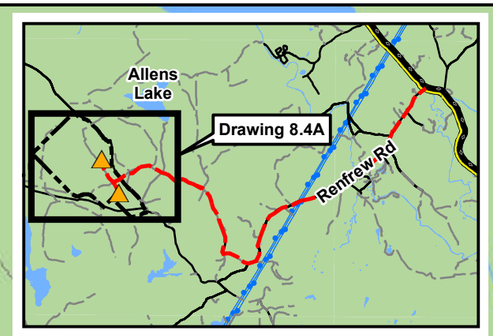
N



Wetland 1
1
Wetland 8
Wetland 7
Watercourse 2
Wetland 5
Wetland 6
Wetland 2
Watercourse 1
Wetland 4
2
Wetland 3
Listera australis

0 50 100 200 300 400 500 Metres

Notes:

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

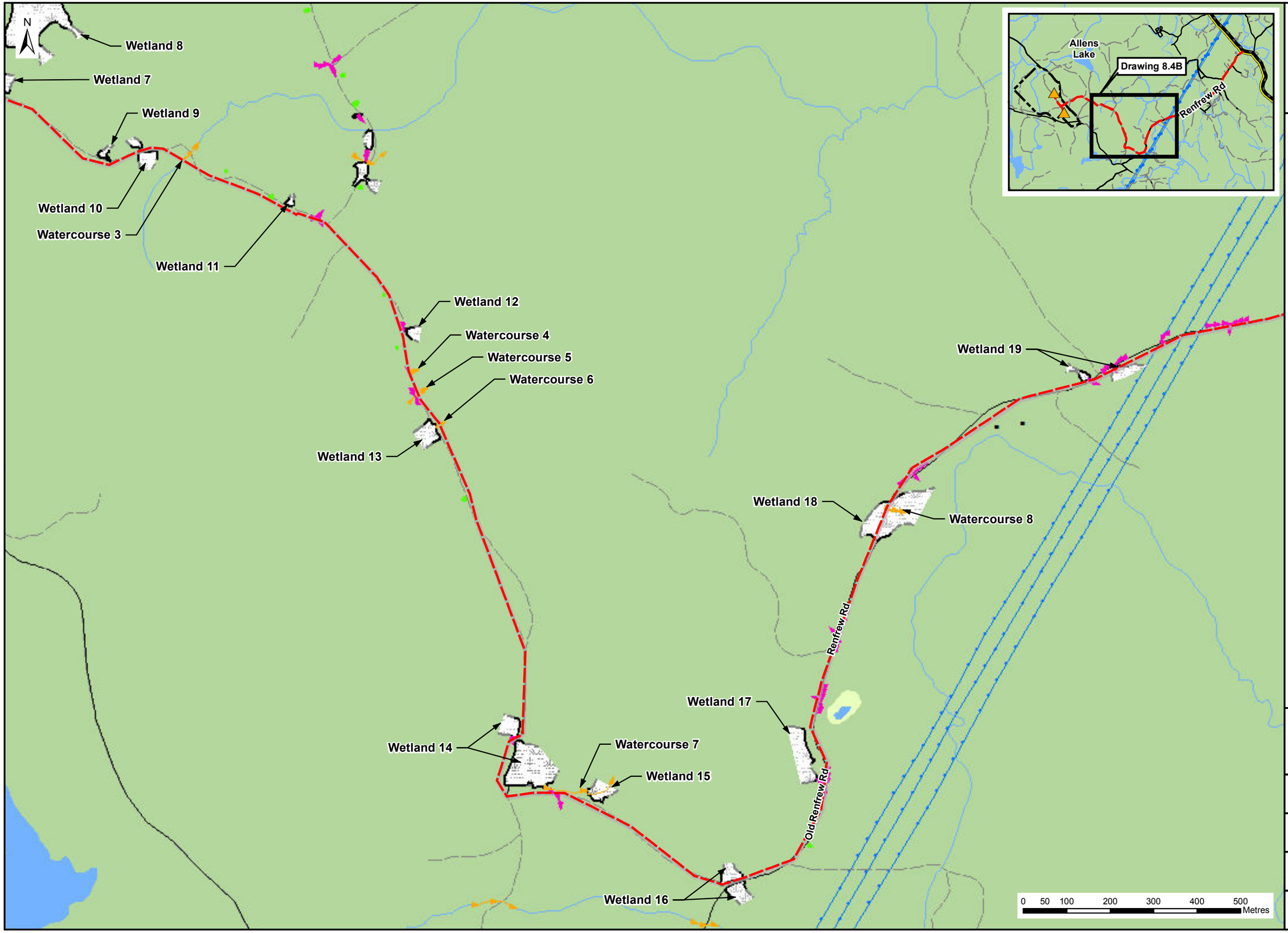
Legend:

- Proposed Turbine
- Rare Plant Location
- Proposed Access Road
- Disturbance Area
- Project Site Boundary
- Field Identified Watercourse
- Field Identified Drainage
- Confirmed Wetland Boundary
- Approximate Wetland Boundary
- Field Identified Wetland
- Field Identified Vernal Pool
- Roads
- Access Roads / Trails
- Mapped Stream
- Indefinite Stream
- Water Bodies

Wetland and Watercourse Assessment: Survey Results

Strum CONSULTING

Date: October 2013	Project #: 12-4550
Scale: 1:8000	Drawing #: **8.4A**
Drawn By: H. Serhan	
Checked By: M. Henley	



Notes:

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

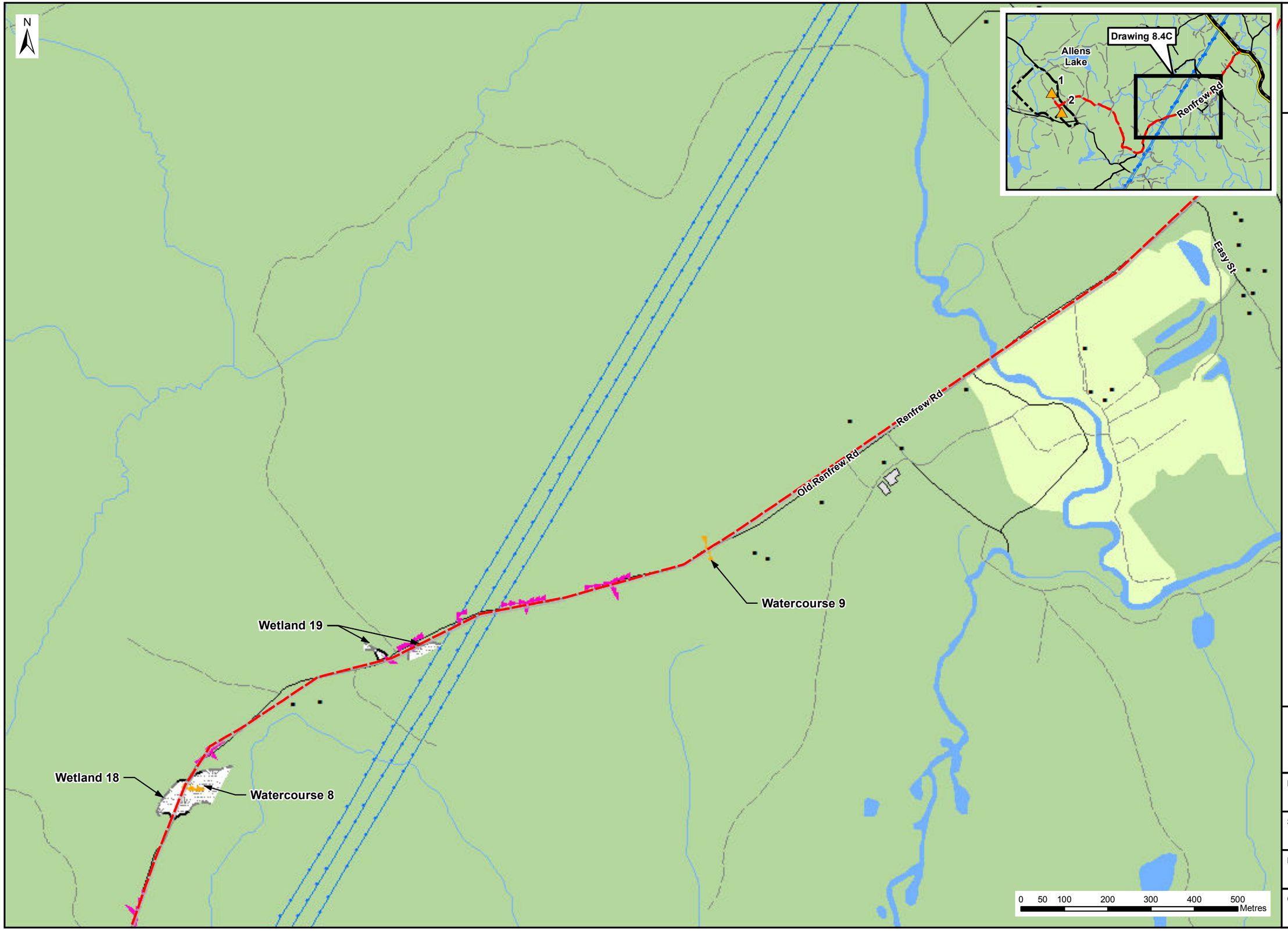
Legend:

- Proposed Turbine
- Proposed Access Road
- Field Identified Watercourse
- Field Identified Drainage
- Confirmed Wetland Boundary
- Approximate Wetland Boundary
- Disturbance Area
- Field Identified Wetland
- Field Identified Vernal Pool
- Building
- Roads
- Access Roads / Trails
- Existing Transmission Lines
- Mapped Stream
- Indefinite Stream
- Water Bodies
- Cleared Area

Wetland and Watercourse Assessment: Survey Results

Strum CONSULTING

Date: October 2013	Project #: 12-4550
Scale: 1:8000	Drawing #: **8.4B**
Drawn By: H. Serhan	
Checked By: M. Henley	



Notes:

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

Legend:

- Proposed Turbine
- Proposed Access Road
- Field Identified Watercourse
- Field Identified Drainage
- Confirmed Wetland Boundary
- Approximate Wetland Boundary
- Field Identified Wetland
- Field Identified Vernal Pool
- Disturbance Area
- Building
- Roads
- Access Roads / Trails
- Existing Transmission Lines
- Large Structure
- Mapped Stream
- Indefinite Stream
- Water Bodies
- Cleared Area

Wetland and Watercourse Assessment: Survey Results

Strum CONSULTING

Date: October 2013	Project #: 12-4550
Scale: 1:8000	Drawing #: *8.4C*
Drawn By: H. Serhan	
Checked By: M. Henley	

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 Old Renfrew Road 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 and in many cases will be improved, as old and often clogged or collapsed culverts will be repaired or replaced, as required.

No wetland alterations are expected in association with turbine pad locations. Turbine locations meet the NSE preferred wetland buffer distance of 30 m from the tip of blade, and where applicable, have incorporated the NSDNR preferred wetland buffer related to SOCI into the Project design.

A provincial wetland alteration permit will be sought for alteration locations 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.

8.5 Terrestrial Vegetation

ACCDC records indicate that 271 vascular flora species, 4 nonvascular flora species, and 24 lichens have been identified within 100 km of the Project site. Of the 299 species identified by ACCDC, 215 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 Appendix E.

Plant surveys were completed within and near the Project site on October 4, 2012 and June 13, 2013. A complete list of plant species identified during the surveys is provided in Appendix E.

One vascular plant SOCI, Southern Twayblade (*Listera australis*), was observed during the plant surveys, which is listed by NSDNR as “Red” (*i.e.*, at risk or potentially at risk). This species was identified approximately 336 m south of turbine # 2, within wetland 3 (Drawing 8.4A). As Project activities will not impact this species, plant SOCI are not addressed further in the EA.

8.5.1 Boreal Felt Lichen

ACCDC records indicate that 24 lichens, including 35 individual sightings of boreal felt lichen (*Erioderma pedicellatum*), occurred within 100 km of the Project site. The closest sighting of boreal felt lichen was recorded at 39 km +/- 10 km from the Project site. Geographical Information System (GIS) predictive mapping was reviewed to identify the potential for suitable boreal felt lichen habitat at the Project site. No mapped habitat was identified within the Project site boundaries. In addition, a targeted survey was conducted on October 5, 2013 by Chris Pepper, which revealed that there is

no suitable habitat for boreal felt lichen, largely due to the historical clearing that has occurred at 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 2012) 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 41 unique species and/or habitat records pertaining to terrestrial mammals within a 100 km radius of the Project site. These records include:

- Thirty-five records that are classified as "Deer Wintering", which relate to known over-wintering habitat for White-tailed deer (*Odocoileus virginianus*);
- Three records that are classified as 'Species of Concern", pertaining to Fisher (*Martes pennanti*) and Long-tailed shrew (*Sorex dispar*);
- Two records classified as "Other Habitat" for species such as American black bear (*Ursus americanus*) and American beaver (*Castor canadensis*); and
- One record classified in the database as "Species at Risk", relating to Southern flying squirrel (*Glaucomys volans*).

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

The ACCDC database (2012) indicates that five species of terrestrial mammals (excluding bats) have been recorded within a 100 km radius of the Project site (Table 8.5).

Table 8.5: 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]
Eastern Cougar	*Puma concolor*	Not Listed	Not Listed	Data Deficient	Undetermined
Fisher	*Martes pennant*	Not Listed	Not Listed	Not Listed	Yellow
Long-tailed shrew	*Sorex dispar*	Not Listed	Not Listed	Not Listed	Yellow
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 2012

[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 February 2012 and June 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, a snow-tracking survey was conducted for Mainland moose and other animal sign in January 2013 and a pellet count survey was completed for Mainland moose in May 2013. A detailed methodology for snow-tracking and pellet count surveys is provided in Appendix F.

Table 8.6 lists the mammal species observed/identified at or near the Project site during field studies.

Table 8.6: 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
Common shrew	*Sorex cinereus*	Not Listed	Not Listed	Not Listed	Green
Eastern cougar	*Puma concolor*	Not Listed	Not Listed	Data Deficient	Undetermined
Eastern coyote	*Canis latrans*	Not Listed	Not Listed	Not Listed	Green
Mainland moose	*Alces alces americanus*	Not Listed	Endangered	Not Listed	Red
Racoon	*Procyon lotor*	Not Listed	Not Listed	Not Listed	Green
Red squirrel	*Tamiasciursus hudsonicus*	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
Woodland jumping mouse	*Napaeozapus insignis*	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:

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

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 2000, representing 2% of the provincial total (NSDNR 2012d). ACCDC data indicate that the closest observation of this species to the Project site was 77 ± 10 km away.

No indication of Fisher was observed during field surveys. In addition, although small patches of mature forest are present, habitat at the Project site and in the general landscape is highly fragmented. Given the low density population in the vicinity of the Project site and the lack of forest interior habitat, it is highly unlikely that Fisher occurs at the Project site.

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

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).

Long-tailed shrew in Nova Scotia was thought to be found only in the Cobequid Mountains (Scott 1987; Woolaver *et al*. 1998), but more recent research has identified an additional population 60 km to the southwest, near Wolfville (Shafer and Stewart 2006). ACCDC data indicate that the closest observation of Long-tailed shrew to the Project site was 46 ± 10 km away.

No indication of Long-tailed shrew was observed during field studies. Furthermore, no talus slope habitat is present at the Project site. Considering that the range of this species in Nova Scotia does not coincide with the Project location and that suitable habitat is absent, it is highly unlikely that Long-tailed shrew occur at the Project site.

The Project is therefore not expected to have any impact on Long-tailed shrew 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 recent 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 located approximately 20 km to the northeast of the closest such area, which encompasses the greater Halifax area. ACCDC records, meanwhile, indicate that the closest observation of this species to the Project site was 54 ± 10 km away.

Evidence of Mainland moose was observed at the Project site during targeted pellet-group surveys conducted in May 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. In particular, a mature conifer stand in the Project site's northeastern extent may provide escape cover

and relief from deep snows and hot summer temperatures, while regenerating cutovers may provide suitable forage.

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).
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). ACCDC data indicate that the closest observation of this species to the Project site was 50 ± 10 km away.

No indication of Southern flying squirrel was observed during field studies. Furthermore, red oak was not identified at the Project site during intensive botany surveys, a finding which is supported by local habitat mapping. Indeed, mast producing hardwoods, including red oak and American beech, are rare at the Project site. Given that suitable habitat is absent and that the known geographic range of the species in Nova Scotia does not coincide with the Project location, it is highly 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 28 unique species and/or habitat records pertaining to reptiles and amphibians within a 100 km radius of the Project site. These records include:

- Twenty-six that are classified in the database as “Species at Risk”, all of which relate to Wood turtle (*Glyptemys insculpta*);
- One record classified as “Species of Concern”, which relates to Painted turtle (*Chrysemys picta*); and
- One records classified as “Other Habitat”, which related to Wood turtle.

There are two records pertaining to herpetofauna within a 10 km radius of the Project site; Miller Brook, which flows through the Project site, and an additional 4.09 km to the west in the headwaters of the Herbert River (Lagoon Brook).

Data from the ACCDC (2012) indicate that three species of herpetofauna have been recorded within a 100 km radius of the Project site (Table 8.7).

Table 8.7: 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]
Four-toed salamander	*Hemidactylium scutatum*	Not Listed	Not Listed	Not at Risk	Green
Snapping turtle	*Chelytra serpentine*	Special Concern	Vulnerable	Special Concern	Green
Wood turtle	*Glyptemys insculpta*	Threatened	Threatened	Threatened	Yellow

Source: ACCDC 2012

[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 February 2012 and June 2013. Species were either identified directly through visual observation, or indirectly using other evidence (*e.g.,* calls, egg masses, tadpoles, etc.). Table 8.8 lists the amphibian and reptile species identified at or near the Project site during field studies.

Table 8.8: Herpetofauna Species Recorded During Field Studies

Common Name	Scientific Name	*SARA* Status[1]	NS *ESA* Status[2]	COSEWIC Status[3]	NSDNR Status[4]
Northern leopard frog	*Lithobates pipiens*	Not Listed	Not Listed	Not at Risk	Green
Wood frog	*Lithobates sylvaticus*	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:

- Common snapping turtle – “Special Concern” (*SARA*), “Vulnerable” (NS *ESA*), “Special Concern” (COSEWIC);
- Wood turtle – “Threatened” (*SARA*), “Threatened” (NS *ESA*), “Threatened” (COSEWIC), “Yellow” (NSDNR).

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

Common snapping turtle
Common snapping turtle, despite its conservation status, is considered relatively common in mainland Nova Scotia (Davis and Browne 1996). Common snapping turtle habitat is usually associated with slow moving water of moderate depth, with a muddy bottom and dense vegetation. Established populations are typically found in ponds, lakes and river edges (COSEWIC 2008).

The species has a widespread distribution across mainland Nova Scotia, including in the greater Halifax area (COSEWIC 2008), and the closest record of Common snapping turtle within the ACCDC database is 7 ± 5 km away.

No indication of Common snapping turtle was observed during field studies. However, multiple watercourses at the Project site feature suitable habitat characteristics for this species, and beaver activity in at least one watercourse has led to the formation of open water features (*i.e.*, beaver

ponds). Due to its widespread distribution and the availability of suitable habitat, it is possible that the Common snapping turtle occurs 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.

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).

The species is found throughout the province but seems to be most abundant in central Nova Scotia, including within the Shubenacadie watershed (MacGregor and Elderkin 2003). ACCDC data indicate that the closest observation of this species to the Project site was 8 ± 10 km away, while the NS Significant Species and Habitats Database contains records of this species in Miller Brook, which flows through the Project site.

No indication of Wood turtle was observed during field studies. However, suitable watercourse and associated riparian habitat is present at the Project site and along the proposed access route to support Wood turtles throughout the annual cycle, particularly in Watercourse 3 which features a sandy substrate (Drawing 8.4A). Given that the species is concentrated in central Nova Scotia, and that suitable habitat is present, it is likely that the individual Wood turtle home ranges include part of 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.

8.6.3 Butterflies and *Odonates*

The Nova Scotia Significant Species and Habitats (NSDNR 2012c) database identifies five 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’, including Jutta arctic (*Oeneis jutta*) and Little bluet (*Enallagma minusculum*);
- One record classified as “Species at Risk”, relating to Ebony boghaunter (*Williamsonia fletcheri*); and
- One 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 58 unique taxa of butterfly and *Odonates* within a 100 km radius of the Project site (Table 8.9).

Table 8.9: 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]
Aphrodite fritillary	*Speyeria aphrodite*	Not Listed	Not Listed	Not Listed	Green
Arctic Fritillary	*Boloria chariclea*	Not Listed	Not Listed	Not Listed	Yellow
Baltimore checkerspot	*Euphydryas phaeton*	Not Listed	Not Listed	Not Listed	Green
Banded hairstreak	*Satyrium calanus*	Not Listed	Not Listed	Not Listed	Undetermined
Bog elfin	*Callophrys lanoraieensis*	Not Listed	Not Listed	Not Listed	Red
Bronze copper	*Lycaena hyllus*	Not Listed	Not Listed	Not Listed	Green
Brook snaketail	*Ophiogomphus aspersus*	Not Listed	Not Listed	Not Listed	Red
Clamp-tipped emerald	*Somatochlora tenebrosa*	Not Listed	Not Listed	Not Listed	Green
Common branded skipper	*Hesperia comma*	Not Listed	Not Listed	Not Listed	Green
Common roadside-skipper	*Amblyscirtes vialis*	Not Listed	Not Listed	Not Listed	Green
Compton tortoiseshell	*Nymphalis l-album*	Not Listed	Not Listed	Not Listed	Green
Delicate emerald	*Somatochlora franklini*	Not Listed	Not Listed	Not Listed	Yellow
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
Ebony boghaunter	*Williamsonia fletcheri*	Not Listed	Not Listed	Not Listed	Red
Elfin skimmer	*Nannothemis bella*	Not Listed	Not Listed	Not Listed	Green
Forcipate emerald	*Somatochlora forcipata*	Not Listed	Not Listed	Not Listed	Red
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
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
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
Lance-Tipped darner	*Aeshna constricta*	Not Listed	Not Listed	Not Listed	Green
Laurentian skipper	*Hesperia comma*	Not Listed	Not Listed	Not Listed	Green
Maine snaketail	*Ophiogomphus mainensis*	Not Listed	Not Listed	Not Listed	Red
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
Mustard white	*Pieris oleracea*	Not Listed	Not Listed	Not Listed	Yellow
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

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
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
Riffle snaketail	*Ophiogomphus carolus*	Not Listed	Not Listed	Not Listed	Green
Rusty snaketail	*Ophiogomphus rupinsulensis*	Not Listed	Not Listed	Not Listed	Red
Salt and pepper skipper	*Amblyscirtes hegon*	Not Listed	Not Listed	Not Listed	Green
Salt marsh copper	*Lycaena dospassosi*	Not Listed	Not Listed	Not Listed	Not Listed
Satyr comma	*Polygonia satyrus*	Not Listed	Not Listed	Not Listed	Yellow
Seaside dragonlet	*Erythrodiplax berenice*	Not Listed	Not Listed	Not Listed	Yellow
Skillet clubtail	*Gomphus ventricosus*	Not Listed	Not Listed	Not Listed	Red
Spot-winged glider	*Pantala hymenea*	Not Listed	Not Listed	Not Listed	Yellow
Striped hairstreak	*Satyrium liparops*	Not Listed	Not Listed	Not Listed	Undetermined
Taiga bluet	*Coenagrion resolutum*	Not Listed	Not Listed	Not Listed	Red
Vesper bluet	*Enallagma vesperum*	Not Listed	Not Listed	Not Listed	Yellow
Zebra clubtail	*Stylurus scudderi*	Not Listed	Not Listed	Not Listed	Red

Source: ACCDC 2012

[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 February 2012 and June 2013.

Priority butterfly and *Odonate* species include:

- Arctic fritillary – “Yellow” (NSDNR);
- Bog elfin – “Red” (NSDNR);
- Brook snaketail – “Red” (NSDNR);
- Delicate emerald – “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);
- Mustard white – “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);
- Spot-winged glider – "Yellow" (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 (Mersey Tobeatic Institute 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 cutover 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 mature softwood and mixed wood forest stands interspersed with cutover areas. 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 Cobequid Bay IBA located approximately 32 km northeast of the Project site. This IBA is classified as a globally significant site by IBA Canada due to high concentrations of congregatory species and shorebirds. In addition, a review of the Nova Scotia Significant Species and Habitat Database revealed several

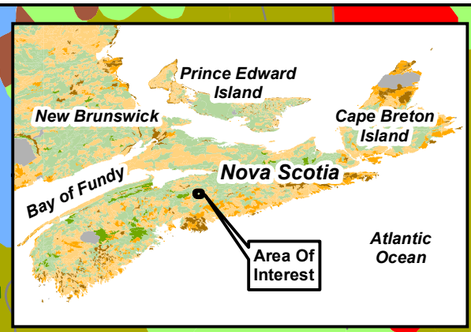
N

Old Renfrew Rd

Allens Lake

1

2



0 50 100 200 300 400 500 Metres

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 Site Boundary
- Roads
- Access Roads / Trails
- Water Bodies

Forested Land

- Softwood
- Mixedwood
- Hardwood

Non-Forested Land

- Unclassified Forest
- Brush
- Clear Cut
- Partial Cut-over
- Open Bog
- Treed Bog

Habitat Cover

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Date:	Project #:
October 2013	12-4550
Scale: 1:10,000	Drawing #: **8.5**
Drawn By: H. Serhan	
Checked By: M. Henley	

sightings of eagle nests within 20 km of the Project site. Locations were reported near Gay's River, Nix Brook, Lower Nine Mile River, Grand Lake, Black Brook, Beaver Brook, and the Shubenacadie River. Loon nesting was also recorded in the vicinity of Long Lake, Grand Lake, and Shubenacadie River.

The Project site is contained within map square 20MQ48 of the Maritime Breeding Bird Atlas (MBBA) (MBBA 2012). In the most recent edition of the MBBA (2006-2010), 82 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:

- Bank Swallow (*Riparia riparia*) – "Red" (NSDNR);
- Barn Swallow (*Hirundo rustica*) – "Endangered" (NS *ESA*), "Threatened" (COSEWIC), "Yellow" (NSDNR);
- Bay-breasted Warbler (*Dendroica castanea*) – "Yellow" (NSDNR);
- Bobolink (*Dolichonyx oryzivorus*) – "Vulnerable" (NS *ESA*), "Threatened" (COSEWIC), "Yellow" (NSDNR);
- Boreal Chickadee (*Poecile hudsonicus*) – "Yellow" (NSDNR);
- Canada Warbler (*Wilsonia canadensis*) – "Threatened" (*SARA*), "Endangered" (NS *ESA*), "Threatened" (COSEWIC), "Red" (NSDNR);
- Cliff Swallow (*Petrochelidon pyrrhonota*) – "Red" (NSDNR);
- Common Loon (*Gavia immer*) – "Red" (NSDNR);
- Eastern Kingbird (*Tyrannus tyrannus*) – "Yellow" (NSDNR);
- Eastern Wood-Pewee (*Contopus virens*) – "Vulnerable" (NS *ESA*), "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);
- Pine Grosbeak (*Pinicola enucleator*) – "Red" (NSDNR);
- Pine Siskin (*Spinus pinus*) – "Yellow" (NSDNR);
- Rose-breasted Grosbeak (*Pheucticus ludovicianus*) – "Yellow" (NSDNR);
- Ruby-crowned Kinglet (*Regulus calendula*) – "Yellow" (NSDNR);
- Spotted Sandpiper (*Actitis macularius*) – "Yellow" (NSDNR);
- Tennessee Warbler (*Vermivora peregrine*) – "Yellow" (NSDNR);
- Tree Swallow (*Tachycineta bicolor*) – "Yellow" (NSDNR);
- Wilson's Snipe (*Gallinago delicata*) – "Yellow" (NSDNR); and
- Yellow-bellied Flycatcher (*Empidonax flaviventris*) – "Yellow" (NSDNR).

The NS Significant Species and Habitats database contains 449 unique records pertaining to birds and/or bird habitat within a 100 km radius of the Project site. These records include:

- 190 classified in the database as "Other Habitat", of which the majority relate to Bald Eagle (*Haliaeetus leucocephalus*) (136) and Osprey (*Pandion haliaetus*) (39), but also including records of Great Blue Heron (*Ardea herodias*) (5) and Gray Partridge (*Perdix perdix*) (2), among others;

- 113 records classified as "Species of Concern", of which the majority relate to Common Loon (52), but also including records of unclassified Tern species (20), Common Tern (*Sterna hirundo*) (14), Northern Goshawk (*Accipiter gentilis*) (6), and Great Blue Heron (4), among others;
- 89 records classified as "Migratory Bird", including Double-crested Cormorant (*Phalacrocorax auritus*) (20), unclassified shorebirds (19), Great Blue Heron (15), American Black Duck (*Anas rubripes*) (9), and Common Eider (*Somateria mollissima*) (7), among others; and
- 57 records classified as "Species at Risk", primarily relating to Piping Plover (*Charadrius melodus*) (22), Peregrine Falcon (*Falco peregrinus*) (9), and Harlequin Duck (*Histrionicus histrionicus*) (4) but also including records of Roseate Tern (*Sterna dougallii*) (3) and Common Tern (3), among others.

Multiple significant habitat features related to birds are present within a 10 km radius of the Project site (Table 8.10).

Table 8.10. Significant Habitat Features Related to Birds within a 10km Radius of the Project Site

Species	Location	Distance to Project Site (km)	Direction
Common Loon	Grand Lake	8.99	S/SE
Common Loon	Long Lake	9.95	SW
Common Loon	Shubenacadie Grand Lake	7.44	SE
Bald Eagle	Nine Mile River	7.62	E
Bald Eagle	Long Lake	9.95	SW
Bald Eagle	Point adjacent to Miller's Cove	8.92	S/SE

Source: NSDNR 2012c

The ACCDC database contains records of 98 bird species within a 100 km radius of the Project site. Table 8.11 lists these species as well as their respective provincial and national conservation status ranks.

Table 8.11 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 Bittern	*Botaurus lentiginosus*	Not Listed	Not Listed	Not Listed	Yellow
American Coot	*Fulica americana*	Not Listed	Not Listed	Not at Risk	Undetermined
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
Baltimore Oriole	*Icterus galbula*	Not Listed	Not Listed	Not Listed	Red
Bank Swallow	*Riparia riparia*	Not Listed	Not Listed	Not Listed	Red
Barn Swallow	*Hirundo rustica*	No Status	Endangered	Threatened	Yellow
Barrow's Goldeneye - Eastern pop.	*Bucephala islandica*	Special Concern	Not Listed	Special Concern	Red
Bay-breasted Warbler	*Dendroica castanea*	Not Listed	Not Listed	Not Listed	Yellow
Bicknell's Thrush	*Catharus bicknelli*	Special Concern	Endangered	Threatened	Red
Black Guillemot	*Cepphus grylle*	Not Listed	Not Listed	Not Listed	Green

Common Name	Scientific Name	*SARA* Status[1]	NS *ESA* Status[2]	COSEWIC Status[3]	NSDNR Status[4]
Black Tern	*Chlidonias niger*	Not Listed	Not Listed	Not at Risk	Red
Black-backed Woodpecker	*Picoides arcticus*	Not Listed	Not Listed	Not Listed	Yellow
Black-billed Cuckoo	*Coccyzus erythropthalmus*	Not Listed	Not Listed	Not Listed	Red
Black-legged Kittiwake	*Rissa tridactyla*	Not Listed	Not Listed	Not Listed	Yellow
Blackpoll Warbler	*Dendroica striata*	Not Listed	Not Listed	Not Listed	Yellow
Blue-winged Teal	*Anas discors*	Not Listed	Not Listed	Not Listed	Red
Bobolink	*Dolichonyx oryzivorus*	No Status	Vulnerable	Threatened	Yellow
Boreal Chickadee	*Poecile hudsonicus*	Not Listed	Not Listed	Not Listed	Yellow
Boreal Owl	*Aegolius funereus*	Not Listed	Not Listed	Not at Risk	Undetermined
Brant	*Branta bernicla*	Not Listed	Not Listed	Not Listed	Yellow
Brown Thrasher	*Toxostoma rufum*	Not Listed	Not Listed	Not Listed	Undetermined
Brown-headed Cowbird	*Molothrus ater*	Not Listed	Not Listed	Not Listed	Green
Canada Warbler	*Wilsonia canadensis*	Threatened	Endangered	Threatened	Red
Cape May Warbler	*Dendroica tigrina*	Not Listed	Not Listed	Not Listed	Yellow
Chimney Swift	*Chaetura pelagica*	Threatened	Endangered	Threatened	Red
Cliff Swallow	*Petrochelidon pyrrhonota*	Not Listed	Not Listed	Not Listed	Red
Common Goldeneye	*Bucephala clangula*	Not Listed	Not Listed	Not Listed	Green
Common Loon	*Gavia immer*	Not Listed	Not Listed	Not at Risk	Red
Common Moorhen	*Gallinula chloropus*	Not Listed	Not Listed	Not Listed	Undetermined
Common Nighthawk	*Chordeiles minor*	Threatened	Threatened	Threatened	Red
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 Kingbird	*Tyrannus tyrannus*	Not Listed	Not Listed	Not Listed	Yellow
Eastern Meadowlark	*Sturnella magna*	No Status	Not Listed	Threatened	Yellow
Eastern Phoebe	*Sayornis phoebe*	Not Listed	Not Listed	Not Listed	Yellow
Eastern Wood-Pewee	*Contopus virens*	Not Listed	Vulnerable	Not Listed	Yellow
Fox Sparrow	*Passerella iliaca*	Not Listed	Not Listed	Not Listed	Green
Gadwall	*Anas strepera*	Not Listed	Not Listed	Not Listed	Red
Gray Catbird	*Dumetella carolinensis*	Not Listed	Not Listed	Not Listed	Red
Gray Jay	*Perisoreus canadensis*	Not Listed	Not Listed	Not Listed	Yellow
Great Cormorant	*Phalacrocorax carbo*	Not Listed	Not Listed	Not Listed	Yellow
Great Crested Flycatcher	*Myiarchus crinitus*	Not Listed	Not Listed	Not Listed	Red
Greater Yellowlegs	*Tringa melanoleuca*	Not Listed	Not Listed	Not Listed	Yellow
Harlequin Duck - Eastern pop.	*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
Killdeer	*Charadrius vociferus*	Not Listed	Not Listed	Not Listed	Yellow
Least Sandpiper	*Calidris minutilla*	Not Listed	Not Listed	Not Listed	Green
Long-eared Owl	*Asio otus*	Not Listed	Not Listed	Not Listed	Red
Marsh Wren	*Cistothorus palustris*	Not Listed	Not Listed	Not Listed	Undetermined
Northern Bobwhite	*Colinus virginianus*	Not Listed	Not Listed	Not Listed	No Status
Northern Cardinal	*Cardinalis cardinalis*	Not Listed	Not Listed	Not Listed	Green
Northern Gannet	*Morus bassanus*	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

Common Name	Scientific Name	*SARA* Status[1]	NS *ESA* Status[2]	COSEWIC Status[3]	NSDNR Status[4]
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 - anatum/tundrius	*Falco peregrinus*	Threatened	Vulnerable	Special Concern	Yellow
Philadelphia Vireo	*Vireo philadelphicus*	Not Listed	Not Listed	Not Listed	Undetermined
Pied-billed Grebe	*Podilymbus podiceps*	Not Listed	Not Listed	Not Listed	Yellow
Pine Grosbeak	*Pinicola enucleator*	Not Listed	Not Listed	Not Listed	Red
Pine Siskin	*Spinus pinus*	Not Listed	Not Listed	Not Listed	Yellow
Piping Plover melodus ssp.	*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 Knot rufa ssp	*Calidris canutus*	No Status	Endangered	Endangered	Red
Red Phalarope	*Phalaropus fulicarius*	Not Listed	Not Listed	Not Listed	Yellow
Red-breasted Merganser	*Mergus serrator*	Not Listed	Not Listed	Not Listed	Green
Redhead	*Aythya americana*	Not Listed	Not Listed	Not Listed	Green
Red-necked Phalarope	*Phalaropus lobatus*	Not Listed	Not Listed	Not Listed	Yellow
Ring-billed Gull	*Larus delawarensis*	Not Listed	Not Listed	Not Listed	Green
Roseate Tern	*Sterna dougallii*	Endangered	Endangered	Endangered	Red
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	Not Listed	Not Listed	Not Listed	Yellow
Rusty Blackbird	*Euphagus carolinus*	Special Concern	Endangered	Special Concern	Red
Savannah Sparrow princeps ssp.	*Passerculus sandwichensis*	Special Concern	Not Listed	Special Concern	Green
Scarlet Tanager	*Piranga olivacea*	Not Listed	Not Listed	Not Listed	Undetermined
Semipalmated Plover	*Charadrius semipalmatus*	Not Listed	Not Listed	Not Listed	Green
Semipalmated Sandpiper	*Calidris pusilla*	Not Listed	Not Listed	Not Listed	Yellow
Short-eared Owl	*Asio flammeus*	Special Concern	Not Listed	Special Concern	Red
Solitary Sandpiper	*Tringa solitaria*	Not Listed	Not Listed	Not Listed	Green
Spotted Sandpiper	*Actitis macularius*	Not Listed	Not Listed	Not Listed	Yellow
Tennessee Warbler	*Vermivora peregrina*	Not Listed	Not Listed	Not Listed	Yellow
Turkey Vulture	*Cathartes aura*	Not Listed	Not Listed	Not Listed	Yellow
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
Whip-Poor-Will	*Caprimulgus vociferus*	Threatened	Threatened	Threatened	Red
Willet	*Tringa semipalmata*	Not Listed	Not Listed	Not Listed	Red
Willow Flycatcher	*Empidonax traillii*	Not Listed	Not Listed	Not Listed	Yellow
Wilson's Snipe	*Gallinago delicata*	Not Listed	Not Listed	Not Listed	Yellow
Wilson's Warbler	*Wilsonia pusilla*	Not Listed	Not Listed	Not Listed	Yellow
Wood Thrush	*Hylocichla mustelina*	Not Listed	Not Listed	Not Listed	Undetermined
Yellow-bellied Flycatcher	*Empidonax flaviventris*	Not Listed	Not Listed	Not Listed	Yellow

Source: ACCDC 2012

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

Field surveys were completed to characterize the year round, pre-construction (baseline) bird community. Surveys were designed to capture changes in the diversity and abundance of bird species coinciding with such important events as breeding and migration. All field surveys were based on a previously developed methodology designed for COMFIT 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.

Winter Bird Survey
Eleven area searches were carried out at the Project site on February 14, 2013 (Drawing 8.7). A total of 15 species were identified during winter surveys, including 50 individual birds (Tables G1/2, Appendix G). Hairy Woodpecker (*Picoides villosus*), Black-capped Chickadee (*Parus atricapillus*), and Common Raven (*Corvus corax*) were the most abundant and frequently observed species.

Resident species, as opposed to winter visitors/nomadic species, accounted for 88% of all birds observed during the winter surveys.

Spring Migration Surveys
Spring migration surveys were conducted on April 27, May 15, and June 7, 2013 at the Project site, with a total of 34 stopover count surveys conducted at 12 locations (Drawing 8.7).

A total of 58 species, comprising 663 individual birds, were observed during spring migration surveys (Tables G3/4, Appendix G). White-throated Sparrow (*Zonotrichia albicollis*), Palm Warbler (*Dendroica palmarum*), and Hermit Thrush (*Catharus guttatus*) were the most abundant and frequently observed species.

The spring bird community was dominated by migrant passerines, which accounted for 74% of the species and 86% of the individual birds observed.

Breeding Bird Surveys
Eleven point count locations at the Project site were surveyed on June 19 and again on June 27, 2013, (Drawing 8.7). A total of 409 individual birds, representing 50 species, were observed during these point counts (Tables G5/6, Appendix G). Twenty-nine of the observed species are considered probable breeders based upon the observance of breeding pairs and/or the establishment of permanent territories, and three species are confirmed breeders based upon the presence of nests and/or fledged young. White-throated Sparrow, Common Yellowthroat (*Geothlypis trichas*), and Magnolia Warbler (*Dendroica magnolia*) were the most abundant species observed during these surveys, while Alder Flycatcher (*Empidonax alnorum*), Black-and-White Warbler (*Mniotilta varia*), Blue-headed Vireo (*Vireo solitaries*), Nashville Warbler (*Vermivora ruficapilla*) and Palm Warbler were also commonly observed.

Fall Migration Surveys
Thirty-five stopover count surveys were conducted at 17 locations at the Project site during site visits on November 4, 2012 and September 10 and October 5, 2013 (Drawing 8.7). A total of 45 species,

N

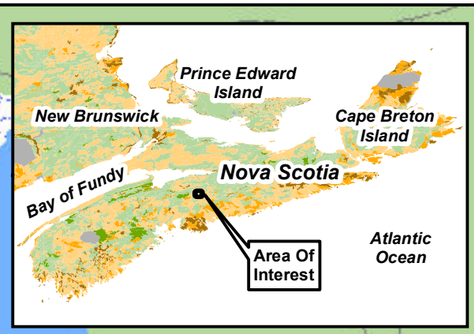
Old Renfrew Rd

Miller Brook

Allens Lake

Storys Lake

NMR8
NMR14
NMR9
NMR15
NMR7
NMR16
1
NMR5
NMR1
NMR2
NMR13
2
NMR3
NMR10
NMR4
NMR11
NMR12



0 100 200 400 600 800 1,000 Metres

Notes:

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

Legend:

- Bird Survey Locations
- Bat Detector Location
- Proposed Turbine Location
- Proposed Access Road
- Project Site Boundary
- Roads
- Access Roads / Trails
- Existing Transmission Lines
- Mapped Stream
- Indefinite Stream
- Water Bodies
- Mapped Wet Area

Bird Survey and Bat Detector Locations

Strum CONSULTING

Date: October 2013	Project #: 12-4550
Scale: 1:12,500	Drawing #: **8.7**
Drawn By: G. Gregory	
Checked By: M. Henley	

consisting of 352 individual birds, were recorded (Tables G7/8, Appendix G). Black-capped Chickadee, Golden-crowned Kinglet (*Regulus satrapa*), and Common Raven were the most abundant and frequently observed species.

Fall migrants, including both neotropical and short-distance migrants, accounted for 60% of the species and 41% of the individual birds observed during these surveys.

Bird Survey Summary

The Project site is situated in a landscape featuring mature softwood and mixed wood stands, interspersed with cutovers of varying age and freshwater lakes. A high degree of fragmentation has resulted in large areas of transitional/edge habitat which can support a relatively dense bird population, although in such instances diversity can be limited.

The bird community at the Project site reflects both the habitat character and inland location.

As is the case in much of Nova Scotia, the winter bird community at the Project site is limited in terms of diversity and abundance. Resident species were dominant, accounting for 86% of the individuals observed. The intact forest stands appear to support a rather dense woodpecker community, which may suggest that individuals have concentrated in these areas as a result of habitat fragmentation. Pileated Woodpecker and Barred Owl (*Strix varia*) are indicative of mature forest conditions. Winter visitors were relatively few at the Project site, highlighted by the presence of just one Common Redpoll (*Acanthis flammea*). This species varies widely in its winter abundance in the province, and was observed in large numbers throughout the province in the winter of 2012/2013. The general absence of this species from the site is therefore curious, but may reflect the limited mature white birch (*Betula papyrifera*) habitat and the distance to supplemental food sources such as feeders.

The arrival of spring migrants at the Project site occurred in pulses consistent with patterns observed throughout the region. By late-April, the typical early migrants, including American Robin, Northern Flicker (*Colaptes auratus*), White-throated Sparrow, Hermit Thrush, Palm Warbler, and Yellow-bellied Sapsucker (*Sphyrapicus varius*), were present in reasonable numbers.

The main migrant pulse, including most of the wood warblers, reached the Project area by mid-May, although survey results suggest warbler abundance is lower than expected. The Project site does provide habitat for limited numbers of those migrants frequenting open-type/shrubby habitats, such as Common Yellowthroat, Yellow-rumped Warbler, and Magnolia Warbler, with greater numbers of Palm Warblers. Similarly, common forest species such as Black-throated Green Warbler (*Dendroica virens*), Northern Parula (*Parula americana*), Ovenbird (*Seiurus aurocapilla*), Black-and-white Warbler (*Mniotilta varia*) and American Redstart (*Setophaga ruticilla*), were present in relatively low but consistent numbers. Other warbler species, such as Chestnut-sided Warbler (*Dendroica pensylvanica*), were observed in numbers lower than the prevalence of edge habitat would otherwise suggest.

Small numbers of waterfowl/waterbirds, including American Black Duck (*Anas rubripes*), Mallard (*Anas platyrhynchos*), Wood Duck (*Aix sponsa*), and Common Loon, were observed during spring

migration surveys, and it is likely that individuals move between a series of freshwater lakes on the landscape. While it is possible that these local flyways may encompass the Project site, no significant migratory movements of waterfowl were observed in the vicinity of the Project site.

Over 74% of those species observed during spring migration surveys were also observed during the breeding season, which suggests that the majority of species using the Project area as stop-over habitat during migration remain to establish breeding territories. The Project site supports a diverse and abundant breeding bird community, likely due to the diversity of habitat types available. Regenerating cutovers, roadside shrubs, and open wetlands provide habitat for early-succession associated species, such as Palm Warbler, Common Yellowthroat, Magnolia Warbler, Alder Flycatcher, and White-throated Sparrow. This guild is the dominant feature of the breeding bird community at the Project site. Intact mid-aged to mature softwood and mixed wood stands, meanwhile, provide breeding habitat for those species requiring a more established forest structure, such as Black-throated Green Warbler, Ovenbird (*Seiurus aurocapilla*), and Blue-headed Vireo (*Vireo solitarius*). These forest species breed at the site in much less abundance than those of shrubby habitats, due to the limited availability of intact stands at the site. However, the presence of Pileated Woodpecker (*Dryocopus pileatus*) and Barred Owl (*Strix varia*) suggests that trees of adequate size, as well as standing deadwood, are present in intact stands to support a reasonably vibrant cavity nesting community which also includes small to moderate densities of Black-capped Chickadee, Brown Creeper, Chimney Swift, and common woodpecker species.

The Project site supports a relatively diverse breeding aerial insectivore community. This guild has been the victim of marked population level declines in recent decades, and includes several SOCI such as Olive-sided Flycatcher and Eastern Wood-Pewee. The presence these species is indicative of forest habitats interspersed with freshwater wetlands, habitat features which are abundant on the landscape. These wetlands, particularly softwood swamps, are also frequented by such species as Gray Jay and Swamp Sparrow (*Melospiza georgiana*).

The fall bird community in the Project area was characterized by typical flocks of migrant passerines and resident species. The prevalence of shrub habitat in regenerating cutovers accounts for the multitude of small to medium-sized mixed flocks of wood warblers, travelling with Black-capped Chickadees, in mid-September. Despite advantageous conditions for migration the previous night, including clear skies and a gentle to moderate north wind, surveys in early October revealed that most migrant warblers, with the exception of small numbers of Palm Warblers, Yellow-rumped Warblers, and Blackpoll Warblers, had already passed through the Project site. Sparrows, including White-throated Sparrow, Song Sparrow, and Dark-eyed Junco, increased in abundance in early October, indicative of the typical migrant pulse of sparrows through Nova Scotia in this month. The Project site appears to be attractive to Golden-crowned Kinglets arriving from breeding grounds to the north, as an influx of this species was observed as the fall season progressed.

The Project site also appears to be situated within a local flyway for Common Ravens in the fall, as upwards of 16 individuals were observed flying over the site shortly after dawn, likely en route to foraging grounds off-site. Although targeted surveys were not conducted, evidence of raptor migration at the Project site was limited to a single observation of a Sharp-shinned Hawk (*Accipiter striatus*) flying over the site.

It should be noted that the late fall survey (November) was conducted in the year prior to the remainder of the fall surveys, which may introduce a bias due to between year variation. For instance, relatively low abundances of birds in November may have been an artefact of the sampling year, although results in terms of abundance and diversity were not outside of the expected range for this time of year.

Overall, there were 70 different bird species identified at the Project site during surveys conducted throughout the year, including 12 SOCI (Table 8.12, Drawings 8.8A-D).

Table 8.12: Bird SOCI identified at the Project Site

Common Name	Scientific Name	SARA Status	NSESA Status	COSEWIC Status	NSDNR Status	Season(s) Observed
Blackpoll Warbler	*Dendroica striata*	Not Listed	Not Listed	Not Listed	Yellow	Fall
Canada Warbler	*Wilsonia canadensis*	Threatened	Endangered	Threatened	Red	Spring, Breeding
Chimney Swift	*Chaetura pelagica*	Threatened	Endangered	Threatened	Red	Breeding
Common Loon	*Gavia immer*	Not Listed	Not Listed	Not at Risk	Red	Spring, Breeding, Fall
Common Snipe	*Gallinaga gallinaga*	Not Listed	Not Listed	Not Listed	Yellow	Spring
Eastern Wood-Pewee	*Contopus virens*	Not Listed	Vulnerable	Special Concern	Yellow	Spring, Breeding
Golden-crowned Kinglet	*Regulus satrapa*	Not Listed	Not Listed	Not Listed	Yellow	Winter, Spring, Breeding, Fall
Gray Jay	*Perisoreus canadensis*	Not Listed	Not Listed	Not Listed	Yellow	Winter, Breeding, Fall
Olive-sided Flycatcher	*Contopus cooperi*	Threatened	Threatened	Threatened	Red	Spring, Breeding
Pine Grosbeak	*Pinicola enucleator*	Not Listed	Not Listed	Not Listed	Red	Fall
Ruby-crowned Kinglet	*Regulus calendula*	Not Listed	Not Listed	Not Listed	Yellow	Spring
Yellow-bellied Flycatcher	*Empidonax flaviventris*	Not Listed	Not Listed	Not Listed	Yellow	Spring, Breeding

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

Of the SOCI listed in Table 8.12, the following four species are listed under either *SARA* or NS *ESA*:

- Canada Warbler;
- Chimney Swift;
- Eastern Wood-Pewee; and
- Olive-sided Flycatcher.

The likelihood of these species to be impacted by the Project is evaluated below.

N

Old Renfrew Rd

Miller Brook

Allens Lake

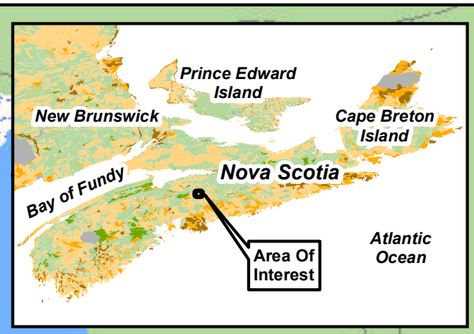
Storys Lake

1

2

Golden-crowned Kinglet

Gray Jay



0 100 200 400 600 800 1,000 Metres

Notes:

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

Legend:

- Winter Priority Bird Species Locations
- Proposed Turbine Location
- Proposed Access Road
- Project Site Boundary
- Roads
- Access Roads / Trails
- Mapped Stream
- Indefinite Stream
- Water Bodies
- Mapped Wet Area

Winter Priority Bird Species Locations

Strum CONSULTING

Date: October 2013	Project #: 12-4550
Scale: 1:12,500	Drawing #: ***8.8a***
Drawn By: G. Gregory	
Checked By: M. Henley	

N

Old Renfrew Rd

Miller Brook

Allens Lake

Storys Lake

Ruby-crowned Kinglet

Eastern Wood-Pewee
Golden-crowned Kinglet

1

Golden-crowned Kinglet
Olive-sided Flycatcher

Canada Warbler
Ruby-crowned Kinglet

Canada Warbler
Common Loon
Ruby-crowned Kinglet
Wilson's Snipe
Yellow-bellied Flycatcher

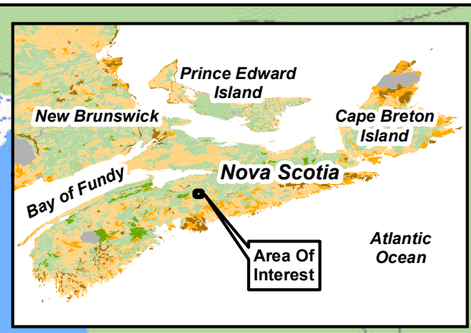
Ruby-crowned Kinglet

2

Canada Warbler

Golden-crowned Kinglet
Yellow-bellied Flycatcher

Canada Warbler
Common Loon
Golden-crowned Kinglet
Yellow-bellied Flycatcher



0 100 200 400 600 800 1,000 Metres

Notes:

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

Legend:

- Spring Priority Bird Species Locations
- Proposed Turbine Location
- Proposed Access Road
- Project Site Boundary
- Roads
- Access Roads / Trails
- Mapped Stream
- Indefinite Stream
- Water Bodies
- Mapped Wet Area

Spring Priority Bird Species Locations

Strum CONSULTING

Date: October 2013	Project #: 12-4550
Scale: 1:12,500	Drawing #: **8.8b**
Drawn By: G. Gregory	
Checked By: M. Henley	

N

Old Renfrew Rd

Miller Brook

Allens Lake

Storys Lake

Eastern Wood-Pewee
Olive-sided Flycatcher

Chimney Swift

Eastern Wood-Pewee

1

Common Loon
Olive-sided Flycatcher

Canada Warbler
Golden-crowned Kinglet

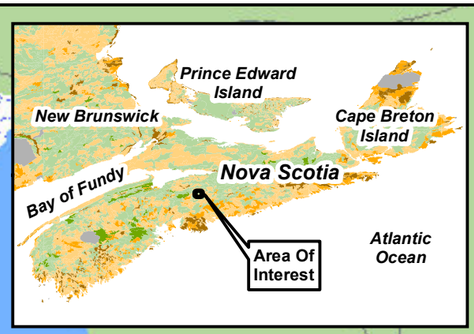
2

Canada Warbler
Yellow-bellied Flycatcher

Golden-crowned Kinglet
Yellow-bellied Flycatcher

Olive-sided Flycatcher

Canada Warbler
Common Loon
Golden-crowned Kinglet
Gray Jay
Yellow-bellied Flycatcher



0 100 200 400 600 800 1,000 Metres

Notes:

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

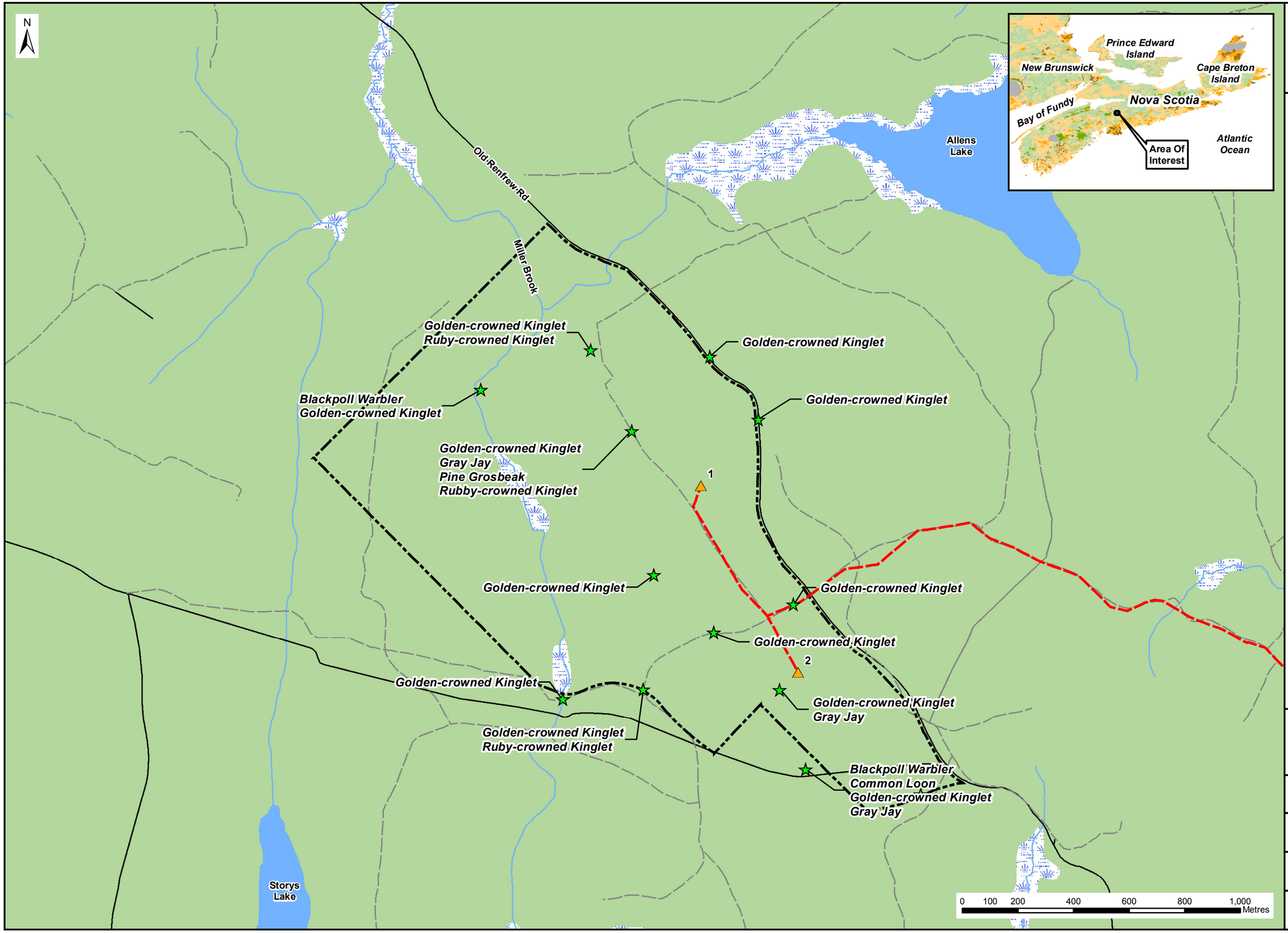
Legend:

- Breeding Priority Species Locations
- Proposed Turbine Location
- Proposed Access Road
- Project Site Boundary
- Roads
- Access Roads / Trails
- Mapped Stream
- Indefinite Stream
- Water Bodies
- Mapped Wet Area

Breeding Priority Bird Species Locations

Strum CONSULTING

Date: October 2013	Project #: 12-4550
Scale: 1:12,500	Drawing #: 8.8c
Drawn By: G. Gregory	
Checked By: M. Henley	



Notes:

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

Legend:

- Project Site Boundary
- Proposed Turbine Location
- Proposed Access Road
- Fall Priority Bird Species Locations
- Roads
- Access Roads / Trails
- Mapped Stream
- Indefinite Stream
- Water Bodies
- Mapped Wet Area

Fall Priority Bird Species Locations

Strum CONSULTING

Date: October 2013	Project #: 12-4550
Scale: 1:12,500	Drawing #: 8.8d
Drawn By: G. Gregory	
Checked By: M. Henley	

Canada Warbler

The Canada Warbler uses a wide range of forest types that have a well-developed shrub layer and a structurally-complex forest floor (COSEWIC 2008b). In Nova Scotia, highest breeding densities are achieved in poorly drained areas such as treed and shrub swamps (BAMP 2013). Such wetland habitats are abundant at the Project site, although both proposed turbine locations are currently located greater than 120 m from the nearest field identified wetland.

Eleven male Canada Warblers (representing a minimum of 5 individuals) were detected during surveys completed on June 7, 19, and 27, 2013. Individuals were observed singing at four sites in young mixed wood (1 individual), treed swamp (3 individuals), and shrub bog (1 individual). Four of these males were observed singing more than 1 week apart in breeding habitat and are therefore considered to be "probable" breeders (*i.e*., "Territory" status, Maritimes Breeding Bird Atlas; MBBA 2012). The closest Canada Warbler observation to a proposed turbine location was 334 m to the northwest of Turbine 2.

Based on the distance between Canada Warbler observations and the proposed turbine locations, as well as the maintenance of a buffer around all field identified wetlands, it is unlikely that Project activities will adversely affect the Canada Warbler.

Chimney Swift

Chimney Swift use large hollow trees and chimneys in areas of high insect abundance, such as near lakes and wetlands, for nesting and roosting (MTRI 2008). Mature forest stands, potentially featuring trees of sufficient diameter to be used as nesting habitat, are present towards the northern extent of the Project site and along a mapped watercourse to the west of the proposed turbine locations.

One Chimney Swift was observed during the breeding season on June 19, 2013 foraging above a stream within mature softwood habitat. Although unconfirmed, it is possible that this individual found suitable nesting habitat within a large tree within the mature forest stand, and as such was considered a "Possible" breeder (MBBA 2012). This observation was 865 m from nearest proposed turbine, and Project infrastructure will not encroach on the mature forest stand. Research does not suggest that this species is particularly susceptible to wind energy developments, as predicted annual mortality of Chimney Swifts in Canada resulting from these operations is just 70 individuals, or less than 0.03% of the population (Zimmerling *et al*. 2013). It is therefore highly unlikely that Project activities will adversely affect the Chimney Swift.

Eastern Wood-Pewee

The Eastern Wood-Pewee is a forest insectivore exhibiting a wide range of habitat use but generally found in deciduous forests in areas of lower canopy cover (*e.g*., near forest clearings and edges) (McCarty 1996). Forest stands of varying successional stage are present at the Project site and commercial forestry operations have resulted in an abundance of edge habitat.

Three Eastern Wood-Pewees were detected at the Project site during surveys on June 7, 19, and 27, 2013. Individuals were heard vocalizing at three sites featuring distinct habitat types, including mature softwood, mature mixed wood, and cutover/clearing. All three singing males were considered just "Possible" breeders (males singing in breeding habitat; MBBA 2012), since they

were not observed at the same location on subsequent surveys. The closest Eastern Wood-Pewee observation to a proposed turbine location was 317 m northwest of Turbine 1.

Considering that Project activities, including access road construction, will not encroach on forested habitats to the north and west of the proposed turbine pad locations, it is unlikely that the Project will negatively impact the Eastern Wood-Pewee.

Olive-sided Flycatcher
The Olive-sided Flycatcher favors early, post-fire landscapes or clearings and coniferous forest edges and openings like meadows, rivers, bogs, swamps and ponds (MTRI 2008). Habitats at the Project site are diverse and include swamp, bog, and edge/transition from softwood stands to regenerating cutover, suggesting that suitable habitat is present for this species, including in the vicinity of the proposed turbines.

Five observations of the Olive-sided Flycatchers (representing a minimum of 4 individuals) were noted at four locations during surveys conducted on June 7, 19, and 27, 2013. Habitat types at these locations included mature softwood, young mixed wood, treed swamp within a cutover area, and regenerating cutover, reflecting the broad range of habitat preferences for this species. In most cases (80%), observed Olive-sided Flycatchers were considered “Possible” breeders at the site based upon the presence of singing males in suitable habitat during the breeding season (MBBA 2012). At one location, however, a breeding territory was assumed based on the continued presence of a singing male on subsequent surveys at least a week apart, providing evidence of “Probable” breeding (MBBA 2012). This probable breeding territory is located 629 m to the northwest of Turbine 1, while the closest observation of this species in breeding season to a proposed turbine location was 364 m to the southwest of Turbine 1.

Should undetected Olive-sided Flycatcher breeding territories also exist along the edges of softwood stands near the proposed turbine locations, the prevalence of this habitat type at the Project site and in the general area should ensure that alternative breeding habitat is available. Considering that all observations of the species were greater than 300 m from proposed turbine locations, and that potential breeding habitat in wetlands will not be disturbed, it is unlikely that Project activities will adversely affect the Olive-sided Flycatcher.

The requirements as set out in the *MBCA* will be adhered to for Project activities. Additional general mitigation measures for Project-related effects to avifauna are provided in Section 4.0. Additional mitigation for avifauna is provided in Section 13.2.2.

8.8 Bats
The Nova Scotia Significant Species and Habitats database (NSDNR 2012c) indicates eighteen 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 (*Myotis lucifugus*) (13) or bat hibernacula (5). 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 16 known hibernacula within a 100 km radius of the Project site (Table 8.13).

Table 8.13 Known Bat Hibernacula within 100 km of the Project site

Hibernaculum	Distance to Project Site (km)	Direction
Centre Rawdon Gold Mine	10.46	NW
Cave of the Bats	15.46	E
Woodville Ice Cave	22.11	W
Gayes River Gold Mine	23.92	E
Hayes Cave	24.59	NNE
Black Brook	26.47	ENE
Frenchman's Cave	29.08	WSW
Minasville Ice Cave	29.54	NNW
Miller's Creek Cave	29.93	W
Peddlar's Tunnel	30.53	WNW
Walton Barite Mine	34.08	WNW
Cheverie Cave	42.55	NW
Lear Shaft	50.00	N
Lake Charlotte Gold Mine	57.63	SE
New Laing Adit #1 and #2	80.69	NE
The Ovens	90.81	SW
McLellan's Brook Cave	98.43	NE

Source: Moseley (2007)

The closest known bat hibernaculum, Centre Rawdon Gold Mine, is considered a significant site, historically supporting upwards of 650 hibernating bats (Moseley 2007). This site is also used as a swarming site by Little brown myotis, Northern long-eared myotis (*Myotis septentrionalis*), and Tri-colored bat (*Perimyotis subflavus*) during late summer (Randall 2011).

The largest known hibernaculum in Nova Scotia is Hayes Cave, located in South Maitland approximately 24.59 km to the northeast (Moseley 2007). Up to 6,000 bats enter this cave in September and reside until June (Davis and Browne 1996), although preliminary results from 2012 suggest that white-nose syndrome has reduced the hibernating population to approximately 250 individuals (M. Elderkin, personal communication).

Table 8.14 presents bat species recorded within a 100 km radius of the Project site, according to ACCDC.

Table 8.14 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
Little brown myotis	*Myotis lucifugus*	Not Listed	Endangered	Endangered	Yellow
Northern long-eared myotis	*Myotis septentrionalis*	Not Listed	Endangered	Endangered	Yellow
Tri-colored bat	*Perimyotis subflavus*	Not Listed	Endangered	Endangered	Yellow

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

The Little brown myotis, Northern long-eared myotis, and Tri-colored bat were added to the NS *ESA* list and declared endangered on July 11, 2013. A 90% population decline over the past two years has been attributed to white-nose syndrome; a disease caused by the fungus *Geomyces destructans* (NS *ESA* 2013). The disease has killed nearly 7 million bats in eastern North America in the past 8 years. White-nose syndrome is lethal and affects all bat species that congregate in caves and abandoned mines used for hibernation through the winter (NS *ESA* 2013).

Field surveys of bat migration/habitat use were carried out from August 23 to September 29, 2013 using an AnaBat SD2 Detector (Titley Electronics, Columbia, Missouri). Since insectivorous bats are known to utilise edge habitats during foraging (Furlonger *et al*. 1986), the detector was deployed along the edge of a regenerating cutover and an intact, mid-aged softwood stand, approximately 62.5 m south of Turbine 1 and 703 m northwest of Turbine 2 (Drawing 8.7).

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), so these calls were not identified to species.

8.8.1 Results

In total, 154 files were recorded, of which only nine were determined to be bat generated ultrasound. The remaining files detected were determined to be extraneous noise likely caused by wind gusts, precipitation, and/or equipment malfunction. Most of the "noisy files" (120 of 154 files) originated on the nights of September 4, 11, 12, 13 and 22nd. Hourly weather data collected at Halifax Stanfield International Airport for these dates indicate that recorded extraneous noise coincided with precipitation events (Environment Canada 2013). Precipitation could explain recorded extraneous noise detected on these particular nights. Rustling vegetation and wind gusts can also cause extraneous noise.

All echolocation calls were recorded between August 27th and September 15th. Four of the detected calls were attributable to *Myotis* species bats, while two calls attributable to Hoary bat (*Lasiurus cinereus*) and one call attributable to Eastern red bat (*Lasiurus borealis*) were also detected. Both species are migratory and were likely passing through the Project site, otherwise a higher level of detected activity would be expected. Two additional bat calls were not able to be identified to species level. No particular pattern of bat activity was recorded over the survey period, with little or no activity detected on most nights. No bat activity was detected beyond September 15th.

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

The Little brown myotis is the most common species in Nova Scotia, and is probably ubiquitous in the province (Broders *et al*. 2003). 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 hibernates from September to early or mid-May in abandoned mines or caves (Fenton and Barclay 1980; Mosely 2007).

Although ACCDC records indicate the closest observation of Little brown myotis to be 60 ±10 km from the Project site, it likely that some of the echolocation calls recorded during field studies were emitted by Little brown myotis.

The Northern long-eared myotis, although once considered uncommon throughout Nova Scotia (Moseley 2007), is likely ubiquitous in the forested regions of the province (Broders *et al*. 2003). This species is widely distributed in the eastern United States and Canada, and is commonly encountered during swarming and hibernation (Caceres and Barclay 2000). 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).

ACCDC data indicates that the closest Northern long-eared myotis sighting to the Project site was 36 ±10 km away; however, it is likely that some of the echolocation calls recorded during field studies were emitted by Northern long-eared myotis.

Tri-colored bat, formerly known as the Eastern pipistrelle, is frequently observed in Nova Scotia, but has a restricted distribution focused in the interior of the southwest region of the province (Farrow and Broders 2011). Research conducted at Kejimkujik National Park found Tri-colored bats 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). The species occurs throughout most of

eastern North America, with Nova Scotia representing the northeastern extent of its range (Fujita and Kunz 1984).

Tri-colored bats require clumps of *Usnea* lichen for roosting; a habitat feature typically associated with mature spruce and balsam fir trees (Farrow 2007). This association suggests that the species may be negatively impacted by intensive forestry practices that remove roosting habitat (Farrow 2007). A few isolated stands of mature softwood forest dominated by red spruce are still present throughout the central and southern areas of the Project site (Drawing 8.5), yet mature balsam fir trees were conspicuously absent. Much of the Project site in the area of the proposed turbine locations has been cut-over in the past 5 to 10 years.

The species typically forages over water bodies, but also feeds over tree canopies (reviewed by Quinn and Broders 2007) and it appears that, unlike the Little brown myotis, Tri-colored bats stay active throughout the night, possibly as a means to reduce intraspecific competition (Broders *et al.* 2003). 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).

Tri-colored bat has been recorded at Hayes Cave, less than 25 km from the Project site and ACCDC data indicates that the closest observation of this species to the Project site was 26 km away. Although Tri-colored bat was not detected during field studies, it is possible that this species occurs at the Project site, either during the breeding season or during late-summer movements to hibernacula.

Potential effects of the Project on bats, as well as proposed mitigation measures, are discussed in more detail in Section 13.2.3.

9.0 SOCIO-ECONOMIC ENVIRONMENT

9.1 Local Demographics and Industry

The area surrounding the Project site is sparsely populated by the small communities of Upper Rawdon and Upper Nine Mile River, within the Municipality of the County of East Hants. The largest towns in the Municipality include Enfield (pop. 5,016), Elmsdale (pop. 3,034), and Lantz (pop. 3,326) (Statistics Canada 2012). The nearest communities to the Project site are Renfrew (3.6 km), Upper Rawdon (6.0 km), and Upper Nine Mile River (6.4 km).

9.1.1 Demography

Population statistics for East Hants from the 2011 census are summarized in Table 9.1.

Table 9.1 Population in East Hants

Population Statistics	East Hants
Population in 2011	22,111
Population in 2006	21,397
Population change from 2006-2011 (%)	3.3
Total private dwellings in 2011	9,396
Land area (square km)	1,786
Population density per square kilometer	12.4

Source: Statistics Canada 2011

The age distribution in East Hants reveals a median age of 40.0 years, which is similar to the provincial median age (41.8), and HRM (39.0) (Statistics Canada 2006). A breakdown of age distribution in East Hants is outlined in Table 9.2 below.

Table 9.2: Age Distribution in East Hants

Age Statistics	East Hants
0 - 14 years	4,060 (19.0%)
15 - 64 years	14,910 (69.7%)
65+ years	2,425 (11.3%)
Total Population	**21,395 (100%)**

Source: Statistics Canada 2006

East Hants average housing cost is $156,288, slightly less 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). East Hants exceeds 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
East Hants	$156,288	$37,575
Province of Nova Scotia	**$158,000**	**$36,917**

Source: Statistics Canada 2006

9.1.2 Health Care and Emergency Services

The Nine Mile River Volunteer Fire Department is located approximately 9 km east of the Project site on Elmsdale Road. The Gore District Volunteer Fire Department is also located nearby, approximately 12 km northwest of the Project site.

Health services in the region are provided by the Colchester East Hants Health Authority which offers a wide range of services through the Municipality of East Hants' Lloyd E. Matheson Centre in Elmsdale, in addition to the Colchester Regional Hospital in Truro. Health and emergency services exist in the area and are accessible to Project workers if the need should arise.

9.1.3 Industry and Employment

Employment and unemployment rates for February 2012 in the Annapolis Valley (includes Hants County) Economic Region indicate that the unemployment rate was 10.8%, which is higher than the provincial average of 8.5% (Statistics Canada 2012). With regard to employment rates, the Annapolis Valley employment rate of 52.3% was found to be lower than the provincial rate of 57.6% (Statistics Canada 2012).

A breakdown of the labour force within East Hants is provided in Table 9.4. The highest proportion of workers in East Hants fall into the "other services" category (18.9%). While Statistics Canada does not specifically list tourism as an industry, it likely falls under the "other services" heading. Other significant industries include retail trade, business services, construction and manufacturing (Statistics Canada 2006).

Table 9.4: Labour Force by Industry in East Hants

Industry	Total East Hants
Total experienced labour force 15 years +	11,600
Other services	2,195
Business services	2,125
Retail trade	1,325
Construction	1,245
Manufacturing	1,170
Health care and social services	965
Agricultural and other resource-based industries	855
Educational services	635
Wholesale trade	565
Finance and real estate	515

Source: Statistics Canada 2006

A review of businesses located within 7 km of the Project site is provided in Table 9.5.

Table 9.5: Local Businesses and Proximity to Project Site

Business	Distance and direction to Project site*
Riverland Campground	4.2 km northeast of Project Site, on C.P. Thompson Road
Renfrew Camping	5.0 km east of Project Site, on Renfrew Road
Bull Meadow Range Complex	6.9 km southwest of the Project Site, on Highway 354
Classic Meat Packers	6.4 km north of Project Site, on Highway 14

*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 and increased revenue for the Municipality of East Hants.

It is estimated that the Project will result in approximately $12.2 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 Scotia companies for the delivery of equipment and construction materials, as well as professional development, construction and operational services.

Job Creation
Elements of job creation throughout 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 and biological survey services, archaeological services, land and community relations services, website development, and many others. As this 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, however it is known that dozens of professionals within Nova Scotia will render their services as part of the development of the Project.
- Construction - Though the construction phase of the Project is relatively short, it will require significant manpower for realization. Much of the construction employment will come through contracting and subcontracting of Nova Scotia construction firms. This will likely include significant elements of civil and electrical construction. During the construction phase, it is estimated that 30 people will be temporarily employed by 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. 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 this Project will be one of several projects which share long-term operations and maintenance teams to ensure project performance. The jobs associated with operations and maintenance are long-term, steady, stable, and high-paying jobs

In addition to the direct investments that the Project would bring to Nova Scotia's economy, a suit of auxiliary economic benefits can also be expected. It has previously been demonstrated that investments in wind power developments can result in significant indirect ancillary benefits to local

communities. Workers that are directly involved with the development would contribute to local economies by redistributing wealth to a variety of goods and services such as hotels, restaurants, and grocery stores (USDE 2008).

Tax Revenue
As outlined in the *Wind Turbine Facilities Municipal Taxation Act* (2006), the Municipality of East Hants will receive tax revenues per MW on an annual basis and as such, the royalty will annually increase as the Consumer Price Index rises. Property taxes to be paid to the municipality over the lifespan of the Project are estimated at $589,000.

Investment in the Local Community
Through a Community Dividend, the proponent is committed to sharing the economic benefits of the Project with the surrounding community. The Project will direct 1% of the annual gross revenues to a local community liaison committee that will decide how it can be used for the betterment of the community. It is estimated that over the lifetime of the Project the Community Dividend will invest more than $300,000 in the local community.

9.2 Land Use and Value

The property on which the proposed wind farm is to be built is "Resource Forest" land owned by Elmsdale Lumber Company Ltd. All properties within 1.2 km of the proposed turbine locations are owned by Elmsdale Lumber Company Ltd. (Service NS 2013).

Potential effects on property values is often a 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.

Prior to 2013, the most comprehensive study on the impact of wind farms on property values had been completed by Hoen *et al.* (2009). This research analyzed data on nearly 7,500 sales of single family homes situated within 10 miles (16 km) 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 (Carter 2011).

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.

Until very recently, the primary limitation of previous research on the effects of wind energy facilities on surrounding home values has been that research has been based on relatively small sample sizes (data sets) of relevant home-sale data. The inability to account for the complexity of the various factors which affect property values has also been cited as a limitation to previous studies. In particular, data had been limited for homes located within about a half mile (800 m) of turbines, where impacts would be expected to be the largest: Hinman (2010) (n~11); Carter (2011) (n~41). This is in part due to the fact that setback requirements generally result in wind facilities being sited in areas with relatively few houses, limiting the number of sales transactions available to be analyzed (Hoen *et al.* 2013). Although these smaller datasets are adequate to examine large impacts (*e.g*., over 10%), they are less likely to reveal small effects with any reasonable degree of statistical significance.

A recent study published in August 2013 by Berkeley National Laboratory (principal authors) was conducted to address these gaps in data, and included the largest home-sale data set to date. Researchers collected data from 51,276 home sales spanning 27 counties in nine states, related to 67 different wind facilities (Hoen *et al*. 2013). These homes were within 10 miles of 67 different wind facilities, and 1,198 of the sales analyzed were within 1 mile (1.6 km) of a turbine, giving a much larger data set than previous studies have collected. The data span the periods well before announcement of the wind facilities to well after their construction (Hoen *et al.* 2013).

Two types of models were employed during the study to estimate property-value impacts: (1) an ordinary least squares (OLS) model, which is standard for this type of study, and (2) a spatial-process model, which accounts for spatial variability. These models allow the researchers to control for home values before the announcement of a wind facility (as well as the post-announcement, pre-construction period), the spatial dependence of unobserved factors effecting home values, and value changes over time. A series of robustness models was also employed to add an additional level of confidence to the study results.

Regardless of model specification, the results of the study revealed no statistical evidence that home values near turbines were affected in the post-construction or post-announcement/pre-construction periods. Therefore, the authors conclude that if effects do exist, either the average impacts are relatively small (within the margin of error in the models) and/or sporadic (impacting only a small subset of homes) (Hoen *et al*. 2013).

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 vicinity of the Project site includes hunting, fishing, ATV-ing, golfing, camping and hiking. Rawdon Gold Mines Variety and Campground, Riverland Campground and Renfrew Camping are all located within 10 km of the Project site. Adjacent to Renfrew Camping is a 9 hole, par 3 golf course situated on 25 acres of land. For hiking, the Nine Mile River Trails is located off of Enfield Road approximately 8.4 km southeast of the Project site. Elmsdale is home to the Fundy ATVenturers Club (ATV Association of NS 2012).

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 nearest communities to the Project site examined were Elmsdale and Mount Uniacke in the Halifax Regional Municipality Region and South Rawdon in Fundy Shore and Annapolis Valley Region. Table 9.6 below shows the total trips (people who stopped for at least 30 minutes or stayed overnight) that were made to these communities 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 (%)
Fundy Shore and Annapolis Valley	**37%**	
South Rawdon	0%	1%
Halifax Regional Municipality	**79%**	
Elmsdale	2%	2%
Mount Uniacke	2%	2%

Source: NSDERDT 2011

The data shows tourism in South Rawdon, Elmsdale and Mount Uniacke is not a major economic driver.

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

The turbines will consist of a small footprint on privately owned land. Therefore, no impacts are expected to the broader recreational community.

10.0 CULTURAL AND HERITAGE RESOURCES

10.1 Archeological Resource Impact Assessment

Davis MacIntyre and 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.

Archaeological reconnaissance's were conducted in September 2012 and again in December 2012 as changes to the road and turbine layout were made. The only archaeologically-significant features encountered were the remains of a 19th century homestead (house, barn and pit) on the south side of Old Renfrew Road southeast of Three Cornered Lake (Davis MacIntyre and Associates Ltd. 2013). The site has been recorded in the Maritime Archaeological Resource Inventory, and is therefore protected under provincial legislation. Given the current Project layout, it is not expected that the site will be impacted by construction. The ARIA was forwarded to the NS Department of Communities, Culture and Heritage. The response letter is provided in Appendix H, confirming that no significant archaeological material will be disturbed by the Project.

11.0 OTHER CONSIDERATIONS

11.1 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 (*i.e.*, 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.

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 receptor locations (*e.g.*, dwellings, cottages/camps, hospitals, schools, and daycares). These guidelines were developed in Germany to prevent excessive annoyance to neighbours of wind energy developments and are now included under that country's *Federal Emission Control Act* (as cited in Haugen 2011).

Shadow flicker can be mitigated by siting wind turbines at sufficient distance from residences likely to be affected. Flicker effects have been reported to occur only within ten rotor diameters of a turbine (Office of the Deputy Prime Minister 2004). A Land Use Planning for Wind Energy document was developed by EDS Consulting for Manitoba in 2009. The report suggests that at 500 m and more, shadow flickers occurs only at sunrise and sunset and at distances exceeding 900 m shadow flicker is considered to be insignificant (EDS 2009). Based on a conservative approach, with a blade diameter of 100 m, the potential shadow flicker effect could be felt up to 1,000 m from a turbine.

Desktop resources and site reconnaissance was used to develop a list of potential shadow flicker receptors. No structures were identified within 1 km of a proposed turbine location.

Due to the distance between Project infrastructure and potential receptors, no adverse impacts to residential receptors are expected.

11.2 Electromagnetic Interference

The rotating blades and support structures of wind turbines can interfere with various types of electromagnetic signals emitted from telecommunication and radar systems (RABC and CanWEA 2012). In response to this phenomenon, the Radio Advisory Board of Canada 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.

Consultation with relevant agencies was completed and results are provided in Table 11.1.

Table 11.1: Radar, Navigation and Communications Consultation Results

Signal Source	Operator	Required/ Suggested Consultation Zone Radius	Consultation Results
Air defense and air control radar systems	DND	100 km	No objections or concerns.

Signal Source	Operator	Required/ Suggested Consultation Zone Radius	Consultation Results
DND Radio Communications	DND	n/a	No objections or concerns.
Maritime vessel traffic system radars	Canadian Coast Guard	60 km	No objections or concerns.
VHF omnidirectional range	Nav Canada	15 km	No objections or concerns.
Primary air traffic control surveillance radar		80 km (primary surveillance) 10 km (secondary surveillance)	
Weather radar	EC	50 km	No objections or concerns.

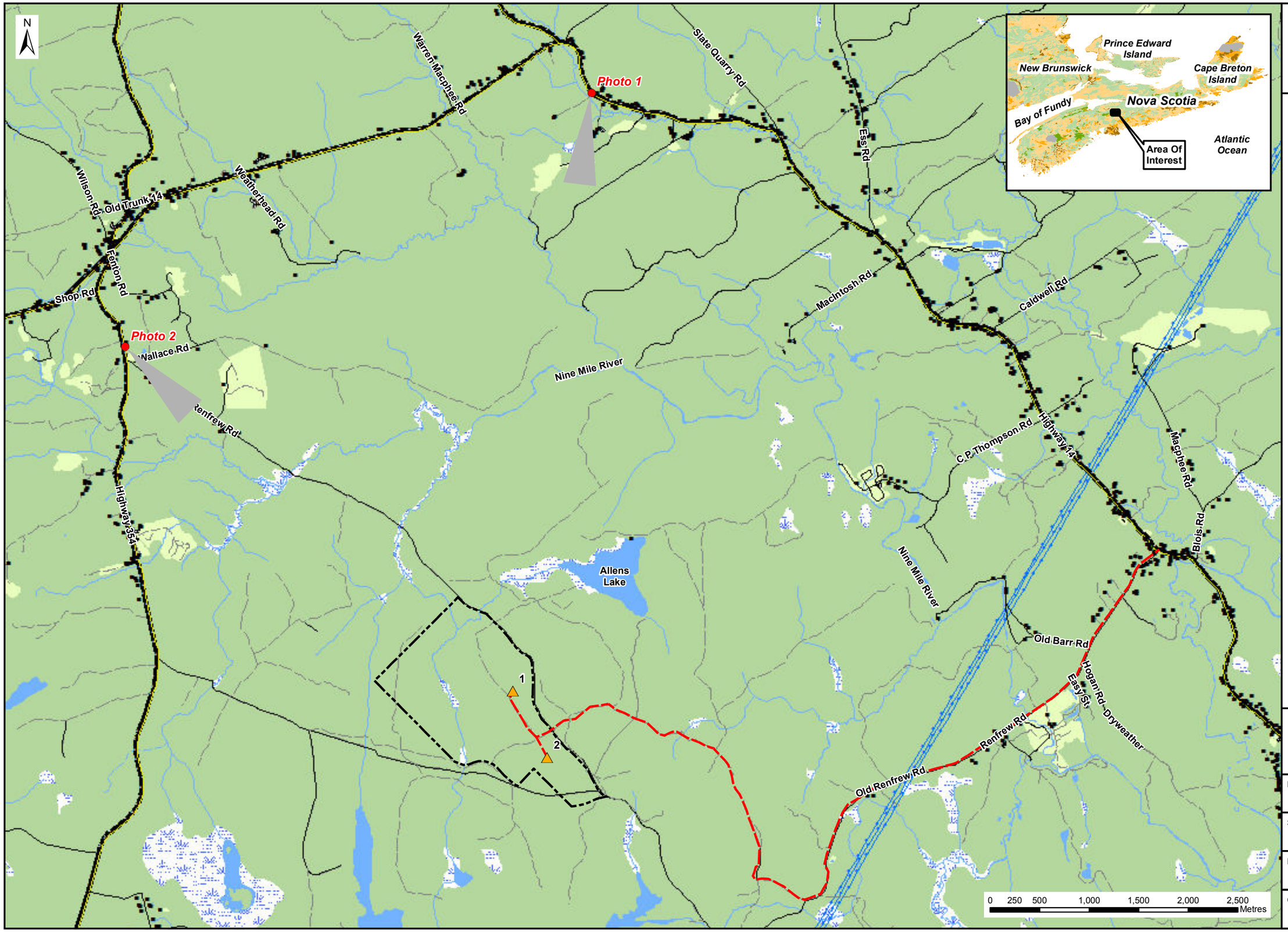
Aeronautical obstruction clearance was also obtained from Transport Canada and is provided in Appendix I, along with relevant correspondence from the above operators. Additional consultation will be required if any modifications are made to the Project design.

11.3 Visual Impacts

Predicted View Plane
To assess the potential impact on visual aesthetics in the local area, representative photos were taken from vantage points within the community to complete a Visual Impact Assessment.

Photographs were collected around the Project Area from distances of approximately 5.2 to 6.4 km from the nearest proposed turbine location. GIS software was used to plot the photo locations and construct bearing lines to assist in the construction of a 3D model. Views captured in the photographs were recreated in the 3D model, and .jpeg files were exported. Digital photographs were overlaid on the model renderings, aligned by matching the dominant ridge line. Proposed turbine locations and specifics regarding the height of the turbines were used to position and model the proposed turbines. Simulated wind turbines were added to the digital photographs consistent with the location and scale represented in the 3D renderings

Photos taken from two locations are shown in Drawing 11.1. Simulated results are provided in Figures 11.1-11.2.



Notes:

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

Legend:

- Photo Locations
- Proposed Turbine
- Proposed Access Road
- 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

Visual Assessment Locations

Strum CONSULTING

Date: October 2013	Project #: 12-4550
Scale: 1:35,000	Drawing #: **11.1**
Drawn By: H. Serhan	
Checked By: M. Henley	

Figure 11.1: View looking south from Highway 14 near the intersection with Indian Road.

Figure 11.2: View looking southeast from the parking lot of the NSTIR building at 3448 Highway 354.

Effects to the visual landscape are considered minimal to non-existent due to the size and location of the wind farm and setback distances from residences.