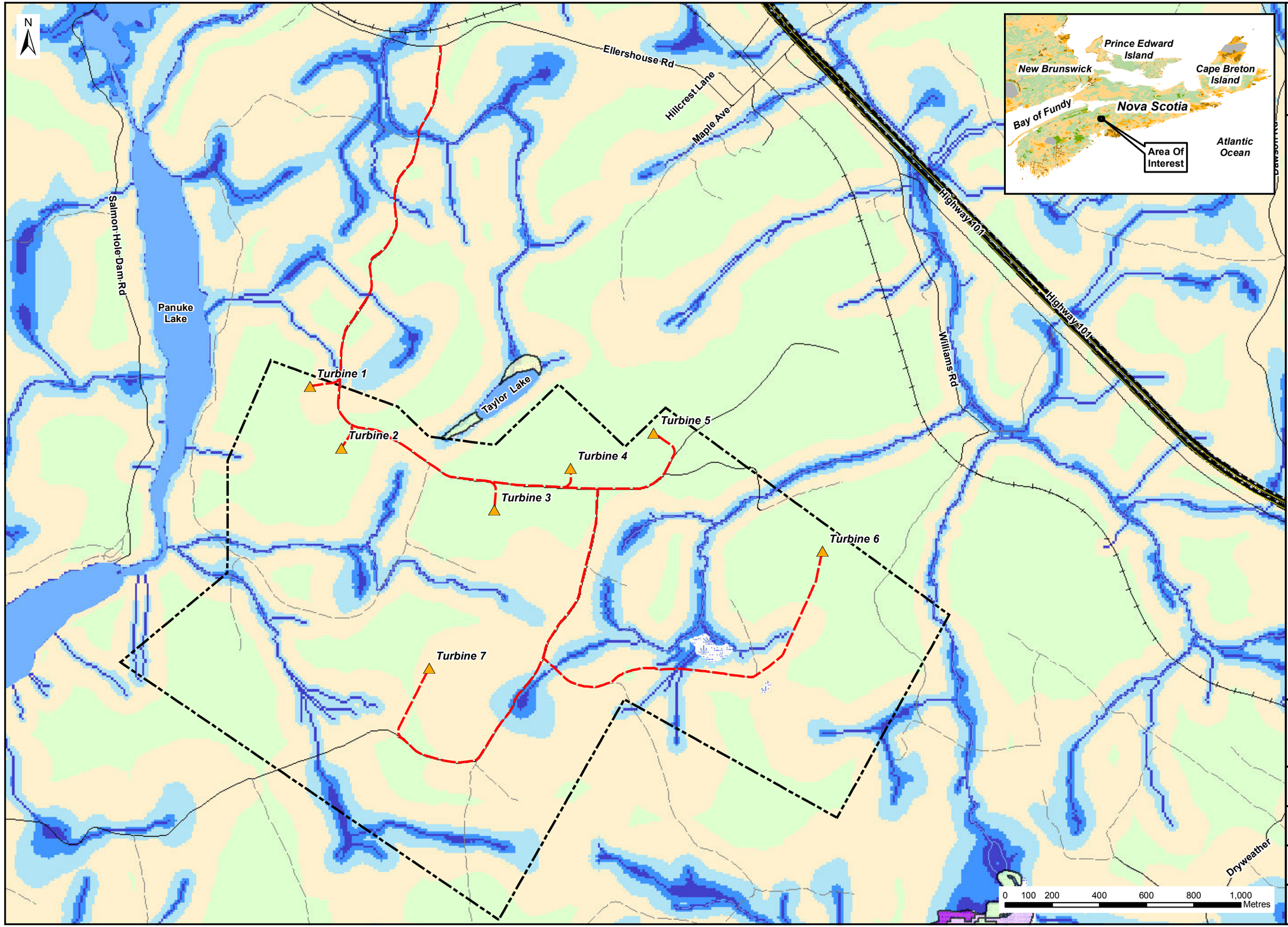
8.3.1 Watercourse Alterations

Based on the proposed Project layout, one watercourse alteration may be required for watercourse 1 to accommodate road upgrades. This watercourse flows under the existing road via a culvert that was observed to be in a good state of repair. As noted in table 8.2, this watercourse is small in size (with a bank full width of 3 m). Final engineering design will determine if alterations to this watercourse are necessary. No watercourses were observed within 100 m of the proposed turbine locations and no mapped watercourses are present within 200 m of the proposed turbine locations. Any potential impacts to watercourses should be easily addressed through the provincial permitting process.

8.3.2 Fish and Fish Habitat

For the purposes of the EA, the watercourse on the Project site has been assumed to be 'fish bearing' and shall be treated as such throughout site development plans.

Fish species historically and currently present in the Avon River have been relatively well documented through desktop and field exercises in recent years. The majority of studies have been focused on evaluating the effects to fish passage caused by the installation of hydroelectric facilities and the Windsor Causeway on the lower reaches of the river and its tributaries. The result of these developments is thought to be the elimination of much Atlantic salmon (*Salmo salar*) habitat, and significant reductions in the number of shad (*Alosa sapidissima*), smelt and sea-run trout. Despite the negative effects on some fish species stemming from these developments, some migratory stocks appear to have persisted, as smelt and gaspereau have been regularly taken by non-commercial fishers in the lower Avon (upstream of the causeway). Still, all commentary seems to confirm that the numbers are much reduced from their pre-causeway condition (DFO 2007).



Notes:

1. Reference: Digital Topographic Mapping by Nova Scotia Geomatics Centre. Wetland Inventory and Wet Areas Mapping by Nova Scotia Department of Natural Resources (NS DNR).
2. Projection: NAD83(CSRS), UTM Zone 20 North.

Legend:

- Proposed Turbine
- Proposed Access Road
- Project Study Area
- Major Roads and Highways
- Active Railroad
- Public Roads
- Access Roads / Trails
- Mapped Stream
- Mapped Indefinite Stream
- Water Bodies
- Mapped Wet Area

NS DNR Wetland Inventory

Wetland Type

- Bog or Fen
- Fen
- Marsh
- Salt Marsh
- Swamp

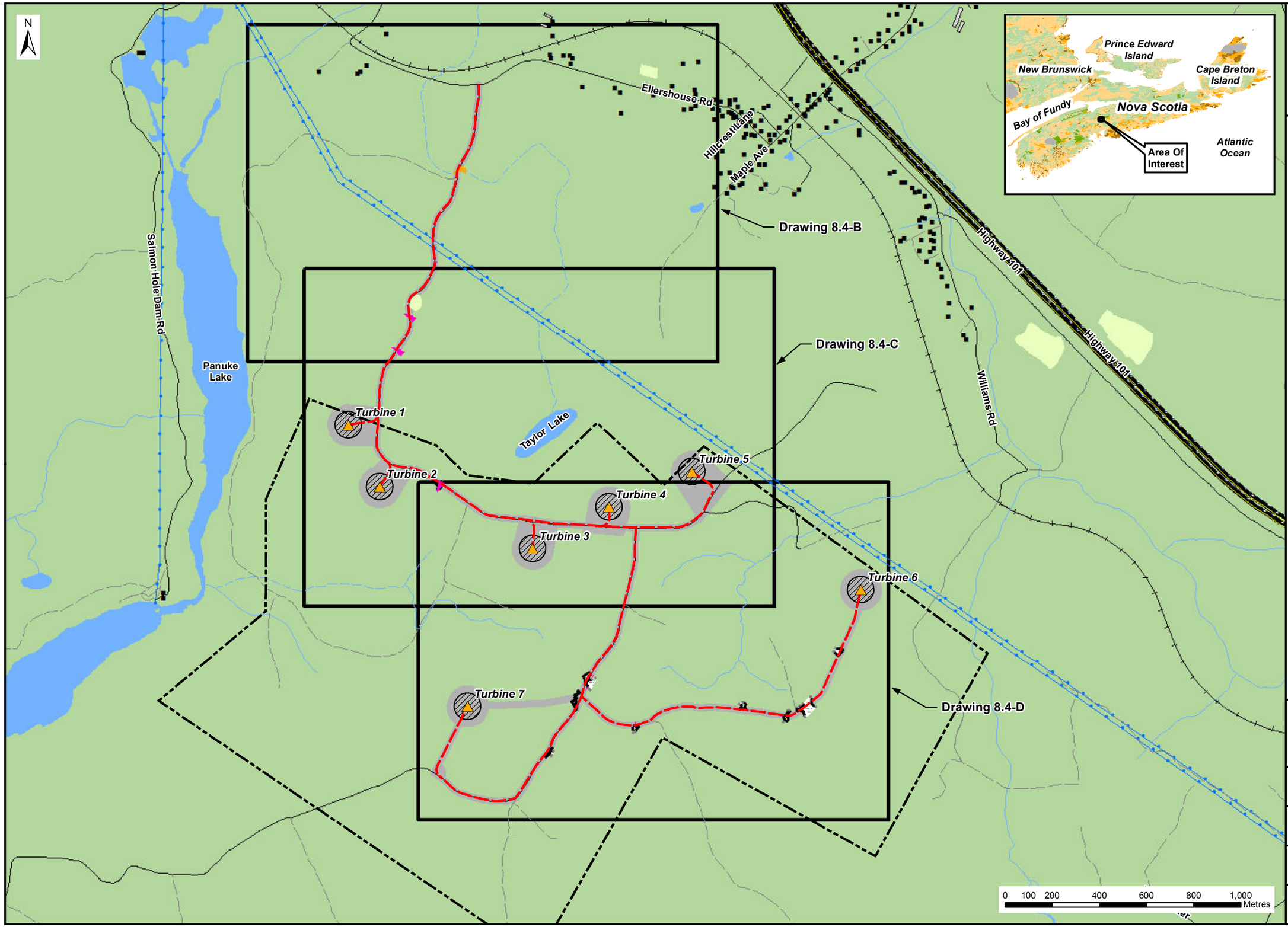
Depth to Water Table (m)

- 0 - 0.10 m
- 0.11 - 0.50 m
- 0.51 - 2 m
- 2.01 - 10 m
- > 10 m

Wetland and Watercourse Desktop Review Results

Strum CONSULTING

Date: Nov. 2013	Project #: 12-4583
Scale: 1:15,000	Drawing #: **8.3**
Drawn By: H. Serhan	
Checked By: M. Smith	



Notes:

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

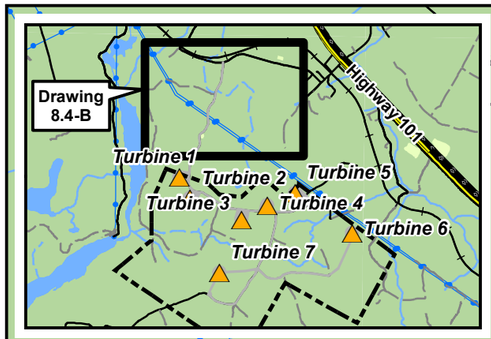
Legend:

- Proposed Turbine
- Proposed Access Road
- 1 Ha Disturbance Area
- Project Study Area
- Field Identified Watercourse
- Field Identified Drainage Channel
- Confirmed Wetland Boundary
- Approximate Wetland Boundary
- Field Identified Wetland
- Assessment Area
- Building
- Active Railroad
- Major Roads and Highways
- Public Roads
- Access Roads / Trails
- Existing Transmission Lines
- Large Structure
- Mapped Stream
- Mapped Indefinite Stream
- Water Bodies
- Cleared Area

Wetland and Watercourse Survey Results

Strum CONSULTING

Date: Nov. 2013	Project #: 12-4583
Scale: 1:15,000	Drawing #: 8.4-A
Drawn By: H. Serhan	
Checked By: M. Smith	



N

Ellershouse Rd

Watercourse 1

0 50 100 150 200 250
Metres

Notes:

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

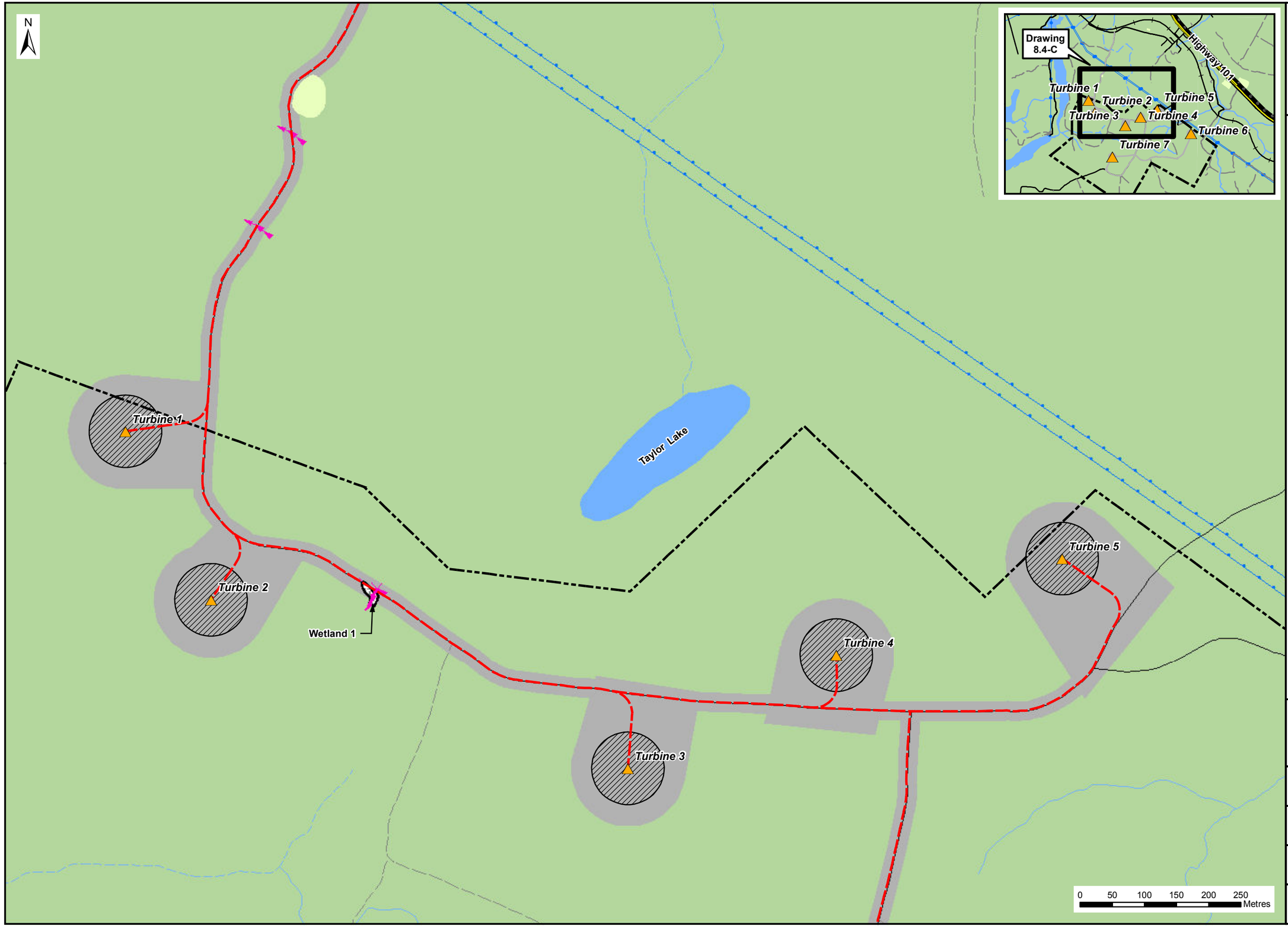
Legend:

- Proposed Turbine
- Proposed Access Road
- Project Study Area
- Field Identified Watercourse
- Field Identified Drainage Channel
- Assessment Area
- Building
- Active Railroad
- Public Roads
- Access Roads / Trails
- Existing Transmission Lines
- Mapped Stream
- Mapped Indefinite Stream
- Water Bodies
- Cleared Area

Wetland and Watercourse Survey Results

Strum CONSULTING

Date:	Project #:
Nov. 2013	12-4583
Scale: 1:5500	Drawing #: **8.4-B**
Drawn By: H. Serhan	
Checked By: M. Smith	



Notes:

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

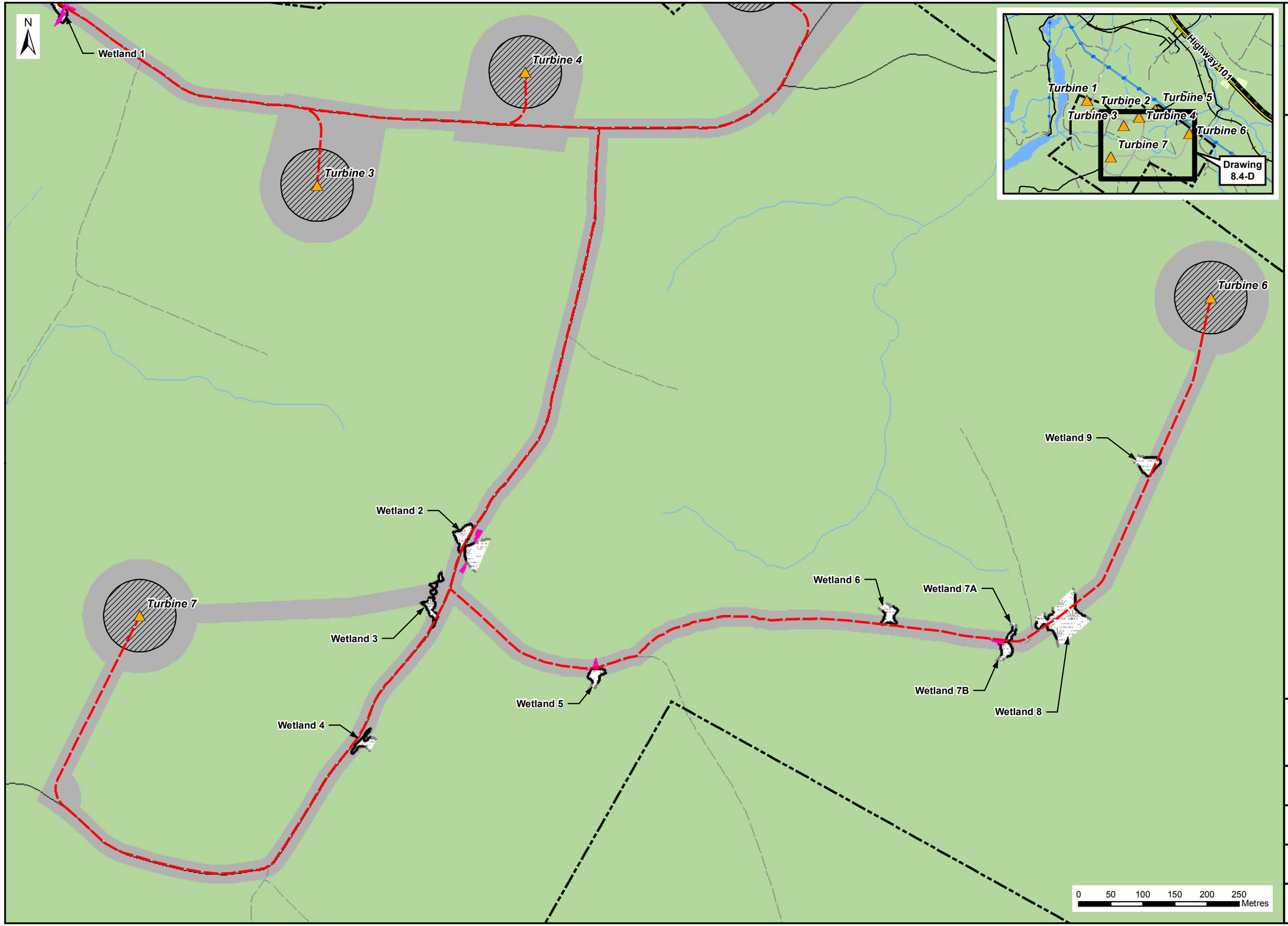
Legend:

- Proposed Turbine
- Proposed Access Road
- 1 Ha Disturbance Area
- Project Study Area
- Field Identified Watercourse
- Field Identified Drainage Channel
- Confirmed Wetland Boundary
- Approximate Wetland Boundary
- Field Identified Wetland
- Assessment Area
- Public Roads
- Access Roads / Trails
- Existing Transmission Lines
- Mapped Stream
- Mapped Indefinite Stream
- Water Bodies
- Cleared Area

Wetland and Watercourse Survey Results

Strum CONSULTING

Date: Nov. 2013	Project #: 12-4583
Scale: 1:5500	Drawing #: **8.4-C**
Drawn By: H. Serhan	
Checked By: M. Smith	



Notes:

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

Legend:

- Proposed Turbine
- Proposed Access Road
- 1 Ha Disturbance Area
- Project Study Area
- Field Identified Watercourse
- Field Identified Drainage Channel
- Confirmed Wetland Boundary
- Approximate Wetland Boundary
- Field Identified Wetland
- Assessment Area
- Public Roads
- Access Roads / Trails
- Mapped Stream
- Mapped Indefinite Stream

Wetland and Watercourse Survey Results

Strum CONSULTING

Date: Nov. 2013	Project #: 12-4583
Scale: 1:5500	Drawing #: 8.4-D
Drawn By: H. Serhan	
Checked By: M. Smith	

The principal migratory species known to pass through the Windsor causeway are the American eel (*Anguilla rostrata*), alewife (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis)*. Other important species that may also still move upstream of the causeway include rainbow smelt (*Osmerus mordax*), striped bass (*Morone saxatilis*), white perch (*Morone Americana)* and sea-run trout (*Salvelinus fontinalis*). The current status of the American shad in the river is unknown (Daborn and Brylinksy 2004).

In 2003, the Acadia Centre for Estuarine Research conducted a survey of fish populations above and below the Windsor Causeway, which included Pesaquid Lake, and the lower reaches of the Avon River, with a particular focus on the diadromous species (Daborn and Brylinsky 2004). Species recorded in the river, upstream of the causeway are listed in Table 8.3.

Table 8.3: Fish recorded in Pesaquid Lake and the lower Avon River, 2003

Common Name	Scientific Name
Alewife	*Alosa pseudoharengus*
Blueback herring	*Alosa aestivalis*
Yellow perch	*Perca flavescens*
White perch	*Morone americana*
White sucker	*Catostomus commersonii*
Small-mouth bass	*Micropterus dolomeui*
Lake chub	*Couesius plumbeus*
Redbelly dace	*Chrosomus eos*
Banded killifish	*Fundulus heteroclitus*
Threespine stickleback	*Gasterosteus aculeatus*
Fourspine stickleback	*Apeltes quadracus*
Ninespine stickleback	*Pungitius pungitius*

Source: Daborn and Brylinsky, 2004

The species list compiled by Daborn and Brylinsky is considered by DFO to be complete for the fishing methods deployed. It should be noted, however that non-captures of some species during the survey, while perhaps indicative of the relative abundance of those species, does not eliminate the possibility of their presence (DFO 2007).

A review of the Atlantic Canada Conservation Data Center (ACCDC) database for fish species recorded within a 100 km radius of the Project site was completed. All species, including status rankings, are provided in Table 8.4.

Table 8.4: Fish 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]
American eel	*Anguilla rostrata*	Not Listed	Not Listed	Threatened	Green
Atlantic salmon	*Salmo salar*	No Status	Not Listed	Special Concern	Red

Common Name	Scientific Name	*SARA* Status[1]	NS *ESA* Status[2]	COSEWIC Status[3]	NSDNR Status[4]
Atlantic salmon - Inner Bay of Fundy population (IBoF)	*Salmo salar*	Endangered	Not Listed	Endangered	Red
Atlantic sturgeon	*Acipenser oxyrhynchus*	Not Listed	Not Listed	Threatened	Red
Atlantic whitefish	*Coregonus huntsmani*	Not Listed	Endangered	Endangered	Red
Striped bass	*Morone saxatilis*	No Status	Not Listed	Endangered	Red

Source: ACCDC 2013
[1] Government of Canada 2012; [2] NS *ESA* 2013; [3] COSEWIC 2012a; [4]NSDNR 2010

Fish species 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 (*i.e.*, SOCI), which are assessed further as a VEC.

In the context of this EA, SOCI include those that are:

- Listed under *SARA* as "Endangered", "Threatened", or "Special Concern";
- Listed under the NS *ESA* as "Endangered", "Threatened", or "Vulnerable";
- Assessed by COSEWIC as "Endangered", "Threatened", or "Special Concern"; or
- Assessed by NSDNR as "Red" (at risk or may be at risk) or "Yellow" (sensitive).

Priority fish species include:

- American eel – "Threatened" (COSEWIC);
- Atlantic salmon – "Special Concern" (COSEWIC), "Red" (NSDNR);
- Atlantic salmon (Inner Bay of Fundy population) – "Endangered" (*SARA*), "Endangered" (COSEWIC) "Red" (NSDNR);
- Atlantic sturgeon – "Threatened" (COSEWIC), "Red" (NSDNR);
- Atlantic whitefish - "Endangered" (NS *ESA*), "Endangered" (COSEWIC); "Red" (NSDNR); and
- Striped bass – "Endangered" (COSEWIC), "Red" (NSDNR).

American Eel

The distribution of the American eel ranges from South America to Greenland in accessible freshwater systems that are connected to the Atlantic Ocean. This species spawns in salt water, and juveniles drifts in ocean currents, eventually migrating inland through freshwater rivers and their tributaries. In later life stages, American eel persist in a variety of freshwater and estuarine habitats (COSEWIC 2012b). The American eel is commonly found throughout Nova Scotia and has been documented in the Avon River watershed (Daborn and Brylinsky 2004). Therefore, the species may be found the lakes and watercourses near and within the Project site.

Potential effects of the Project on this species, as well as proposed mitigation measures, are discussed in more detail in Section 13.2.1.

Atlantic Salmon

Atlantic salmon are an anadromous species native to the North Atlantic Ocean and coastal rivers, which undertakes long feeding migrations to the ocean as older juveniles and adults, and return to freshwater streams to reproduce. The species requires rivers that are clear, cool and well oxygenated, with pools and shallow riffles and gravel, rubble, rock or boulder bottoms for reproduction (NS Fisheries and Aquaculture 2007; COSEWIC 2010a). The watercourse identified at the Project site forms part of the Avon River watershed, therefore any Atlantic salmon present would form part of the IBoF population (NS Fisheries and Aquaculture 2008; DFO 2008).

IBoF salmon spawn in those rivers of Nova Scotia and New Brunswick that drain into the Minas Basin and Chignecto Bay (COSEWIC 2010a). Although IBoF Atlantic salmon have been recorded in 32 rivers in recent years, the population is estimated to have declined by 94% in the past decade (DFO 2008). DFO states that though 2002-2003 data suggests that Atlantic salmon are not currently present in the freshwater portion of the Avon (Daborn and Brylinsky 2004; Gibson *et al.* 2004, as cited in DFO 2007), this observation does not exclude the possibility that salmon could be observed in the river (DFO 2007). It is possible; therefore that Atlantic salmon may be encountered at the Project site.

The recovery strategy for the species includes a live gene-banking program which has been developed to prevent the imminent extinction of the species (DFO 2010b), and several key populations are maintained in DFO Biodiversity Centres in New Brunswick and Nova Scotia. These stocks will be used to restore self-sustaining populations in select Inner Bay of Fundy rivers. The recovery strategy sets a goal of conserving the genetic characteristics of the few remaining anadromous IBoF Atlantic salmon populations in order to re-establish self-sustaining populations of the species (DFO 2010b).

Potential effects of the Project on this species, as well as proposed mitigation measures, are discussed in more detail in Section 13.2.1.

Atlantic Sturgeon

Little is known about the habitat requirements for Atlantic sturgeon at the northern extent of its range, though important freshwater habitats for the species appear to be rivers with access to the sea, preferably with deep channels. Research suggests that the species spawns in freshwater over hard-bottom substrates at depths of 1-3 m in areas of strong currents, under waterfalls, and in deep pools just above the marine-freshwater demarcation (COSEWIC 2011a). Juveniles remain in freshwater for the first summer before migrating to estuaries in winter. Juveniles remain in the freshwater-estuary system for 3 to 5 years before migrating to the near-shore marine environment as adults (NOAA 2006).

Occurring in rivers and estuaries near North Atlantic shore environments, the Atlantic sturgeon has been reported in the Annapolis, Avon, Shubenacadie, St. Croix and LaHave River systems, as well as the Minas Basin (Colligan *et al.* 1998; COSEWIC 2011a). In Canada, the species is known to spawn only in two areas, the St. John River and middle St. Lawrence. Historically, the St. Croix River in New Brunswick was also a known spawning area, although the current status of this population is unknown.

Recent surveys recorded catches of Atlantic sturgeon in the Avon estuary, but not upstream of the causeway (Daborn and Brylinsky 2004). Although the watercourses on the Project site drain into the Avon River, they are not conducive to the spawning habitat requirements of Atlantic sturgeon, therefore it is unlikely that they would be found within the Project site.

The Project is therefore not expected to have any impact on Atlantic sturgeon and no further consideration of effects and mitigation for specific to this species has been undertaken.

Atlantic Whitefish

The Atlantic whitefish is a Canadian endemic species, which is currently restricted to three interconnected lakes in the Petite Riviere watershed (Hebb, Milipsigate and Minamkeak). A few records of Atlantic whitefish are known from the Petite Rivière outside of these three lakes including Birch Brook, the mainstem of the river (Bradford *et al.* 2010 as cited in COSEWIC 2011b), and Fancy Lake (COSEWIC 2011b). Though historical populations were anadromous, the remaining population of Atlantic whitefish is considered landlocked and complete their life cycle in the three lakes and connecting streams (COSEWIC 2011b).

Atlantic whitefish was also historically present in the Tusket-Annis watershed, however this population is now considered extirpated, as there are no known records of the species since 1982 (Bradford *et al.* 2004 as cited in COSEWIC 2011b). The on-site watercourse does not form part of, or lie in close proximity to the Petite Riviere watershed. Therefore, it is unlikely that the species is present at the Project site.

The Project is therefore not expected to have any impact on Atlantic whitefish and no further consideration of effects and mitigation for specific to this species has been undertaken.

Striped Bass

The striped bass is an anadromous species typically associated with estuaries and coastal waters, which spawns and over-winters in fresh and occasionally brackish water.

In Nova Scotia, the Annapolis River and the Shubenacadie–Stewiacke River system in the Bay of Fundy historically supported spawning populations (Rulifson and Dadswell 1995, as cited in COSEWIC 2004). Today, the species is known to spawn only in two river systems in eastern Canada: the Miramichi and the Shubenacadie-Stewiacke systems. Catches have been recorded throughout the province, including in the Avon and Annapolis rivers, River Phillip, Shubenacadie (Grand) Lake, and the Minas Basin.

Recreational catch records for the Avon include striped bass, though recent surveys documented the species in the estuary but not in the river above the Windsor causeway (Daborn and Brylinsky 2004). Though unlikely that striped bass would be encountered at the Project site, the species cannot be ruled out entirely due to its presence in the estuary.

Potential effects of the Project on this species, as well as proposed mitigation measures, are discussed in more detail in Section 13.2.1.

8.4 Terrestrial Habitat

Forests in this hilly ecodistrict are comprised of tolerant hardwoods, such as sugar maple (*Acer saccharum)*, yellow birch (*Betula alleghaniensis)*, and beech (*Fagus grandifolia)*. Red spruce forests are significant in the Rawdon Hills and Mount Uniacke area. The more poorly drained locations support red maple (*Acer rubrum*), black spruce (*Picea mariana)*, and eastern larch (*Larix laricina) (*Webb and Marshall 1999*)*.

Habitat mapping (NSDNR 2012a) suggests that the vast majority of the Project site is forested, with mixed wood and softwood stands being the dominant habitat features (Table 8.5; Drawing 8.5).

Table 8.5: Habitat Types at the Project Site

Habitat Type	Area (Ha)	Proportion of Project Site (%)
Mixed wood	280.66	62.15%
Softwood	162.71	36.03%
Hardwood	5.77	1.28%
Alders (<75% Cover)	0.99	0.22%
Gravel Pit	0.82	0.18%
Brush	0.67	0.15%
Total	**451.615**	**100.00%**

Source: NSDNR 2012a

Aerial imagery combined with field observations; however, reveal that the proportion of intact forest stands is currently less than habitat mapping suggests, due to recent forestry activities at the Project site. Based on aerial imagery interpretation, as much as 18.3% (83 ha) of the Project site has been cutover. Intact forest stands at the Project site are varied in their composition and successional stage. Balsam fir (*Abies balsamea*), red maple, red spruce (*Picea rubens*), black spruce, and yellow birch characterize the canopy in most stands. Tolerant hardwoods, in general, are lacking from the site despite the prominence of well drained hilltops on the landscape.

Owing to the well-drained nature of the soils, wetland habitat is limited at the Project site. Those wetlands present are for the most part treed or shrub swamps that form at the base of slopes and are covered by dense layer of speckled alder (*Alnus incana*), or other hardwood shrubs such as yellow or white birch (*Betula papyrifera*), growing under a hardwood or mixed-wood tree canopy. Wetlands also occur in open areas that may have been disturbed by forestry activities. These wetlands are often covered by a dense layer of opportunistic herbs such as woolgrass (*Scirpus cyperinus*), fringed sedge (*Carex crinita*) and soft rush (*Juncus effusus*).

It is expected that an area of approximately 1 ha will be disturbed around each turbine location. Two of the proposed turbines are located within previously cutover areas, whereas habitats within the remaining turbine disturbance footprint consist of young to mid-aged red maple/balsam fir stands (73.2%), young spruce stands (21.4%), and mature spruce-dominated patches (4.4%). Excluding turbine located in cutovers, the additional disturbance area associated with turbine pads will represent approximately one percent of the Project site.

8.4.1 Wetlands

A desktop identification of the location and extent of potential wetlands across the Project site was completed by reviewing the following information sources:

- Satellite and aerial photography;
- Nova Scotia Wet Areas Mapping database (WAM) (NSDNR 2012b);
- Nova Scotia Geomatics Centre; and
- NS Significant Species and Habitat Database (NSDNR 2012c).

The NS Significant Species and Habitat Database identifies two areas of wetland habitat in proximity to the Project site (Drawing 8.3). A 0.6 ha treed swamp lies along the southwestern boundary of Taylor Lake and a 0.9 ha marsh borders the northern extent of Taylor Lake. No mapped wetlands are identified within 350 m of a proposed turbine location.

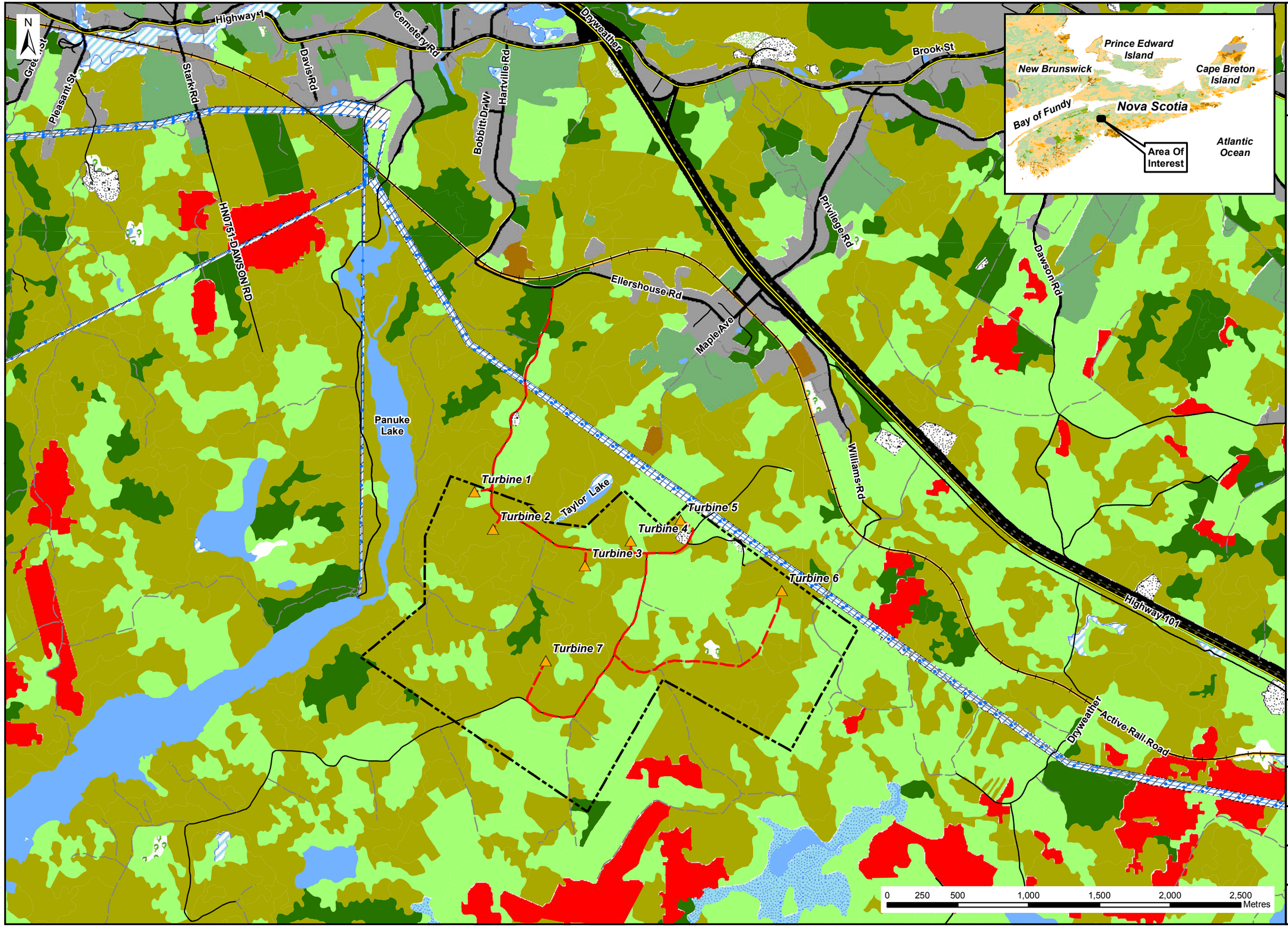
WAM indicates the potential for wetland habitat and/or watercourses in several areas throughout the Project site. However the proposed turbine locations are in areas with low potential for wetland habitat and/or watercourses. Satellite imagery does not indicate any open areas that may represent open bog, marsh or fen type wetlands in areas near the proposed turbine locations.

A total of nine wetlands were observed throughout the Project site within a 30 m easement of the proposed access roads (Drawing 8.4 A-D). No wetlands were found within 100 m of a proposed turbine location. The wetlands on the Project site are all treed or shrub swamps, many of which have been disturbed by logging activities, either recent or historic. The soil within these wetlands is for the most part a shallow mucky or peaty organic soil layer that occurs on a restrictive rock surface. However, wetlands in the northwest (wetlands 1 and 2) occur in a muck modified depleted mineral soil layer with no district organic horizon. No watercourses were observed to be associated with any of the nine wetlands on the site, but several ephemeral drainage features, including roadside ditches, were observed to contribute to or drain water from the wetlands.

Detailed wetland characterizations are provided in Table D1 (Appendix D).

Based on the current layout, it is expected that minor wetland alterations will be required in areas where upgrades and/or modifications to the access roads are required. Detailed design will determine the exact number and total area of alterations required. However, impacts to individual wetlands along the road will be very limited and will represent small areas to facilitate road upgrades/modifications (where required) for the safe passage of Project infrastructure. Where alterations are required along the existing road, hydrological function and connectivity of all wetlands will be maintained. No wetland alterations will be required in association with turbine pad locations.

A provincial wetland alteration permit will be sought for the alteration location as required by the Nova Scotia Wetland Alteration Application process. This will be done during the permitting stage of the Project and will include a characterization of wetland function affected by the development footprint. Detailed mitigation measures and BMPs to reduce adverse effects on the altered wetland, as well as the adjacent, non-altered wetlands will be outlined as part of this process. Compensation for direct impacts to the wetland will be provided in accordance with NSE requirements.



Notes:

1. Reference: Digital Topographic Mapping by Nova Scotia Geomatics Centre. Forestry Inventory by Nova Scotia Department of Natural Resources (NS DNR).
2. Projection: NAD83(CSRS), UTM Zone 20 North.

Legend:

- Proposed Turbine
- Proposed Access Road
- Project Study Area
- Active Railroad
- Major Roads and Highways
- Public Roads
- Access Roads / Trails
- Existing Transmission Lines
- Water Bodies

Forested Land (Type)

- Softwood
- Mixedwood
- Hardwood

Non-Forested Land (Type)

- Old Field
- Seed Orchard / Production Area
- Brush
- Alders <75% Cover
- Alders >75% Cover
- Clear Cut
- General Wetlands
- Open Bogs
- Lake/River Wetland
- Water
- Agriculture
- Urban and Miscellanious
- Gravel Pit
- Powerline Corridor
- Road Corridor
- Rail Corridor

Habitat Cover

Strum CONSULTING

Date: Nov. 2013	Project #: 12-4583
Scale: 1:15,000	Drawing #: 8.5
Drawn By: H. Serhan	
Checked By: M. Smith	

8.5 Terrestrial Vegetation

ACCDC records indicate that 334 flora species have been identified within 100 km of the Project site. Of the 334 species identified by ACCDC, 230 SOCI were identified within 100 km of the Project site. This preliminary list was used to develop a short list of plant SOCI that might be present at the Project site. The short list of plant SOCI is provided in Table E1 (Appendix E).

A plant survey was completed on the Project site on August 21st, 2013. A complete list of plant species identified during the surveys is provided in Table E2 (Appendix E). No plant SOCI were observed on the Project site.

8.6 Terrestrial Fauna

Information regarding terrestrial fauna for the Project site, including any SOCI, was obtained through a combination of desktop review and field studies.

The desktop component included a review of the NS Significant Species and Habitat Database (NSDNR 2012c) and ACCDC data (ACCDC 2013) for species recorded within a 100 km radius of the Project site. A comparison of habitat mapping data to known habitat requirements for species expected to occur within the area, and for all SOCI, was also completed.

8.6.1 Mammals

The Nova Scotia Significant Species and Habitat Database (NSDNR 2012c) contains 35 unique species and/or habitat records pertaining to terrestrial mammals within a 100 km radius of the Project site. These records include:

- Twenty-four records that are classified as “Deer Wintering”, which relate to known over-wintering habitat for White-tailed deer (*Odocoileus virginianus*);
- Five records that are classified as ‘Species of Risk”, which pertain to American Marten (*Martes americana*) (4) and Southern flying squirrel (*Glaucomys volans*) (1);
- Four records classified as “Species of Concern”, which relate to Fisher (*Martes pennanti*) (3) and Long-tailed Shrew (*Sorex dispar*) (1); and
- Two records classified in the database as “Other Habitat”, relating to American Beaver (*Castor canadensis*) and American Black Bear (*Ursus americanus*).

No records that relate to terrestrial mammal habitat are within 10 km of the Project site.

The ACCDC database (2013) indicates that seven species of terrestrial mammals (excluding bats) have been recorded within a 100 km radius of the Project site (Table 8.6).

Table 8.6: Mammal 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]
American Marten	*Martes americana*	Not Listed	Endangered	Not Listed	Red
Eastern Cougar	*Puma concolor*	Not Listed	Not Listed	Data Deficient	Undetermined
Fisher	*Martes pennanti*	Not Listed	Not Listed	Not Listed	Yellow

Common Name	Scientific Name	*SARA* Status[1]	NS *ESA* Status[2]	COSEWIC Status[3]	NSDNR Status[4]
Long-tailed shrew	*Sorex dispar*	Not Listed	Not Listed	Not Listed	Yellow
Lynx	*Lynx canadensis*	Not Listed	Endangered	Not at Risk	Red
Mainland moose	*Alces americanus*	Not Listed	Endangered	Not Listed	Red
Southern flying squirrel	*Glaucomys volans*	Not Listed	Not Listed	Not at Risk	Yellow

Source: ACCDC 2013
[1]Government of Canada 2012; [2]NS *ESA* 2013; [3]COSEWIC 2012a; [4]NSDNR 2010

Of note is that sightings of many of the most common species are unreported to ACCDC, and are therefore under-represented or absent from the database. Consequently, a review of the ACCDC data reveals predominantly rare or noteworthy species despite the fact that these species certainly represent a small fraction of the existing mammal community in an area.

Field studies (between April and November 2013) of mammalian fauna at the Project site consisted of direct observation of individuals, as well as the indirect identification of species by sound and/or sign (*e.g.,* scat, tracks, scent, dens, lodges, etc). In addition, targeted pellet count surveys were completed for Mainland moose in May and November 2013. A detailed methodology for pellet count surveys is provided in Appendix F.

Table 8.7 lists the mammal species observed/identified at or near the Project site during field studies.

Table 8.7: Mammal Species Observed during Field Studies

Common Name	Scientific Name	*SARA* Status[1]	NS *ESA* Status[2]	COSEWIC Status[3]	NSDNR Status[4]
American black bear	*Ursus americanus*	Not Listed	Not Listed	Not at Risk	Green
American porcupine	*Erethizon dorsatum*	Not Listed	Not Listed	Not at Risk	Green
Bobcat	*Lynx rufus*	Not Listed	Not Listed	Not Listed	Green
Snowshoe hare	*Lepus americanus*	Not Listed	Not Listed	Not Listed	Green
White-tailed deer	*Odocoileus virginianus*	Not Listed	Not Listed	Not Listed	Green

[1]Government of Canada 2012; [2]NS *ESA* 2013; [3]COSEWIC 2012a; [4]NSDNR 2010

Priority mammal species include:

- American Marten – “Endangered” (NS *ESA*), “Red” (NSDNR);
- Fisher – “Yellow” (NSDNR);
- Long-tailed shrew – “Yellow” (NSDNR);
- Lynx – “Endangered” (NS *ESA*), “Red” (NSDNR);
- Mainland moose – “Endangered” (NS *ESA*), “Red” (NSDNR); and
- Southern flying squirrel – “Yellow” (NSDNR).

American Marten
American marten prefer mature coniferous forests, and have been more recently observed in mixed forests and cutovers (MTRI 2008). Although these types of habitat are prevalent at the Project site, the current known distribution of the American marten in Nova Scotia is limited to Cape Breton and the southwestern part of the province, near Yarmouth (NSDNR 2012d).

It is therefore unlikely that the Project will interact with and/or impact American marten populations and no further consideration of effects and mitigation for this species has been undertaken.

Fisher
Fisher prefer dense, mature to old-growth forests with continuous overhead cover (Allen 1983). Generally considered a forest-interior species (OMNR 2000), Fisher require large tracts of well-connected habitat (Meyer 2007).

Fisher are distributed throughout mainland Nova Scotia, and trapping data suggests population concentrations in Cumberland, Colchester, and Pictou counties; just 29 Fisher have been harvested from Hants County since 2007, representing 3.5% of the provincial total during that time (NSDNR 2012d).

No indication of Fisher was observed during field surveys. However, mid-aged mixed wood stands in the interior of the site may provide suitable canopy closure and coarse woody debris (CWD) of sufficient diameter for Fisher. While these intact stands are likely too small to form a core area within a Fisher home range, it is possible that they provide habitat connectivity for dispersing juveniles in search of a permanent territory. While trapping data suggests that the density of the Fisher population in the area of the Project site is low, harvest can be influenced by both density and trapper effort.

Potential effects of the Project on this species, as well as proposed mitigation measures, are discussed in more detail in Section 13.2.1.

Long-tailed shrew
Long-tailed shrew are closely associated with steep, talus slopes, usually close to running water, and the presence of rocks is considered a principal habitat component (Kirkland 1981).

Thought to be found only in the Cobequid Mountains (Scott 1987; Woolaver *et al*. 1998), more recent research has identified an additional population of Long-tailed Shrew near Wolfville at Stewart Mountain, approximately 41 km to the north of the Project site (Shafer and Stewart 2006).

No indication of Long-tailed shrew was observed during field studies. Slopes of sufficient grade (≥25%) are present, particularly along a mapped watercourse at the Project site's eastern extent. Although habitat in this area was not surveyed extensively, boulders were observed at the base of the slope which could indicate suitable boulder talus in the area of the watercourse. Given that a known population exists in the region, and that slopes with a grade consistent with known habitat requirements are present, it is possible that Long-tailed Shrew occur at the Project site.

Presence/absence of this small mammal can only be verified through the implementation of a targeted live-trapping program.

Potential effects of the Project on this species, as well as proposed mitigation measures, are discussed in more detail in Section 13.2.1.

Canada Lynx
The distribution of Canada lynx is limited to the availability of extensive coniferous forests and distribution of Snowshoe hare (*Lepus americanus*) (main prey item), and in Nova Scotia the Canada lynx is limited to the Cape Breton Highlands (MTRI 2008). Although individuals may travel great distances in times of food scarcity (as cited in Parker 2001), potentially passing through the Project site, the possibility of this occurring during the construction phase of the Project is highly unlikely.

The Project, therefore, will not have any impact on Canada lynx and no further consideration of effects and mitigation for this species has been undertaken.

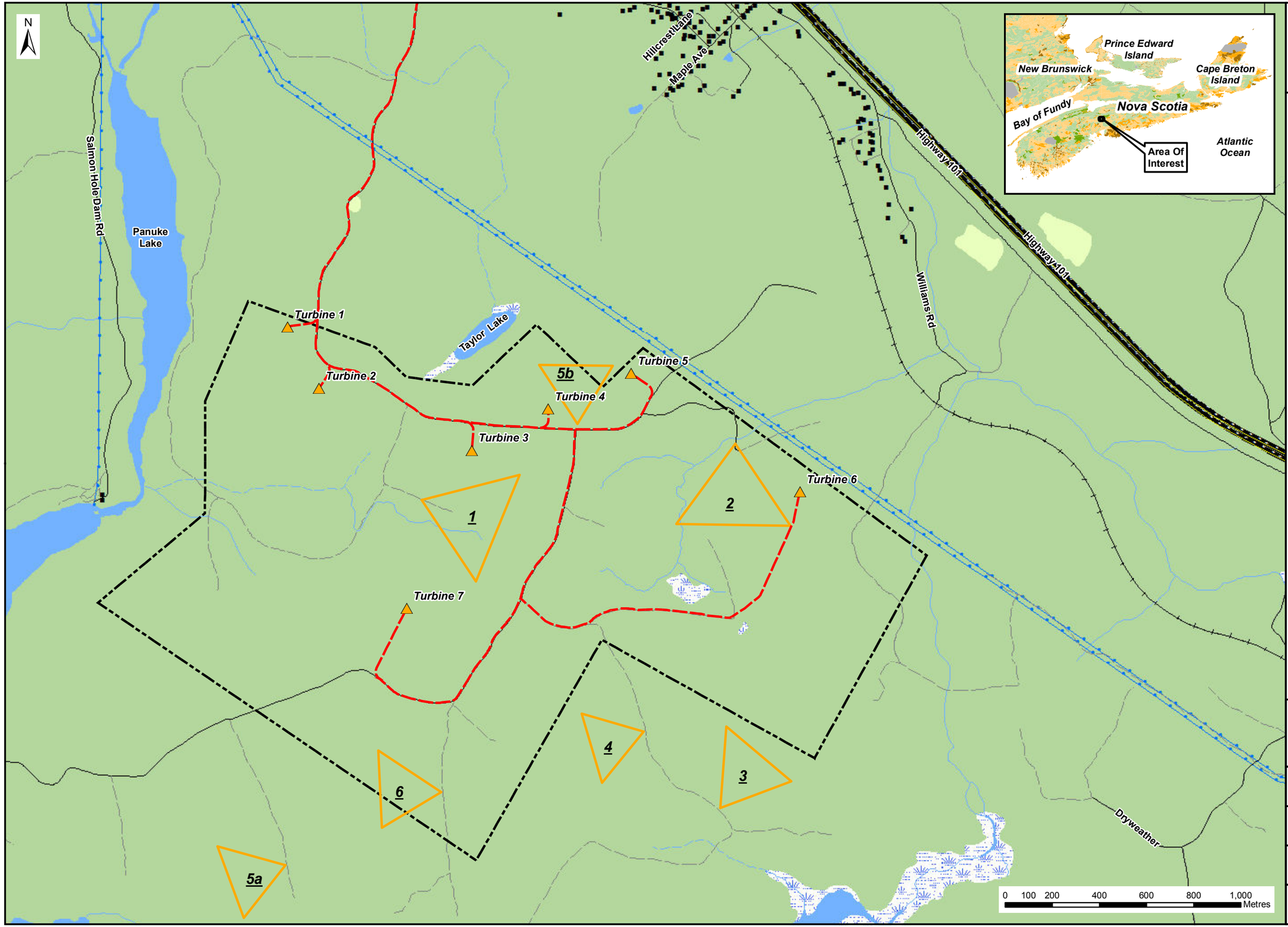
Mainland Moose
Habitat requirements for Mainland moose change throughout the year. Early successional growth, such as that provided by regenerating cutovers, offers quality foraging habitat for moose, and interspersed wetlands provide suitable summer habitat for cows and calves (Parker 2003; Snaith and Beazley 2004). Mature softwood forest is used as escape cover throughout the year, and also provides thermal relief during the summer months (Broders *et al*. 2012) and relief from deep snows in winter (Telfer 1970).

Five significant concentration areas for Mainland moose have been identified in Nova Scotia (NSDNR 2012e). The Project site is situated in close proximity to the northern extent of one such concentration area. The closest observation of Mainland Moose contained within the ACCDC database (ACCDC 2013) is approximately 23 km to the west near Round Mountain.

No evidence of Mainland moose was observed at the Project site during targeted pellet-group surveys conducted in May and November 2013 (Drawing 8.6). The highly fragmented nature of the general landscape has resulted in a habitat patchwork that appears to provide for the varied requirements of this species. Mid-aged forest stands in the Project site's interior may provide escape cover and relief from deep snows and hot summer temperatures, especially along south facing slopes, while regenerating cutovers may provide suitable forage as they age. It is therefore possible that Mainland Moose occur at the Project site.

Potential effects of the Project on this species, as well as proposed mitigation measures, are discussed in more detail in Section 13.2.1.

Southern flying squirrel
Southern flying squirrel requires mast bearing trees for forage and tree cavities for nesting and in the Atlantic Region, southern flying squirrels select older forest stands (COSEWIC 2006). In Nova Scotia, the species demonstrates a particular affinity to red oak (*Quercus rubra*) which is most commonly found in mixed wood stands as opposed to pure hardwood stands (Lavers 2004).



Notes:

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

Legend:

- Proposed Turbine
- Proposed Access Road
- Moose Survey Transect
- Project Study Area
- Building
- Active Railroad
- Major Roads and Highways
- Public Roads
- Access Roads / Trails
- Existing Transmission Lines
- Large Structure
- Mapped Stream
- Mapped Indefinite Stream
- Water Bodies
- Mapped Wet Area
- Cleared Area

Moose Survey Transects

Strum Consulting

Date: Nov. 2013	Project #: 12-4583
Scale: 1:15,000	Drawing #: 8.6
Drawn By: H. Serhan	
Checked By: M. Smith	

In Nova Scotia, Southern flying squirrel occur primarily in a region bounded by the South Mountain in the north, Kentville in the east, New Ross in Lunenburg County to the south, and extends to Kejiimkujik National Park in the west (COSEWIC 2006). This range extends to within approximately 6 km of the Project site.

No indication of Southern flying squirrel was observed during field studies, although the species' nocturnal habits mean it is unlikely to be identified in the absence of targeted surveys. Habitat mapping indicates a small amount of red oak at the Project site, and tolerant hardwoods are present which may include other mast bearing trees such as American beech (*Fagus grandifolia*). However, these tree species are at best a minor component of the stands at the Project site. Given that suitable habitat is scarce, it is unlikely that Southern flying squirrel occurs at the Project site.

The Project is therefore not expected to have any impact on Southern flying squirrel and no further consideration of effects and mitigation for this species has been undertaken.

8.6.2 Herpetofauna

The Nova Scotia Significant Species and Habitat Database (NSDNR 2012c) contains 44 unique species and/or habitat records pertaining to reptiles and amphibians within a 100 km radius of the Project site. These records include:

- Forty-four that are classified in the database as "Species at Risk", which relate to Wood turtle (*Glyptemys insculpta*) (22), Blanding's Turtle (*Emydoidea blandingii*) (13), and Eastern Ribbon Snake (*Thamnophis sauritus*) (7);
- One record classified as "Species of Concern", which relates to Painted Turtle (*Chrysemys picta*); and
- One record classified as "Other Habitat", which also relates to Wood turtle.

There are two records pertaining to Wood Turtle within a 10 km radius of the Project site: Herbert River, 7.75 km to the north in the community of Brooklyn, and a 9.87 km to the north in a tributary of the Kennetcook River in the community of Belmont

Data from the ACCDC (2013) indicate that three species of herpetofauna have been recorded within a 100 km radius of the Project site (Table 8.8).

Table 8.8: Herpetofauna Species Recorded by ACCDC 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]
Blanding's Turtle	*Emydoidea blandingii*	Endangered	Endangered	Endangered	Red
Eastern Ribbon Snake	*Thamnophis sauritus*	Threatened	Threatened	Threatened	Red
Four-toed Salamander	*Hemidactylium scutatum*	Not Listed	Not Listed	Not at Risk	Green
Wood turtle	*Glyptemys insculpta*	Threatened	Threatened	Threatened	Yellow

Source: ACCDC 2013
[1]Government of Canada 2012; [2]NS *ESA* 2013; [3]COSEWIC 2012a; [4]NSDNR 2010

The same data limitations and interpretations as noted for the mammalian fauna (Section 8.6.1) are also applicable to the reptile and amphibian data.

Field studies of amphibian and reptile species were conducted in conjunction with other surveys between April and November 2013. Species were either identified directly through visual observation, or indirectly using other evidence (*e.g.,* calls, egg masses, tadpoles, etc.). Table 8.9 lists the amphibian and reptile species identified at or near the Project site during field studies.

Table 8.9: Herpetofauna Species Recorded During Field Studies

Common Name	Scientific Name	*SARA* Status[1]	NS *ESA* Status[2]	COSEWIC Status[3]	NSDNR Status[4]
Green frog	*Lithobates clamitans*	Not Listed	Not Listed	Not Listed	Green
Spring peeper	*Pseudacris crucifer*	Not Listed	Not Listed	Not Listed	Green

[1]Government of Canada 2012; [2]NS *ESA* 2013; [3]COSEWIC 2012a; [4]NSDNR 2010

Priority herpetofauna species include:

- Blanding's turtle – "Endangered" (SARA), "Endangered" (NS *ESA*), "Endangered" (COSEWIC), "Red" (NSDNR);
- Eastern ribbon snake – "Threatened" (*SARA*), "Threatened" (NS *ESA*), "Threatened" (COSEWIC), "Red" (NSDNR);
- Wood turtle – "Threatened" (*SARA*), "Threatened" (NS *ESA*), "Threatened" (COSEWIC), "Yellow" (NSDNR).

None of the priority species listed above were observed during field studies.

Blanding's turtle
Blanding's turtle make use of a variety of wetland habitats including lakes, ponds, brooks, creeks, and marshes (COSEWIC 2005), and are closely associated with areas of extensive beaver activity (TBTRT 2012).

The known range of this species in Nova Scotia is restricted to the southwestern interior of the province where there are five disjunct populations within the Medway, Mersey, and Sissiboo River watersheds (TBTRT 2012). The geographic separation from the range of Blanding's turtle in Nova Scotia means that the Project it is highly unlikely that species occurs at the Project site.

The Project is therefore not expected to have any impact on Blanding's turtle and no further consideration of effects and mitigation for this species has been undertaken.

Eastern ribbon snake
Eastern ribbon snake is a semi-aquatic species typically found in freshwater habitats including wetlands, still water streams and marshes (COSEWIC 2002).

In Nova Scotia, concentrations of Eastern ribbonsnake are thought to be limited to interior portions of the Mersey, Medway, and LaHave River watersheds in the southwestern region of the province, although recent discoveries have expanded the known range of this species to include the Petite

Rivière watershed (Gilhen *et al*. 2012). Nonetheless, the Project site has substantial geographic separation from the species' known range in Nova Scotia; it is therefore highly unlikely that Project Eastern ribbon snake occurs at the Project site.

The Project is therefore not expected to have any impact on Eastern ribbon snake and no further consideration of effects and mitigation for this species has been undertaken.

Wood turtle
Wood turtle requires three key habitat components: a watercourse, sandy substrate for nesting, and a forested area for thermal relief during the summer months (MacGregor and Elderkin 2003). Ideal streams have a clear, moderate flow, a hard bottom composed of sand or gravel, and are seven to 100 feet wide (MacGregor and Elderkin 2003).

The species is found throughout the province but seems to be most abundant in central Nova Scotia (MacGregor and Elderkin 2003). ACCDC data indicate that the closest observation of this species to the Project site was 2.97 km to the west, in the headwaters of a small tributary to Panuke Lake.

No indication of Wood turtle was observed during field studies. However, suitable watercourse and associated riparian habitat is present at the Project site, albeit away from proposed Project infrastructure (Drawing 8.4B). It's possible that dispersing Wood turtles may travel from this habitat through the site in search of territories in surrounding lands.

Potential effects of the Project on this species, as well as proposed mitigation measures, are discussed in more detail in Section 13.2.1.

8.6.3 Butterflies and *Odonates*

The Nova Scotia Significant Species and Habitats (NSDNR 2012c) database identifies four significant habitat features relating to butterflies and *Odonates* within a 100 km radius of the Project site. These records include:

- Two records classified as 'Species of Concern', both of which relate to Jutta arctic (*Oeneis jutta*);
- One record classified as "Species at Risk", relating to Ebony boghaunter (*Williamsonia fletcheri*); and
- One record classified as 'Other Habitat' pertaining to Hoary elfin (*Callophrys polios*).

The database contains no records of butterflies or *Odonates* within a 10 km radius of the Project site.

The ACCDC database contains records of 131 unique taxa of butterfly and Odonates within a 100 km radius of the Project site (Table 8.10).

Table 8.10: Unique Butterfly and Odonate 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]
Amber-winged spreadwing	*Lestes eurinus*	Not Listed	Not Listed	Not Listed	Green
American emerald	*Cordulia shurtleffii*	Not Listed	Not Listed	Not Listed	Green
Aphrodite fritillary	*Speyeria aphrodite*	Not Listed	Not Listed	Not Listed	Green
Arctic fritillary	*Boloria chariclea*	Not Listed	Not Listed	Not Listed	Yellow
Aurora damsel	*Chromagrion conditum*	Not Listed	Not Listed	Not Listed	Green
Azure bluet	*Enallagma aspersum*	Not Listed	Not Listed	Not Listed	Green
Baltimore checkerspot	*Euphydryas phaeton*	Not Listed	Not Listed	Not Listed	Green
Banded hairstreak	*Satyrium calanus*	Not Listed	Not Listed	Not Listed	Undetermined
Band-winged meadowhawk	*Sympetrum semicinctum*	Not Listed	Not Listed	Not Listed	Green
Beaverpond baskettail	*Epitheca canis*	Not Listed	Not Listed	Not Listed	Green
Beaverpond clubtail	*Gomphus borealis*	Not Listed	Not Listed	Not Listed	Green
Black-shouldered spinyleg	*Dromogomphus spinosus*	Not Listed	Not Listed	Not Listed	Green
Black-tipped darner	*Aeshna tuberculifera*	Not Listed	Not Listed	Not Listed	Green
Bog elfin	*Callophrys lanoraieensis*	Not Listed	Not Listed	Not Listed	Red
Boreal bluet	*Enallagma boreale*	Not Listed	Not Listed	Not Listed	Green
Bronze copper	*Lycaena hyllus*	Not Listed	Not Listed	Not Listed	Green
Brook snaketail	*Ophiogomphus aspersus*	Not Listed	Not Listed	Not Listed	Red
Brush-tipped emerald	*Somatochlora walshii*	Not Listed	Not Listed	Not Listed	Green
Calico pennant	*Celithemis elisa*	Not Listed	Not Listed	Not Listed	Green
Canada darner	*Aeshna canadensis*	Not Listed	Not Listed	Not Listed	Green
Chalk-fronted corporal	*Libellula julia*	Not Listed	Not Listed	Not Listed	Green
Clamp-tipped emerald	*Somatochlora tenebrosa*	Not Listed	Not Listed	Not Listed	Green
Common baskettail	*Epitheca cynosura*	Not Listed	Not Listed	Not Listed	Undetermined
Common branded skipper	*Hesperia comma*	Not Listed	Not Listed	Not Listed	Green
Common green darner	*Anax junius*	Not Listed	Not Listed	Not Listed	Green
Common roadside-skipper	*Amblyscirtes vialis*	Not Listed	Not Listed	Not Listed	Green
Common whitetail	*Plathemis lydia*	Not Listed	Not Listed	Not Listed	Green
Compton tortoiseshell	*Nymphalis l-album*	Not Listed	Not Listed	Not Listed	Green
Crimson-ringed whiteface	*Leucorrhinia glacialis*	Not Listed	Not Listed	Not Listed	Green
Delicate emerald	*Somatochlora franklini*	Not Listed	Not Listed	Not Listed	Yellow
Delta-spotted spiketail	*Cordulegaster diastatops*	Not Listed	Not Listed	Not Listed	Green
Dot-tailed whiteface	*Leucorrhinia intacta*	Not Listed	Not Listed	Not Listed	Green
Dragonhunter	*Hagenius brevistylus*	Not Listed	Not Listed	Not Listed	Green
Dusky clubtail	*Gomphus spicatus*	Not Listed	Not Listed	Not Listed	Green
Eastern comma	*Polygonia comma*	Not Listed	Not Listed	Not Listed	Not Listed
Eastern pine elfin	*Callophrys niphon*	Not Listed	Not Listed	Not Listed	Green
Eastern red damsel	*Amphiagrion saucium*	Not Listed	Not Listed	Not Listed	Green
Eastern veined white	*Pieris oleracea*	Not Listed	Not Listed	Not Listed	Yellow
Ebony boghaunter	*Williamsonia fletcheri*	Not Listed	Not Listed	Not Listed	Red
Elfin skimmer	*Nannothemis bella*	Not Listed	Not Listed	Not Listed	Green

Common Name	*Scientific Name*	*SARA* Status[1]	NS *ESA* Status[2]	COSEWIC Status[3]	NSDNR Status[4]
Emerald spreadwing	*Lestes dryas*	Not Listed	Not Listed	Not Listed	Green
Familiar bluet	*Enallagma civile*	Not Listed	Not Listed	Not Listed	Green
Fawn darner	*Boyeria vinosa*	Not Listed	Not Listed	Not Listed	Green
Forcipate emerald	*Somatochlora forcipata*	Not Listed	Not Listed	Not Listed	Red
Fragile forktail	*Ischnura posita*	Not Listed	Not Listed	Not Listed	Green
Frosted whiteface	*Leucorrhinia frigida*	Not Listed	Not Listed	Not Listed	Green
Gray comma	*Polygonia progne*	Not Listed	Not Listed	Not Listed	Green
Gray hairstreak	*Strymon melinus*	Not Listed	Not Listed	Not Listed	Green
Green comma	*Polygonia faunus*	Not Listed	Not Listed	Not Listed	Green
Greenish blue	*Plebejus saepiolus*	Not Listed	Not Listed	Not Listed	Not Listed
Green-striped darner	*Aeshna verticalis*	Not Listed	Not Listed	Not Listed	Green
Hagen's bluet	*Enallagma hageni*	Not Listed	Not Listed	Not Listed	Green
Harlequin darner	*Gomphaeschna furcillata*	Not Listed	Not Listed	Not Listed	Yellow
Harpoon clubtail	*Gomphus descriptus*	Not Listed	Not Listed	Not Listed	Yellow
Harvester	*Feniseca tarquinius*	Not Listed	Not Listed	Not Listed	Green
Henry's elfin	*Callophrys henrici*	Not Listed	Not Listed	Not Listed	Green
Hoary comma	*Polygonia gracilis*	Not Listed	Not Listed	Not Listed	Yellow
Hoary elfin	*Callophrys polios*	Not Listed	Not Listed	Not Listed	Green
Hudsonian whiteface	*Leucorrhinia hudsonica*	Not Listed	Not Listed	Not Listed	Green
Illinois river cruiser	*Macromia illinoiensis*	Not Listed	Not Listed	Not Listed	Green
Incurvate emerald	*Somatochlora incurvata*	Not Listed	Not Listed	Not Listed	Green
Jutta arctic	*Oeneis jutta*	Not Listed	Not Listed	Not Listed	Red
Juvenal's duskywing	*Erynnis juvenalis*	Not Listed	Not Listed	Not Listed	Green
Kennedy's emerald	*Somatochlora kennedyi*	Not Listed	Not Listed	Not Listed	Red
Lake darner	*Aeshna eremita*	Not Listed	Not Listed	Not Listed	Green
Lake emerald	*Somatochlora cingulata*	Not Listed	Not Listed	Not Listed	Green
Lancet clubtail	*Gomphus exilis*	Not Listed	Not Listed	Not Listed	Green
Lance-tipped darner	*Aeshna constricta*	Not Listed	Not Listed	Not Listed	Green
Laurentian skipper	*Hesperia comma*	Not Listed	Not Listed	Not Listed	Green
Least clubtail	*Stylogomphus albistylus*	Not Listed	Not Listed	Not Listed	Green
Little bluet	*Enallagma minusculum*	Not Listed	Not Listed	Not Listed	Green
Lyre-tipped spreadwing	*Lestes unguiculatus*	Not Listed	Not Listed	Not Listed	Green
Maine snaketail	*Ophiogomphus mainensis*	Not Listed	Not Listed	Not Listed	Red
Marsh bluet	*Enallagma ebrium*	Not Listed	Not Listed	Not Listed	Green
Martha's pennant	*Celithemis martha*	Not Listed	Not Listed	Not Listed	Green
Milbert's tortoiseshell	*Aglais milberti*	Not Listed	Not Listed	Not Listed	Green
Monarch	*Danaus plexippus*	Special Concern	Not Listed	Special Concern	Yellow
Mottled darner	*Aeshna clepsydra*	Not Listed	Not Listed	Not Listed	Green
Mustached clubtail	*Gomphus adelphus*	Not Listed	Not Listed	Not Listed	Green
Northern bluet	*Enallagma annexum*	Not Listed	Not Listed	Not Listed	Green
Northern cloudywing	*Thorybes pylades*	Not Listed	Not Listed	Not Listed	Yellow
Northern pearly-eye	*Lethe anthedon*	Not Listed	Not Listed	Not Listed	Green
Northern pygmy clubtail	*Lanthus parvulus*	Not Listed	Not Listed	Not Listed	Green
Ocellated darner	*Boyeria grafiana*	Not Listed	Not Listed	Not Listed	Yellow
Ocellated emerald	*Somatochlora minor*	Not Listed	Not Listed	Not Listed	Green

Common Name	*Scientific Name*	*SARA* Status[1]	NS *ESA* Status[2]	COSEWIC Status[3]	NSDNR Status[4]
Orange bluet	*Enallagma signatum*	Not Listed	Not Listed	Not Listed	Red
Pepper and salt skipper	*Amblyscirtes hegon*	Not Listed	Not Listed	Not Listed	Green
Petite emerald	*Dorocordulia lepida*	Not Listed	Not Listed	Not Listed	Green
Powdered dancer	*Argia moesta*	Not Listed	Not Listed	Not Listed	Green
Prince baskettail	*Epitheca princeps*	Not Listed	Not Listed	Not Listed	Yellow
Quebec emerald	*Somatochlora brevicincta*	Not Listed	Not Listed	Not Listed	Red
Question mark	*Polygonia interrogationis*	Not Listed	Not Listed	Not Listed	Green
Racket-tailed emerald	*Dorocordulia libera*	Not Listed	Not Listed	Not Listed	Green
Red-waisted whiteface	*Leucorrhinia proxima*	Not Listed	Not Listed	Not Listed	Green
Riffle snaketail	*Ophiogomphus carolus*	Not Listed	Not Listed	Not Listed	Green
River jewelwing	*Calopteryx aequabilis*	Not Listed	Not Listed	Not Listed	Green
Ruby meadowhawk	*Sympetrum rubicundulum*	Not Listed	Not Listed	Not Listed	Green
Rusty snaketail	*Ophiogomphus rupinsulensis*	Not Listed	Not Listed	Not Listed	Red
Saffron-winged meadowhawk	*Sympetrum costiferum*	Not Listed	Not Listed	Not Listed	Green
Satyr comma	*Polygonia satyrus*	Not Listed	Not Listed	Not Listed	Yellow
Seaside dragonlet	*Erythrodiplax berenice*	Not Listed	Not Listed	Not Listed	Yellow
Sedge sprite	*Nehalennia irene*	Not Listed	Not Listed	Not Listed	Green
Skillet clubtail	*Gomphus ventricosus*	Not Listed	Not Listed	Not Listed	Red
Ski-tailed emerald	*Somatochlora elongata*	Not Listed	Not Listed	Not Listed	Green
Slaty skimmer	*Libellula incesta*	Not Listed	Not Listed	Not Listed	Green
Slender spreadwing	*Lestes rectangularis*	Not Listed	Not Listed	Not Listed	Green
Sphagnum sprite	*Nehalennia gracilis*	Not Listed	Not Listed	Not Listed	Green
Spiny baskettail	*Epitheca spinigera*	Not Listed	Not Listed	Not Listed	Green
Spotted spreadwing	*Lestes congener*	Not Listed	Not Listed	Not Listed	Green
Springtime darner	*Basiaeschna janata*	Not Listed	Not Listed	Not Listed	Green
Stream bluet	*Enallagma exsulans*	Not Listed	Not Listed	Not Listed	Green
Stream cruiser	*Didymops transversa*	Not Listed	Not Listed	Not Listed	Green
Striped hairstreak	*Satyrium liparops*	Not Listed	Not Listed	Not Listed	Undetermined
Subarctic darner	*Aeshna subarctica*	Not Listed	Not Listed	Not Listed	Green
Superb jewelwing	*Calopteryx amata*	Not Listed	Not Listed	Not Listed	Green
Swamp spreadwing	*Lestes vigilax*	Not Listed	Not Listed	Not Listed	Green
Sweetflag spreadwing	*Lestes forcipatus*	Not Listed	Not Listed	Not Listed	Green
Taiga bluet	*Coenagrion resolutum*	Not Listed	Not Listed	Not Listed	Red
Tule bluet	*Enallagma carunculatum*	Not Listed	Not Listed	Not Listed	Undetermined
Twelve-spotted skimmer	*Libellula pulchella*	Not Listed	Not Listed	Not Listed	Green
Twin-spotted spiketail	*Cordulegaster maculata*	Not Listed	Not Listed	Not Listed	Green
Uhler's sundragon	*Helocordulia uhleri*	Not Listed	Not Listed	Not Listed	Green
Variable dancer	*Argia fumipennis violacea*	Not Listed	Not Listed	Not Listed	Green
Vesper bluet	*Enallagma vesperum*	Not Listed	Not Listed	Not Listed	Yellow
White corporal	*Ladona exusta*	Not Listed	Not Listed	Not Listed	Green
White-faced meadowhawk	*Sympetrum obtrusum*	Not Listed	Not Listed	Not Listed	Green
Widow skimmer	*Libellula luctuosa*	Not Listed	Not Listed	Not Listed	Undetermined
Yellow-legged meadowhawk	*Sympetrum vicinum*	Not Listed	Not Listed	Not Listed	Green

Common Name	*Scientific Name*	*SARA* Status[1]	NS *ESA* Status[2]	COSEWIC Status[3]	NSDNR Status[4]
Zebra clubtail	*Stylurus scudderi*	Not Listed	Not Listed	Not Listed	Red
Zigzag darner	*Aeshna sitchensis*	Not Listed	Not Listed	Not Listed	Green

Source: ACCDC 2013
[1]Government of Canada 2012; [2]NS *ESA* 2013; [3]COSEWIC 2012a; [4]NSDNR 2010

No incidental observations of butterflies were made during other field studies conducted at the Project site between April and November 2013.

Priority butterfly and *Odonate* species include:

- Arctic fritillary – "Yellow" (NSDNR);
- Bog elfin – "Red" (NSDNR);
- Brook snaketail – "Red" (NSDNR);
- Delicate emerald – "Yellow" (NSDNR);
- Eastern veined white – "Yellow" (NSDNR);
- Ebony boghaunter – "Red" (NSDNR);
- Forcipate emerald – "Red" (NSDNR);
- Harlequin darner – "Yellow" (NSDNR);
- Harpoon clubtail – "Yellow" (NSDNR);
- Hoary comma – "Yellow" (NSDNR);
- Jutta arctic – "Red" (NSDNR);
- Kennedy's emerald – "Red" (NSDNR);
- Maine snaketail – "Red" (NSDNR);
- Monarch – "Special Concern" (SARA), "Special Concern" (COSEWIC), "Yellow" (NSDNR);
- Northern cloudywing – "Yellow" (NSDNR);
- Ocellated darner – "Yellow" (NSDNR);
- Orange bluet – "Red" (NSDNR);
- Prince baskettail – "Yellow" (NSDNR);
- Quebec emerald – "Red" (NSDNR);
- Rusty snaketail – "Red" (NSDNR);
- Satyr comma – "Yellow" (NSDNR);
- Seaside dragonlet – "Yellow" (NSDNR);
- Skillet clubtail – "Red" (NSDNR);
- Taiga bluet – "Red" (NSDNR);
- Vesper bluet – "Yellow" (NSDNR); and
- Zebra clubtail – "Red" (NSDNR).

Monarch
Only the Monarch has been granted a designated conservation status at either the provincial or federal level. This species can be found in open-habitats with abundant wildflower growth. Milkweed (*Asclepias* sp.) is a critical element of breeding habitat, whereas asters (*Asteraciae* sp.) and goldenrods (*Solidago* sp.) provide necessary food resources during migration (MTRI 2008).

Nova Scotia falls within the breeding range of this migratory species (COSEWIC 2010b), and individuals can be found throughout the province from May to October (Maritime Butterfly Atlas 2012).

No indication of Monarch was observed during field surveys. Open habitat at the Project site is prevalent, particularly in cutovers areas and along roadsides (Drawing 8.5). Considering the widespread distribution of the species in Atlantic Canada, it is possible that Monarch occurs at the Project site, particularly during the migratory period (late summer/early fall). However, it is unlikely that the Project site provides sufficient nectar resources to support a large congregation of migratory Monarchs.

Potential effects of the Project on this species, as well as proposed mitigation measures, are discussed in more detail in Section 13.2.1.

The requirements as set out in *SARA* and NS *ESA* will be adhered to for Project activities. Additional general mitigation measures for terrestrial fauna are provided in Section 4.0. Where required, species-specific mitigation is provided in Section 13.

8.7 Avifauna

The Project site features predominantly mixed wood forest, as well as significant coverage of mature to overmature softwood forest. Much of the forested area is managed for silviculture and has been subject to clear-cutting or thinning activities within the past decade. A number of areas of wetland habitat exist at the Project site, mostly in the form of shrub or treed swamps, some of which occur in open areas that may have been disturbed by forestry activities. The diversity of habitat types, in particular the prevalence of edge/transitional habitat, provides for the foraging, breeding, and roosting requirements of a variety of resident and migratory bird species. Baseline information was utilized to gain insight into protected avifauna habitats, species utilization of the area, and to identify SOCI potentially occurring at or near the Project site.

The closest Important Bird Area (IBA) in Canada (IBA Canada 2012) is the Southern Bight, Minas Basin IBA located approximately 12 km northwest of the Project site. This IBA is a 22,190 ha staging ground for an estimated 1 to 2 million shorebirds in late July to early August. A high diversity of migrant shorebirds forage on the large intertidal mud and sand flats throughout the Bight. This area is also a designated Ramsar Wetland Site as it supports the largest numbers of mixed species of shoreline birds during fall migration in all of North America.

The Project site is contained within map squares 20MQ17 and 20MQ27 of the Maritime Breeding Bird Atlas (MBBA) (MBBA 2012). In the most recent edition of the MBBA (2006-2010), 94 species were identified as being possible, probable, or confirmed breeders within this area. The following SOCI are considered possible, probable, or confirmed breeders in the survey area:

- American Bittern (Botaurus lentiginosus) – “Yellow” (NSDNR);
- Bank Swallow (*Riparia riparia*) – “Threatened” (NS *ESA)*, “Red” (NSDNR);
- Barn Swallow (*Hirundo rustica*) – “Endangered” (NS *ESA*), “Threatened” (COSEWIC), “Yellow” (NSDNR);
- Black-backed Woodpecker (Picoides arcticus) – “Yellow” (NSDNR);

- Blackpoll Warbler (Dendroica striata) – "Yellow" (NSDNR);
- Bobolink (*Dolichonyx oryzivorus*) – "Vulnerable" (NS *ESA*), "Threatened" (COSEWIC), "Yellow" (NSDNR);
- Boreal Chickadee (*Poecile hudsonicus*) – "Yellow" (NSDNR);
- Common Loon (*Gavia immer*) – "Red" (NSDNR);
- Common Nighthawk (Chordeiles minor) – "Threatened" (SARA), "Threatened" (NS *ESA*), "Threatened" (COSEWIC), "Red" (NSDNR);
- Eastern Kingbird (*Tyrannus tyrannus*) – "Yellow" (NSDNR);
- Eastern Phoebe (Sayornis phoebe) – "Yellow" (NSDNR);
- Eastern Wood-Pewee (*Contopus virens*) – "Vulnerable" (NS *ESA*), "Special Concern" (COSEWIC), "Yellow" (NSDNR);
- Golden-crowned Kinglet (*Regulus satrapa*) – "Yellow" (NSDNR);
- Gray Catbird (*Dumetella carolinensis*) – "Red" (NSDNR);
- Gray Jay (*Perisoreus canadensis*) – "Yellow" (NSDNR);
- Killdeer (*Charadrius vociferous*) – "Yellow" (NSDNR);
- Olive-sided Flycatcher (Contopus cooperi) – "Threatened" (SARA), "Threatened" (NS *ESA*), "Threatened" (COSEWIC), "Red" (NSDNR);
- Pied-billed Grebe (Podilymbus podiceps) – "Yellow" (NSDNR);
- Pine Grosbeak (*Pinicola enucleator*) – "Red" (NSDNR);
- Pine Siskin (*Spinus pinus*) – "Yellow" (NSDNR);
- Ruby-crowned Kinglet (*Regulus calendula*) – "Yellow" (NSDNR);
- Savannah Sparrow (Passerculus sandwichensis) – "Special Concern" (SARA), "Special Concern (COSEWIC);
- Spotted Sandpiper (*Actitis macularius*) – "Yellow" (NSDNR);
- Tennessee Warbler (*Vermivora peregrine*) – "Yellow" (NSDNR); and
- Tree Swallow (*Tachycineta bicolor*) – "Yellow" (NSDNR).

The NS Significant Species and Habitats database contains 426 unique records pertaining to birds and/or bird habitat within a 100 km radius of the Project site. These records include:

- 179 classified in the database as "Other Habitat", of which the majority relate to Bald Eagle (*Haliaeetus leucocephalus*) (106) and Osprey (*Pandion haliaetus*) (37), but also including records of Great Blue Heron (*Ardea herodias*) (5) and unclassified Cormorant species (3), among others;
- 105 records classified as "Species of Concern", of which the majority relate to Common Loon (58), but also including records of unclassified Tern species (16), Common Tern (*Sterna hirundo*) (8), Northern Goshawk (*Accipiter gentilis*) (4), and Great Blue Heron (4), among others;
- 77 records classified as "Migratory Bird", including Double-crested Cormorant (*Phalacrocorax auritus*) (15), Great Blue Heron (15), unclassified shorebirds (12), American Black Duck (*Anas rubripes*) (9), and Common Eider (*Somateria mollissima*) (6), among others; and
- 65 records classified as "Species at Risk", primarily relating to Piping Plover (*Charadrius melodus*) (18), Peregrine Falcon (*Falco peregrinus*) (11), Common Loon (7) and Harlequin

Duck (*Histrionicus histrionicus*) (5) but also including records of Roseate Tern (*Sterna dougallii*) (2) and Common Tern (2), among others.

Multiple significant habitat features related to birds are present within a 10 km radius of the Project site (Table 8.11).

Table 8.11: Significant Habitat Features Related to Birds within a 10km Radius of the Project Site

Site	Species	Location	Distance and Direction from Project Site
HN35	Bald Eagle Nest (Possible Inactive)	Within the Project Site	N/A
HN285	Common Loon Nesting	Panuke Lake	0.24 km to the W
HN300	Common Loon Nesting	Five Mile Lake	3.56 km to the SE
HN301	Common Loon Nesting	Mill Lakes	5.95 km to the W
HN326	Bald Eagle Nest	Along the Meander River	6.64 km to the N
HN28	Bald Eagle Nest (Possible Inactive)	Along Mill Lakes	7.48 km to the W
HN30	Gray Partridge	Town of Windsor near Curry's Corner	9.29 km to the NW
HN24	Bald Eagle Nest (Possible Inactive)	Martock Mountain	9.47 km to the W

Source: NSDNR 2012c

The ACCDC database contains records of 69 bird species within a 100 km radius of the Project site. Table 8.12 lists these species as well as their respective provincial and national conservation status ranks.

Table 8.12: Bird 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]
American Golden-Plover	*Pluvialis dominica*	Not Listed	Not Listed	Not Listed	Yellow
Arctic Tern	*Sterna paradisaea*	Not Listed	Not Listed	Not Listed	Red
Atlantic Puffin	*Fratercula arctica*	Not Listed	Not Listed	Not Listed	Yellow
Baird's Sandpiper	*Calidris bairdii*	Not Listed	Not Listed	Not Listed	Green
Baltimore Oriole	*Icterus galbula*	Not Listed	Not Listed	Not Listed	Red
Bank Swallow	*Riparia riparia*	Not Listed	Threatened	Not Listed	Red
Barn Swallow	*Hirundo rustica*	No Status	Endangered	Threatened	Yellow
Bicknell's Thrush	*Catharus bicknelli*	Threatened	Endangered	Threatened	Red
Black Guillemot	*Cepphus grille*	Not Listed	Not Listed	Not Listed	Green
Black Tern	*Chlidonias niger*	Not Listed	Not Listed	Not at Risk	Red
Black-billed Cuckoo	*Coccyzus erythropthalmus*	Not Listed	Not Listed	Not Listed	Red
Black-headed Gull	*Larus ridibundus*	Not Listed	Not Listed	Not Listed	Green
Black-legged Kittiwake	*Rissa tridactyla*	Not Listed	Not Listed	Not Listed	Yellow
Bobolink	*Dolichonyx oryzivorus*	No Status	Vulnerable	Threatened	Yellow
Brant	*Branta bernicla*	Not Listed	Not Listed	Not Listed	Yellow
Brown Thrasher	*Toxostoma rufum*	Not Listed	Not Listed	Not Listed	Undetermined
Bufflehead	*Bucephala albeola*	Not Listed	Not Listed	Not Listed	Green
Canada Warbler	*Wilsonia Canadensis*	Threatened	Endangered	Threatened	Red
Chimney Swift	*Chaetura pelagica*	Threatened	Endangered	Threatened	Red
Common Goldeneye	*Bucephala clangula*	Not Listed	Not Listed	Not Listed	Green
Common Moorhen	*Gallinula chloropus*	Not Listed	Not Listed	Not Listed	Undetermined
Common	*Chordeiles minor*	Threatened	Threatened	Threatened	Red

Common Name	Scientific Name	*SARA* Status[1]	NS *ESA* Status[2]	COSEWIC Status[3]	NSDNR Status[4]
Nighthawk					
Common Tern	*Sterna hirundo*	Not Listed	Not Listed	Not at Risk	Yellow
Eastern Bluebird	*Sialia sialis*	Not Listed	Not Listed	Not at Risk	Yellow
Eastern Meadowlark	*Sturnella magna*	No Status	Not Listed	Threatened	Yellow
Eastern Phoebe	*Sayornis phoebe*	Not Listed	Not Listed	Not Listed	Yellow
Eskimo Curlew	*Numenius borealis*	Endangered	Not Listed	Endangered	Undetermined
Great Crested Flycatcher	*Myiarchus crinitus*	Not Listed	Not Listed	Not Listed	Red
Greater Scaup	*Aythya marila*	Not Listed	Not Listed	Not Listed	Green
Greater Yellowlegs	*Tringa melanoleuca*	Not Listed	Not Listed	Not Listed	Yellow
Harlequin Duck	*Histrionicus histrionicus*	Special Concern	Endangered	Special Concern	Red
Horned Lark	*Eremophila alpestris*	Not Listed	Not Listed	Not Listed	Green
Hudsonian Godwit	*Limosa haemastica*	Not Listed	Not Listed	Not Listed	Yellow
Indigo Bunting	*Passerina cyanea*	Not Listed	Not Listed	Not Listed	Undetermined
Least Sandpiper	*Calidris minutilla*	Not Listed	Not Listed	Not Listed	Green
Long-eared Owl	*Asio otus*	Not Listed	Not Listed	Not Listed	Red
Nelson's Sparrow	*Ammodramus nelsoni*	Not Listed	Not Listed	Not Listed	Green
Northern Cardinal	*Cardinalis cardinalis*	Not Listed	Not Listed	Not Listed	Green
Northern Goshawk	*Accipiter gentilis*	Not Listed	Not Listed	Not at Risk	Green
Northern Mockingbird	*Mimus polyglottos*	Not Listed	Not Listed	Not Listed	Green
Northern Pintail	*Anas acuta*	Not Listed	Not Listed	Not Listed	Red
Northern Shoveler	*Anas clypeata*	Not Listed	Not Listed	Not Listed	Red
Olive-sided Flycatcher	*Contopus cooperi*	Threatened	Threatened	Threatened	Red
Peregrine Falcon	*Falco peregrinus anatum*	Special Concern	Vulnerable	Special Concern	Yellow
Philadelphia Vireo	*Vireo philadelphicus*	Not Listed	Not Listed	Not Listed	Undetermined
Piping Plover	*Charadrius melodus*	Endangered	Endangered	Endangered	Red
Purple Martin	*Progne subis*	Not Listed	Not Listed	Not Listed	Red
Purple Sandpiper	*Calidris maritima*	Not Listed	Not Listed	Not Listed	Yellow
Razorbill	*Alca torda*	Not Listed	Not Listed	Not Listed	Yellow
Red Crossbill	*Loxia curvirostra*	Not Listed	Not Listed	Not Listed	Green
Red Knot	*Calidris canutus rufa*	Endangered	Endangered	Endangered	Red
Red Knot	*Calidris canutus*	Endangered	Endangered	Endangered	Red
Red Phalarope	*Phalaropus fulicaria*	Not Listed	Not Listed	Not Listed	Yellow
Red-breasted Merganser	*Mergus serrator*	Not Listed	Not Listed	Not Listed	Green
Red-necked Phalarope	*Phalaropus lobatus*	Not Listed	Not Listed	Not Listed	Yellow
Roseate Tern	*Sterna dougallii*	Endangered	Endangered	Endangered	Red
Rusty Blackbird	*Euphagus carolinus*	Special Concern	Endangered	Special Concern	Red
Scarlet Tanager	*Piranga olivacea*	Not Listed	Not Listed	Not Listed	Undetermined
Semipalmated Plover	*Charadrius semipalmatus*	Not Listed	Not Listed	Not Listed	Green
Short-eared Owl	*Asio flammeus*	Special Concern	Not Listed	Special Concern	Red

Common Name	Scientific Name	*SARA* Status[1]	NS *ESA* Status[2]	COSEWIC Status[3]	NSDNR Status[4]
Solitary Sandpiper	*Tringa solitaria*	Not Listed	Not Listed	Not Listed	Green
Vesper Sparrow	*Pooecetes gramineus*	Not Listed	Not Listed	Not Listed	Red
Virginia Rail	*Rallus limicola*	Not Listed	Not Listed	Not Listed	Undetermined
Warbling Vireo	*Vireo gilvus*	Not Listed	Not Listed	Not Listed	Undetermined
Whimbrel	*Numenius phaeopus*	Not Listed	Not Listed	Not Listed	Yellow
Whip-Poor-Will	*Caprimulgus vociferus*	Threatened	Threatened	Threatened	Red
Willet	*Catoptrophorus semipalmatus*	Not Listed	Not Listed	Not Listed	Red
Wilson's Phalarope	*Phalaropus tricolor*	Not Listed	Not Listed	Not Listed	Green
Wood Thrush	*Hylocichla mustelina*	Not Listed	Not Listed	Threatened	Undetermined

Source: ACCDC 2013
[1]Government of Canada 2012; [2]NS *ESA* 2013; [3]COSEWIC 2012a; [4]NSDNR 2010

Field surveys were completed to characterize the pre-construction (baseline) bird community. Surveys were designed to capture changes in the diversity and abundance of bird species in the vicinity of the Project site (*i.e.,* the Project area) coinciding with such important events as breeding and migration. All field surveys were based on a previously developed methodology designed for wind projects, in consultation with officials from NSDNR and CWS, and in accordance with protocols outlined in the document "Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds" (CWS 2007).

Detailed results and methodologies for all bird surveys are provided in Appendix G.

Spring Migration Surveys – Project Site
Spring migration surveys at the Project site were conducted on April 29, May 5, and May 31, 2013, resulting in a total of 24 stopover count surveys, conducted at 8 locations (Drawing 8.7).

A total of 46 species, comprising 441 individual birds, were observed during spring migration surveys at the Project site (Tables G1/G2, Appendix G). White-throated Sparrow (*Zonotrichia albicollis*), American Robin (*Turdus migratorius*), Hermit Thrush (*Catharus guttatus*), and Yellow-rumped Warbler (*Dendroica coronata*) were the most abundant and frequently observed species.

Migrant passerines accounted for 63% of the species and 80.4% of the individual birds observed during spring migration surveys at the Project site. Overall, there were 18.37 ± 0.71 (mean ± 95% confidence interval) individual birds and 11.29 ± 1.14 species observed per survey event during the spring migration at the Project site.

Spring Migration Surveys – Control Site
Spring migration surveys were conducted in the lands surrounding the Project site on April 29, May 5, and May 31, 2013, resulting in a total of 12 stopover count surveys conducted at 4 locations (Drawing 8.7).

A total of 43 species, comprising 216 individual birds, were observed during spring migration surveys at the Control site locations (Tables G3/4, Appendix G). Palm Warbler (*Dendroica palmarum*), White-throated Sparrow (*Zonotrichia albicollis*), and Yellow-rumped Warbler (*Dendroica coronata*), were the most abundant and commonly observed species.

The spring bird community at the Control site was dominated by migrant passerines, accounting for 60.4% of the species and 76.4% of the individual birds observed. Overall, there were 18 ± 3.78 (mean ± 95% confidence interval) individual birds and 12.08 ± 2.57 species observed per survey location during spring migration surveys at the Control site.

82.6% of species observed during spring migration at the Project site were also observed at the Control site during this time. Species of note that were only observed at the Project site include Barred Owl (*Strix varia*), Gray Jay (*Perisoreus canadensis*), and Sharp-shinned Hawk (*Accipiter striatus*). A one-way ANOVA indicated no significant differences in the mean number of individual birds (F= 0.034, p= 0.853) or species (F= 0.254, p= 0.617) observed per survey location during the spring migration period at the Project site compared to the Control site.

Breeding Bird Surveys – Project Site
Eight point count locations on the Project site were surveyed on June 18 and again on June 25, 2013, representing a total of 16 separate survey events (Drawing 8.7). A total of 271 individual birds, representing 42 species, were observed during these point counts (Tables G5/6, Appendix G). Twenty-one of the observed species are considered probable breeders based upon the observance of breeding pairs and/or the establishment of permanent territories. Ovenbird (*Seiurus aurocapilla*), Black-and-white Warbler (*Mniotilta varia*), Red-eyed Vireo (*Vireo olivaceus*), and Black-throated Green Warbler (*Dendroica virens*) were the most abundant and frequently observed species during breeding bird surveys at the Project site.

Migrant passerines accounted for 64.2% of the species and 85.9% of the individual birds observed. Overall, there were 16.93 ± 2.50 (mean ± 95% confidence interval) individual birds and 12.5 ± 1.54 species observed per survey location during breeding surveys at the Project site.

Breeding Bird Surveys – Control Site
Six point count locations at the Control site were surveyed on June 18 and again on June 25, 2013, representing 12 separate survey events (Drawing 8.7). A total of 213 individual birds, representing 39 species, were observed during these point counts (Tables G7/8, Appendix G). Nineteen of the observed species are considered probable breeders based upon the observance of breeding pairs and/or the establishment of permanent territories. White-throated Sparrow, Black-throated Green Warbler (*Dendroica virens*), Ovenbird (*Seiurus aurocapilla*), and Magnolia Warbler were the most abundant and frequently observed species.

Migrant passerines accounted for 71.7% of the species and 86.8% of the individual birds observed. Overall, there were 17.75 ± 2.21 (mean ± 95% confidence interval) individual birds and 13 ± 1.29 species observed per survey location during breeding surveys at the Control site.

76.1% of the species observed during breeding bird surveys at the Project site were also observed at the Control site during that time. Species of note that were only observed at the Project site include American Woodcock (*Scolopax minor*), Canada Warbler (*Wilsonia canadensis*), Ruffed Grouse (*Bonasa umbellus*), and Yellow-throated Warbler (*Dendroica dominica*). A one-way ANOVA indicated no significant differences in the mean number of individual birds (F= 0.210, p= 0.650) or