Appendix F

Vascular Plant Study

Atlantic Canada Conservation Data Centre
Centre de données sur la conservation du Canada Atlantique

A vascular plant inventory of the Greenfield COMFIT site, Colchester County, Nova Scotia, with notes on breeding birds

Pin Cherry (*Prunus pensylvanica*) dominated regenerating clearcut at proposed turbine site G01.

October 22, 2013

Conducted by Sean Blaney,
Atlantic Canada Conservation Data Centre

for RMSenergy Ltd.

Methods

AC CDC botanist Sean Blaney conducted three hours of fieldwork on foot at the Greenfield Community Feed-in Tariff (COMFIT) project site in Colchester County, Nova Scotia on June 27, 2013, walking 4.14 km. GPS tracks of site coverage are mapped in Figure 1. Site planning was in an early stage, with turbine sites and road locations not yet finalized, so Reuben Burge and Lisa Fulton of RMS Energy accompanied Sean Blaney to direct field survey toward the areas most suited to final turbine and road construction. Independent biologist Ross Hall was also with the group and contributed to the bird and plant species lists.

I documented full lists of vascular plant and bird species observed while on site with locations documented for the first observation of each species. For provincially rare species (those ranked S3S4 or lower by AC CDC, see Appendix 1), I recorded location by GPS and noted abundance, extent of occurrence and habitat. Breeding evidence for birds was recorded using the categories of the Maritimes Breeding Bird Atlas. I also documented plant communities present within the turbine construction footprints.

Results and Discussion

I. Vascular Plant Species

I recorded 137 vascular plant taxa (111 native, 26 exotic; Table 1), only one of which was of conservation significance: Meadow Willow (*Salix petiolaris*, S3 – Secure; see Appendix 1 for definitions) was present (a single shrub) in a seepy forest opening along a small streambed (details in Table 3).

Meadow Willow is a marginally rare species in Nova Scotia, which was overlooked by early botanists but is now known from Queens County to southern Cape Breton Island. It is likely increasing in abundance and possibly distribution in response to forestry because it tends to do well in disturbed roadside ditches. The species is not considered rare in New Brunswick.

Further visits to the site would yield additional species to those recorded, but the list developed is likely fairly complete. Based on the nature and condition of the plant communities present, it is not likely that many additional provincially rare plant species would be found in the project footprint.

II. Breeding Birds

I recorded 22 species of breeding birds (Table 2) through incidental observations during plant fieldwork. Earlier morning surveys focused on breeding birds would undoubtedly record a significant number of additional species.

Five bird species were of conservation significance (Table 3), all of which are still fairly common in Nova Scotia but of concern because of major population declines. Canada Warbler is Endangered, and Bobolink and Eastern Wood-Pewee are Vulnerable under the Nova Scotia

Endangered Species Act. A presumed nesting Canada Warbler was within or very near to potential construction impacts of Turbine G03. At least two pairs of Bobolinks were present in hayfield and pasture along the access road leading to the project area, and one presumed nesting Eastern Wood-Pewee was present in mature Sugar Maple forest through which an access road might be built.

Killdeer (S3S4B – Sensitive), Ruby-crowned Kinglet (S4 – Sensitive) and Pine Siskin (S3S4B, S5N – Sensitive) are of conservation concern but lack any legal status. Pine Siskin was heard overhead and may not have been nesting within the area. It was recorded at the same location as the Canada Warbler and if nesting nearby could be affected by construction impacts of Turbine G03. Killdeer was observed with four flightless young in the open pasture along the access road leading to the site. A single Ruby-crowned Kinglet was singing and potentially nesting in young black spruce plantation which could be affected by access road construction to turbine G03.

III. Plant Communities

Notes on plant communities at the proposed turbine construction sites are given in Table 4 and photographs of the proposed turbine sites are given in Figures 2 to 4. None of the plant communities documented within the turbine or road construction footprints are considered provincially rare (AC CDC data, S. Blaney, pers. obs.). Almost all the proposed project footprint is within forest that is under 25 years old, or has been cut recently enough that it is not accurately classified as forest at present. Much of the area around proposed turbine sites G01 and G02 is in the process of conversion from young forest to open cattle pasture. Most of the forest to the south of the farm property is young black spruce plantation.

The only forest community within the potential project footprint in more mature condition is a small Sugar Maple-dominated stand in the western end of the project footprint (see the location where the Eastern Wood-Pewee was noted in Figure 1). The main access road into the turbine construction area may be put through this stand. Moving the road so that it follows the outside of the forest stand, as is the case with the existing access trail would reduce impacts on the forest.

The pasture and hayfield through which the main access road runs provides good habitat for Bobolink, Killdeer and likely other declining meadow-associated bird species. Minimizing the footprint of required road upgrades would help to ensure that this area continues to support declining field birds.

Table 1. Vascular plants recorded in the Greenfield COMFIT project footprint, with Nova Scotia S-ranks and General Status (GS) ranks (defined in Appendix 1). Taxonomy follows Kartesz (1999) – *Synthesis of the North American Flora*, CD-ROM.

Species / Family	Common Name	S-rank	GS Rank	ID Notes
Equisetaceae	**Horsetail Family**			
Equisetum arvense	Field Horsetail	S5	Secure	
Osmundaceae	**Flowering Fern Family**			
Osmunda cinnamomea	Cinnamon Fern	S5	Secure	
Osmunda claytoniana	Interrupted Fern	S5	Secure	
Dennstaedtiaceae	**Bracken Fern Family**			
Dennstaedtia punctilobula	Eastern Hay-Scented Fern	S5	Secure	
Thelypteridaceae	**Marsh-Fern Family**			
Thelypteris noveboracensis	New York Fern	S5	Secure	
Dryopteridaceae	**Wood-Fern Family**			
Athyrium filix-femina ssp. angustum	Common Lady Fern	S5	Secure	
Dryopteris campyloptera	Mountain Wood Fern	S5	Secure	
Dryopteris carthusiana	Spinulose Wood Fern	S5	Secure	
Dryopteris intermedia	Evergreen Wood Fern	S5	Secure	
Pinaceae	**Pine Family**			
Abies balsamea	Balsam Fir	S5	Secure	
Picea mariana	Black Spruce	S5	Secure	
Ranunculaceae	**Buttercup Family**			
Coptis trifolia	Goldthread	S5	Secure	
Ranunculus acris	Common Buttercup	SNA	Exotic	
Ranunculus repens	Creeping Buttercup	SNA	Exotic	
Betulaceae	**Birch Family**			
Alnus incana ssp. rugosa	Speckled Alder	S5	Secure	
Betula alleghaniensis	Yellow Birch	S5	Secure	
Betula papyrifera var. papyrifera	Heart-leaved Birch	S5	Secure	
Betula populifolia	Gray Birch	S5	Secure	
Caryophyllaceae	**Pink Family**			
Cerastium fontanum ssp. vulgare	Common Chickweed	SNA	Exotic	
Polygonaceae	**Smartweed Family**			
Polygonum cilinode	Fringed Black Bindweed	S5	Secure	
Polygonum hydropiper	Marshpepper Smartweed	SNA	Exotic	
Polygonum sagittatum	Arrow-leaved Smartweed	S5	Secure	
Rumex acetosella	Sheep Sorrel	SNA	Exotic	
Clusiaceae	**St. John's-wort Family**			
Hypericum canadense	Canada St John's-wort	S5	Secure	
Violaceae	**Violet Family**			
Viola macloskeyi ssp. pallens	Small White Violet	S5	Secure	
Salicaceae	**Willow Family**			
Populus grandidentata	Large-toothed Aspen	S5	Secure	
Populus tremuloides	Trembling Aspen	S5	Secure	
Salix bebbiana	Bebb's Willow	S5	Secure	
Salix humilis	Upland Willow	S5	Secure	
Salix lucida	Shining Willow	S5	Secure	
Salix petiolaris	Meadow Willow	S3	Secure	
Salix pyrifolia	Balsam Willow	S5	Secure	
Ericaceae	**Heath Family**			
Gaultheria hispidula	Creeping Snowberry	S5	Secure	
Kalmia angustifolia	Sheep Laurel	S5	Secure	
Vaccinium angustifolium	Late Lowbush Blueberry	S5	Secure	

Species / Family	Common Name	S-rank	GS Rank	ID Notes
Primulaceae	**Primrose Family**			
Trientalis borealis	Northern Starflower	S5	Secure	
Grossulariaceae	**Currant Family**			
Ribes glandulosum	Skunk Currant	S5	Secure	
Saxifragaceae	**Saxifrage Family**			
Chrysosplenium americanum	American Golden Saxifrage	S5	Secure	
Rosaceae	**Rose Family**			
Fragaria virginiana	Wild Strawberry	S5	Secure	
Geum macrophyllum	Large-Leaved Avens	S5	Secure	
Geum rivale	Water Avens	S5	Secure	
Potentilla simplex	Old Field Cinquefoil	S5	Secure	
Prunus pensylvanica	Pin Cherry	S5	Secure	
Rubus allegheniensis	Alleghany Blackberry	S5	Secure	
Rubus canadensis	Smooth Blackberry	S5	Secure	ID refers to sp. in the broad sense
Rubus idaeus ssp. strigosus	Red Raspberry	S5	Secure	
Rubus pubescens	Dwarf Red Raspberry	S5	Secure	
Spiraea tomentosa	Steeplebush	S5	Secure	
Fabaceae	**Bean Family**			
Trifolium pratense	Red Clover	SNA	Exotic	
Trifolium repens	White Clover	SNA	Exotic	
Vicia cracca	Tufted Vetch	SNA	Exotic	
Onagraceae	**Evening-Primrose Family**			
Chamerion angustifolium	Fireweed	S5	Secure	
Cornaceae	**Dogwood Family**			
Cornus canadensis	Bunchberry	S5	Secure	
Aquifoliaceae	**Holly Family**			
Nemopanthus mucronatus	Mountain Holly	S5	Secure	
Rhamnaceae	**Buckthorn Family**			
Frangula alnus	Glossy Buckthorn	SNA	Exotic	
Aceraceae	**Maple Family**			
Acer pensylvanicum	Striped Maple	S5	Secure	
Acer rubrum	Red Maple	S5	Secure	
Acer saccharum	Sugar Maple	S5	Secure	
Oxalidaceae	**Wood-Sorrel Family**			
Oxalis montana	Common Wood Sorrel	S5	Secure	
Balsaminaceae	**Touch-me-not Family**			
Impatiens capensis	Spotted Jewelweed	S5	Secure	
Araliaceae	**Sarsaparilla Family**			
Aralia hispida	Bristly Sarsaparilla	S5	Secure	
Aralia nudicaulis	Wild Sarsaparilla	S5	Secure	
Lamiaceae	**Mint Family**			
Lycopus uniflorus	Northern Water Horehound	S5	Secure	
Prunella vulgaris	Common Self-heal	S5	Secure	
Scutellaria lateriflora	Mad-dog Skullcap	S5	Secure	
Plantaginaceae	**Plantain Family**			
Plantago major	Common Plantain	SNA	Exotic	
Oleaceae	**Olive Family**			
Fraxinus americana	White Ash	S5	Secure	
Scrophulariaceae	**Snapdragon Family**			
Veronica officinalis	Common Speedwell	S5	Exotic	
Rubiaceae	**Bedstraw Family**			
Galium palustre	Common Marsh Bedstraw	S5	Secure	
Mitchella repens	Partridgeberry	S5	Secure	

Species / Family	Common Name	S-rank	GS Rank	ID Notes
Caprifoliaceae	**Honeysuckle Family**			
Linnaea borealis ssp. americana	Twinflower	S5	Secure	
Lonicera canadensis	Canada Fly Honeysuckle	S5	Secure	
Sambucus racemosa	Red Elderberry	S5	Secure	
Asteraceae	**Aster Family**			
Anaphalis margaritacea	Pearly Everlasting	S5	Secure	
Doellingeria umbellata	Hairy Flat-top White Aster	S5	Secure	
Eupatorium perfoliatum	Common Boneset	S5	Secure	
Eurybia macrophylla	Large-leaved Aster	S5	Secure	
Euthamia graminifolia	Grass-leaved Goldenrod	S5	Secure	
Hieracium piloselloides	Tall Hawkweed	SNA	Exotic	ID to sp. probable, not confirmed
Hieracium aurantiacum	Orange Hawkweed	SNA	Exotic	
Hieracium caespitosum	Field Hawkweed	SNA	Exotic	
Hieracium scabrum	Rough Hawkweed	S5	Secure	
Hieracium x flagellare	Whiplash Hawkweed	SNA	Exotic	ID to sp. probable, not confirmed
Matricaria discoidea	Pineapple Weed	SNA	Exotic	
Oclemena acuminata	Whorled Wood Aster	S5	Secure	
Prenanthes altissima	Tall Rattlesnakeroot	S5	Secure	
Prenanthes trifoliolata	Three-leaved Rattlesnakeroot	S5	Secure	
Senecio jacobaea	Tansy Ragwort	SNA	Exotic	
Solidago puberula	Downy Goldenrod	S5	Secure	
Solidago rugosa	Rough-stemmed Goldenrod	S5	Secure	
Solidago uliginosa	Northern Bog Goldenrod	S5	Secure	
Symphyotrichum lateriflorum	Calico Aster	S5	Secure	
Symphyotrichum puniceum	Purple-stemmed Aster	S5	Secure	
Juncaceae	**Rush Family**			
Juncus effusus	Soft Rush	S5	Secure	
Juncus tenuis	Path Rush	S5	Secure	
Luzula multiflora	Common Woodrush	S5	Secure	
Cyperaceae	**Sedge Family**			
Carex arctata	Drooping Woodland Sedge	S5	Secure	
Carex brunnescens ssp. sphaerostachya	Brownish Sedge	S5	Secure	
Carex communis	Fibrous-Root Sedge	S5	Secure	
Carex crawfordii	Crawford's Sedge	S5	Secure	
Carex debilis var. rudgei	White-edged Sedge	S5	Secure	
Carex deflexa	Northern Sedge	S4	Secure	
Carex echinata	Star Sedge	S5	Secure	
Carex gynandra	Nodding Sedge	S5	Secure	
Carex intumescens	Bladder Sedge	S5	Secure	
Carex leptalea	Bristly-stalked Sedge	S5	Secure	
Carex leptonervia	Finely-Nerved Sedge	S5	Secure	
Carex novae-angliae	New England Sedge	S5	Secure	
Carex scoparia	Broom Sedge	S5	Secure	
Carex stipata	Awl-fruited Sedge	S5	Secure	
Carex trisperma var. trisperma	Three-seeded Sedge	S5	Secure	
Eriophorum virginicum	Tawny Cottongrass	S5	Secure	
Scirpus atrocinctus	Black-girdled Bulrush	S5	Secure	
Scirpus cyperinus	Common Woolly Bulrush	S5	Secure	
Scirpus hattorianus	Mosquito Bulrush	S5	Secure	
Poaceae	**Grass Family**			
Agrostis capillaris	Colonial Bent Grass	SNA	Exotic	

Species / Family	Common Name	S-rank	GS Rank	ID Notes
Agrostis gigantea	Redtop	SNA	Exotic	
Agrostis scabra	Rough Bent Grass	S5	Secure	
Anthoxanthum odoratum	Large Sweet Vernal Grass	SNA	Exotic	
Calamagrostis canadensis	Bluejoint Reed Grass	S5	Secure	
Cinna latifolia	Drooping Wood Reed Grass	S5	Secure	
Dactylis glomerata	Orchard Grass	SNA	Exotic	
Danthonia compressa	Flattened Oat Grass	S5	Secure	
Danthonia spicata	Poverty Oat Grass	S5	Secure	
Dichanthelium acuminatum	Woolly Panic Grass	S5	Secure	
Festuca filiformis	Hair Fescue	SNA	Exotic	
Glyceria grandis	Common Tall Manna Grass	S4S5	Secure	
Glyceria melicaria	Slender Manna Grass	S4	Secure	
Glyceria striata	Fowl Manna Grass	S5	Secure	
Lolium arundinaceum	Tall Fescue	SNA	Exotic	
Lolium pratense	Meadow Fescue	SNA	Exotic	
Phleum pratense	Common Timothy	SNA	Exotic	
Poa alsodes	Grove Blue Grass	S4	Secure	
Poa pratensis	Kentucky Blue Grass	S5	Secure	
Poa trivialis	Rough Blue Grass	SNA	Exotic	
Liliaceae	**Lily Family**			
Maianthemum canadense	Wild Lily-of-The-Valley	S5	Secure	
Orchidaceae	**Orchid Family**			
Platanthera psycodes	Small Purple Fringed Orchid	S4	Secure	ID to sp. probable, not confirmed (non-flowering)

Table 2. List of birds recorded by Sean Blaney on June 27, 2013 at the Greenfield COMFIT site, with provincial status ranks and breeding evidence recorded following the methods of the Maritimes Breeding Bird Atlas. Breeding evidence with codes are: Poss = Possible breeding, H = adult in suitable nesting habitat, S = singing male in suitable nesting habitat; Prob = Probable breeding, P = pair in suitable nesting habitat; Conf = Confirmed breeding, FY = flightless or dependent young, NE = nest with eggs. Shaded species are of conservation concern with details of their occurrences given in Table 3 and locations mapped in Figure 1.

Species	Common Name	Breeding Evidence	NS End. Sp. Act	S-rank	GS Rank
Charadrius vociferus	Killdeer	Conf-FY		S3S4B	Sensitive
Zenaida macroura	Mourning Dove	Poss-S		S5	Secure
Contopus virens	Eastern Wood-Pewee	Poss-S	Vulnerable	S3S4B	Sensitive
Empidonax alnorum	Alder Flycatcher	Poss-S		S5B	Secure
Regulus calendula	Ruby-crowned Kinglet	Poss-S		S4B	Sensitive
Catharus ustulatus	Swainson's Thrush	Poss-H		S4S5B	Secure
Catharus guttatus	Hermit Thrush	Poss-S		S5B	Secure
Turdus migratorius	American Robin	Poss-S		S5B	Secure
Vireo olivaceus	Red-eyed Vireo	Conf-NE		S5B	Secure
Dendroica magnolia	Magnolia Warbler	Poss-S		S5B	Secure
Dendroica virens	Black-throated Green Warbler	Poss-S		S4S5B	Secure
Seiurus aurocapilla	Ovenbird	Poss-S		S5B	Secure
Geothlypis trichas	Common Yellowthroat	Poss-S		S5B	Secure
Wilsonia canadensis	Canada Warbler	Poss-S	Endangered	S3B	At Risk
Melospiza melodia	Song Sparrow	Poss-S		S5B	Secure
Melospiza lincolnii	Lincoln's Sparrow	Poss-S		S4B	Secure
Junco hyemalis	Dark-eyed Junco	Poss-S		S4S5	Secure
Dolichonyx oryzivorus	Bobolink	Prob-P	Vulnerable	S3S4B	Sensitive
Agelaius phoeniceus	Red-winged Blackbird	Poss-H		S4S5B	Secure
Carpodacus purpureus	Purple Finch	Poss-S		S4S5	Secure
Carduelis pinus	Pine Siskin	Poss-H		S3S4B,S5N	Sensitive
Carduelis tristis	American Goldfinch	Poss-S		S5	Secure

Table 3. Species of conservation concern recorded in the Greenfield COMFIT site, June 27, 2013 with provincial status, location of observation and description the occurrence and potential construction impacts. A specimen of Meadow Willow was collected and will be deposited at the E.C. Smith Herbarium at Acadia University.

Common Name	Species	S-rank	GS Rank	Latitude	Longitude	Location Uncertainty (m)	Description
Meadow Willow	*Salix petiolaris*	S3	Secure	45.344655	-63.136842	10	1 large shrub in seepy forest opening in streambed within regenerating clearcut
Bobolink	*Dolichonyx oryzivorus*	S3S4B	Sensitive	45.346763	-63.148609	50	4+ adults in suitable nesting habitat (open pasture & hayfield). Habitat potentially affected by increasing width of access road through pasture.
Killdeer	*Charadrius vociferus*	S3S4B	Sensitive	45.346957	-63.145627	25	Agitated female with 4 flightless young in open pasture along gravelly track. Habitat potentially affected by increasing width of access road through pasture.
Ruby-crowned Kinglet	*Regulus calendula*	S4B	Sensitive	45.345043	-63.137432	65	Singing male in suitable nesting habitat (15-20 year old balsam fir - black spruce forest / plantation). Habitat potentially affected by construction of access road.
Canada Warbler	*Wilsonia canadensis*	S3B	At Risk	45.345138	-63.135009	10	Singing male in suitable nesting habitat (shrubby wet peatland depression in 15-20 year old balsam fir - black spruce forest / plantation). Habitat within or very near to construction footprint of Turbine G03.
Pine Siskin	*Carduelis pinus*	S3S4B,S5N	Sensitive	45.345138	-63.135009	10	Adult in suitable nesting habitat (overhead from shrubby wet peatland depression in 15-20 year old balsam fir - black spruce forest / plantation). Not clearly nesting within project area, but potential habitat affected by construction of Turbine G03 & associated access road.
Eastern Wood-Pewee	*Contopus virens*	S3S4B	Sensitive	45.346372	-63.143183	25	singing male in suitable nesting habitat (sugar maple forest). Habitat potentially affected by construction of access road.

Table 4. Locations, site community descriptions and dominant understorey flora of proposed turbine locations at the Greenfield COMFIT site.

Turbine #	Latitude	Longitude	Site Description	Dominant Understorey Species
G01	45.347481	-63.138644	~ 5 year old regenerating clearcut; pin cherry 35% cover	*Aralia hispida; Carex brunnescens ssp. sphaerostachya; Rubus idaeus ssp. strigosus; Rubus canadensis; Danthonia spicata; Carex novae-angliae; Dennstaedtia punctilobula*
G02	45.346056	-63.139818	Potential turbine footprint includes: ***a)*** 5 to 10 year old regenerating clearcut dominated by pin cherry and red maple and in the process of conversion from forest to cattle pasture, and ***b)*** ~25 year old red maple - balsam fir - yellow birch - white birch regenerating forest	***Regenerating clearcut:*** *Rubus idaeus ssp. strigosus; Carex brunnescens ssp. sphaerostachya; Carex novae-angliae; Aralia hispida; Dennstaedtia punctilobula; Carex debilis var. rudgei; Betula papyrifera var. papyrifera; Carex intumescens; Scirpus cyperinus; Betula populifolia; Euthamia graminifolia; Agrostis scabra; Doellingeria umbellata; Rumex acetosella;* ***Young forest:*** *Some of above + Maianthemum canadense; Aralia nudicaulis; Oxalis montana; Dryopteris intermedia; Dryopteris campyloptera; Thelypteris noveboracensis; Osmunda cinnamomea*
G03	45.345139	-63.134417	Dry, gravelly log landing site and road at edge of 20-25 year old black spruce plantation with balsam fir - yellow birch - red maple; precommercial thinning ~10 years ago	***Spruce plantation (most of potential turbine footprint):*** very sparse understory of *Dryopteris campyloptera; Dryopteris intermedia; Maianthemum canadense*

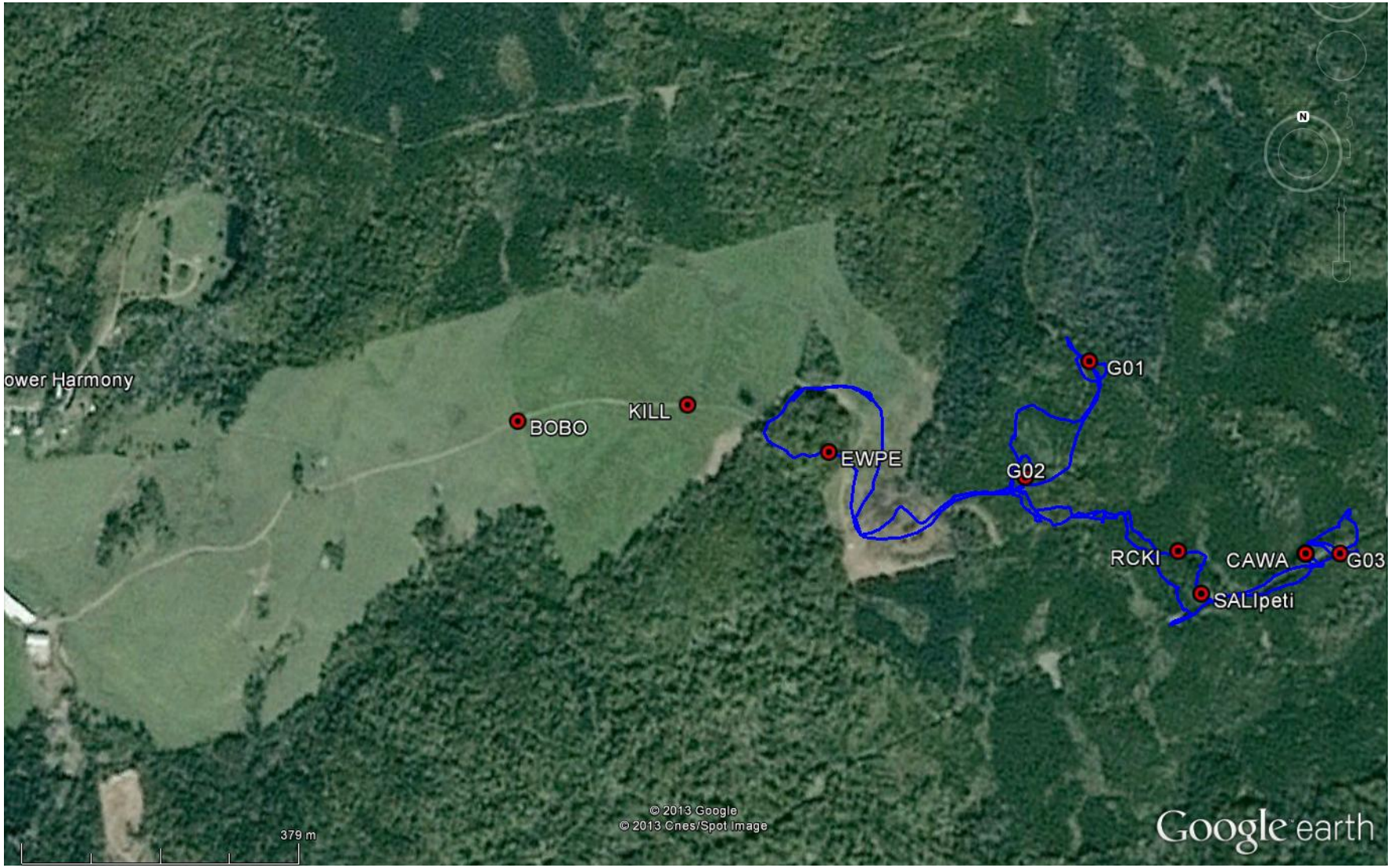

Figure 1. GPS tracks (blue line) of area covered by Sean Blaney on June 27, 2013 at the proposed Greenfield COMFIT site, Colchester County, Nova Scotia. Red dots are proposed turbine locations, as determined in the field by Reuben Burge. Rare locations are: BOBO = Bobolink, KILL = Killdeer, EWPE = Eastern Wood-Pewee, RCKI = Ruby-crowned Kinglet, CAWA = Canada Warbler and Pine Sisken (same location), SALIpeti = Meadow Willow (*Salix petiolaris*). Aerial photo from Google Earth.

Figure 2. Proposed turbine site G01, regenerating from recent clearcut and potential subject to future conversion to pasture.

Figure 3. Proposed turbine site G02, showing recently cleared area in foreground in the process of conversion to pasture, and young mixed forest in background.

Figure 4. Proposed turbine site G03, viewed from existing road and log landing area (above) and from within the young black spruce plantation.

Appendix 1. Definitions of Atlantic Canada Conservation Data Centre (AC CDC) provincial ranks (S-ranks) and Nova Scotia Department of Natural Resources General Status Ranks. Both sets of ranks were developed through the consensus of the Nova Scotia Flora Ranking Committee, cooperatively led by Nova Scotia Department of Natural Resources and AC CDC. The ranks reflect the best understanding of plant status at the time of ranking, but are subject to revision as new information becomes available.

Definitions of provincial (subnational) ranks (S-ranks):

S1 Extremely rare throughout its range in the province (typically 5 or fewer occurrences or very few remaining individuals). May be especially vulnerable to extirpation.

S2 Rare throughout its range in the province (usually 6 to 20 occurrences or few remaining individuals). May be vulnerable to extirpation due to rarity or other factors.

S3 Uncommon throughout its range in the province (usually 21 to 100 occurrences), or found only in a restricted range, even if abundant in at some locations.

S4 Usually widespread, fairly common throughout its range in the province (usually 100+ occurrences), and apparently secure, but the element is of long-term concern.

S5 Demonstrably widespread, abundant, and secure throughout its range in the province, and essentially ineradicable under present conditions (100+ occurrences).

S#S# Numeric range rank: A range between two consecutive numeric ranks. Denotes range of uncertainty about the exact rarity of the Element (e.g., S1S2).

SNA Conservation status not applicable: The taxon is exotic, its occurrence in the jurisdiction is not confirmed, or it is a hybrid without conservation value.

? Is used as a qualifier indicating uncertainty: for numeric ranks, denotes inexactness, e.g., SE? denotes uncertainty of exotic status. (The ? qualifies the character immediately preceding it in the SRANK).

Definitions of National General Status Ranks (from *Wild Species: the General Status Program in Canada, Lisa Twolan and Simon Nadeau, 2004, Canadian Wildlife Service, Ottawa)*

- *Extirpated*: species that have disappeared from (or are no longer present in) a given geographic area but which occur in other areas
- *Extinct:* species that are extirpated worldwide (i.e., they no longer exist anywhere)
- *At Risk*: species for which a formal detailed risk assessment (COSEWIC assessment or provincial or territorial equivalent) has been completed, and which have been determined to be at risk of extirpation or extinction (i.e., Endangered) or are likely to become at risk of extirpation or extinction if limiting factors are not reversed (i.e., Threatened)
- *May Be At Risk*: species that may be at risk of extirpation or extinction and are, therefore, candidates for a detailed risk assessment by COSEWIC or the provincial or territorial equivalent

- *Sensitive*: species that are believed to not be at risk of extirpation or extinction but which may require special attention or protection to prevent them from becoming at risk
- *Secure*: species that are believed to not belong in the categories At Risk, May Be At Risk, Extirpated, Extinct, Accidental, or Exotic. This category includes some species that show a declining trend in numbers in Canada but which remain relatively widespread or abundant.
- *Undetermined*: species for which insufficient data, information, or knowledge is available with which to reliably evaluate their general status
- *Not Assessed*: species that are known or believed to be present in the geographic area in Canada to which the general status rank applies but which have not yet been assessed
- *Exotic*: species that have been moved beyond their natural range as a result of human activity. In the *Wild Species 2005* report, exotic species have been purposefully excluded from all other categories.
- *Accidental*: species occurring infrequently and unpredictably outside their usual range

Appendix G

Breeding Bird Survey

GREENFIELD, NOVA SCOTIA WIND FARM

BREEDING BIRD SURVEY

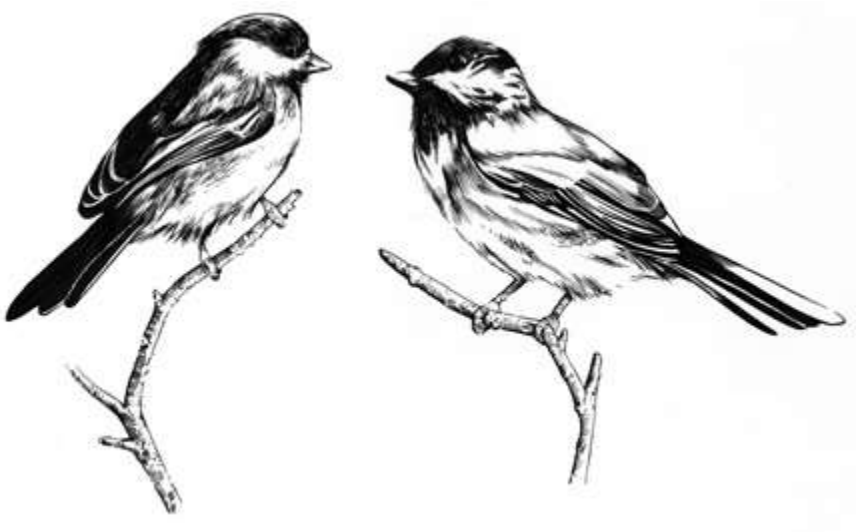

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TABLE OF CONTENTS

INTRODUCTION

Wind is one of the fastest growing renewable energy sources in the world. It offsets emissions from fossil fuel plants, and encourages a cleaner way of living. Various concerns have been raised on wind turbine effects on wildlife and the environment, particularly on avian and bat species (Canadian Wind Energy Association, 2008). With these concerns in mind, the Nova Scotia Environment Act states that an environmental assessment must be conducted prior to the construction of a wind farm. These types of assessments will cover various elements, such as; wildlife, ecology, botany, and geology.

This report focuses on the avian portion of an environmental study being executed on the Greenfield Wind Project site in Colchester County, Nova Scotia. This assessment will provide baseline information regarding population estimates of birds, and help to ensure the proposed turbines are not being built in bird migration routes. It will also ensure that there are no endangered or threatened species in the area, and that the Greenfield location is not a common breeding site.

The avian study which was conducted used the area point count method to record species, and numbers of species found throughout the duration of the study. This avian study was conducted over a 52 week period. Area point counts are used to find population abundance as well as species composition within a specific area.

METHODS

The monitoring protocols established in this document were designed using information from two documents published by the Canadian Wildlife Service:

Environment Canada (2006) Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds.

Environment Canada (2006) Wind turbines and birds: A Guidance Document for Environmental Assessment.

On 23 April 2012, Wildlife Technicians began work at the Greenfield survey location in Colchester County, Nova Scotia. Technicians set up an area point count for avian species in the area. This point count was part of an environmental assessment being conducted which will be used to determine the population estimate of avian species found in the area, and will help to determine if three wind turbines will be erected at the Greenfield location.

The survey locations were given to the technicians prior to the set-up of the point count. The coordinates for the potential sites, as of April 2012, were as follows (All

coordinates are UTM zone 20T): Turbine 1 – 0489272E 5022850N, Turbine 2 – 0488828E 5022737N, Turbine 3 -0488395E 5022645N.

Using each of the survey locations as center points, 100 (m) was measured in each cardinal direction, north (0°), east (90°), south (180°) and west (270°). Using these new locations as a center points, four additional points were established 50 (m) away in each cardinal direction and marked with flagging tape. The area within these four points was the monitoring area for each turbine. A total of four points per turbine were established and monitored (Figure 1).

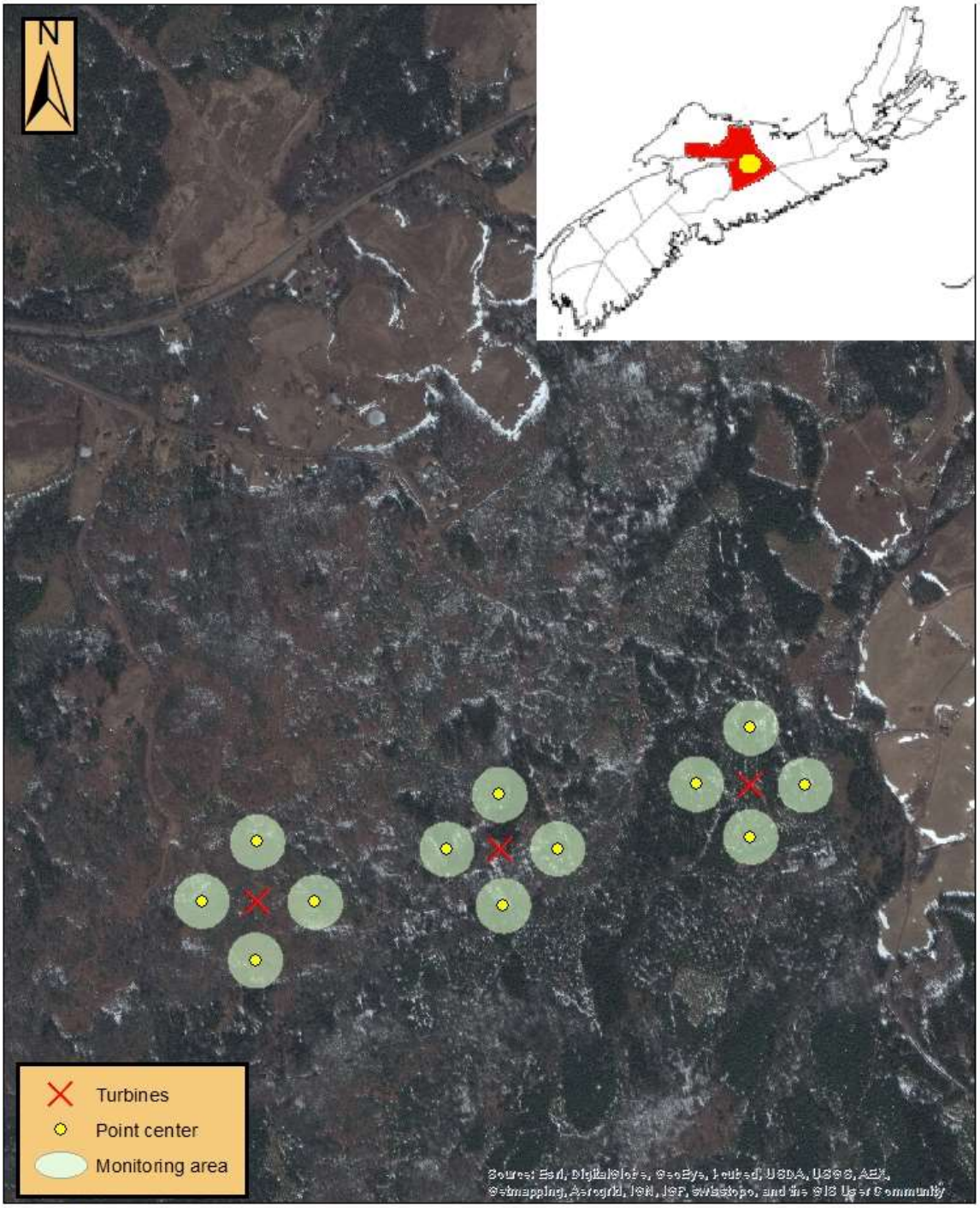

Figure 1. Locations of purposed turbines, as well as monitoring points found throughout the Greenfield wind farm, Colchester County, NS. Map drawn by Black Bird Environmental Consulting, 2013.

For the following 52 weeks, bird populations were monitored once a week, monitoring would begin 30 minutes before sunrise and would last for approximately 3 – 4 hours. Monitoring would not take place during rainy days, or days with high wind speeds as birds are not active during these types of weather conditions. A total of five minutes was spent monitoring at each point location. During the five minutes, any birds seen or heard within the monitoring location were recorded on tally sheets. Recording would include species of bird, number of birds, and location.

RESULTS

Throughout the study of the Greenfield survey location, a total of 38 different bird species were recorded. Within these 38 species, three were listed as below S4 (Table 1) the Eastern Wood Pewee, Boreal Chickadee and the Yellow-bellied Flycatcher, all other species are listed by the ACCDC (Atlantic Canada Conservation Data Centre), as S5 or S4 and Secure with COSEWIC. For a complete list of species, total counts and Sub-national ranks (S-Ranks) found through the duration of the study, refer to Table 2.

Table 1. Uncommon species sub-national and global ranks as defined by the Atlantic Canada Conservation Data Centre found throughout the Greenfield wind project location, Colchester County, Nova Scotia, data collected by Black Bird Environmental Consulting, April - March, 2012-13.

UNCOMMON SPECIES			
Common Name	**Scientific Name**	**Global Rank**	**Sub-National Ranks**
Boreal Chickadee	*Poecile hudsonica*	G5	S3
Eastern Wood Pewee	*Contopus virens*	G5	S3S4B
Yellow Bellied Flycatcher	*Empidonax flaviventris*	G5	S3S4B

*** S3B** - Uncommon, or found only in a restricted range, even if abundant at some locations (21 to 100 occurrences)

*** S4B** - Usually widespread, fairly common, and apparently secure with many occurrences, but of longer-term concern (100+ occurrences), Breeding (Migratory species).

*** G5** - Very common, secure under present conditions.

Table 2. Complete list of bird species observed during the 52 week study of the Greenfield wind project location, Colchester County, Nova Scotia, data collected by Black Bird Environmental Consulting, April - May 2012-2013.

COMPLETE SPECIES LIST			
Common Name	**Scientific Name**	**Global Ranks**	**Sub-National Ranks**
American Robin	*Turdus migratorius*	Secure	S5B*
Blue Jay	*Cyanocitta cristata*	G5	S5
Red-winged Blackbird	*Agelaius phoeniceus*	G5	S4S5B*
Mourning Dove	*Zenaida macroura*	G5	S5
Common Raven	*Corvus corax*	G5	S5
American crow	*Corvus brachyrhynchos*	G5	S5
European Starling	*Sturnus vulgaris*	G5	SNA*
white-throated Sparrow	*Zonotrichia albicollis*	G5	S5B
Song Sparrow	*Melospiza melodia*	G5	S5B
Pileated Woodpecker	*Dryocopus pileatus*	G5	S5
Hairy Woodpecker	*Picoides villosus*	G5	S5
Northern Flicker	*Colaptes auratus*	G5	S5B
Yellow-bellied Sapsucker	*phyrapicus varius*	G5	S4S5B
Red-breasted Nuthatch	*Sitta canadensis*	G5	S4S5
Golden Crowned Kinglet	*Regulus satrapa*	G5	S4
American Goldfinch	*Carduelis tristis*	G5	S5
Swainson's Thrush	*Catharus ustulatus*	G5	S4S5
Yellow-rumped Warbler	*Dendroica coronata*	G5	S5
Black-throated Blue Warbler	*Dendroica caerulescens*	G5	S5B
Black-throated Green Warbler	*Dendroica virens*	G5	S4S5B
Black-and-White Warbler	*Mniotilta varia*	G5	S4S5B
Magnolia Warbler	*Dendroica magnolia*	G5	S5B
Eastern Wood Pewee	*Contopus virens*	G5	S3S4B
Ovenbird	*Seiurus aurocapillus*	G5	S5B

*** S3B** - Uncommon, or found only in a restricted range, even if abundant at some locations (21 to 100 occurrences), Breeding (Migratory species).

*** S4B** - Usually widespread, fairly common, and apparently secure with many occurrences, but of longer-term concern (100+ occurrences), Breeding (Migratory species).

*** S5B** - Widespread, abundant, and secure, under present conditions, Breeding (Migratory species).

*** G5** - Very common, secure under present conditions.

*** NA** - Not Applicable: A conservation status is not applicable because the species is either: a) exotic, b) not definitively known to occur in the province or c) a hybrid not considered to be conservation significance.

Table 2. Complete list of bird species observed during the 52 week study of the Greenfield wind project location, Colchester County, Nova Scotia, data collected by Black Bird Environmental Consulting, April - May 2012-2013.

COMPLETE SPECIES LIST (CONT)			
Common Name	**Scientific Name**	**Global Ranks**	**Sub-National Ranks**
Winter Wren	*Troglodytes troglodytes*	G5	S5B
Black-capped Chickadee	*Poecile atricapilla*	G5	S5B
Boreal Chickadee	*Poecile hudsonica*	G5	S3
Yellow Bellied Flycatcher	*Empidonax flaviventris*	G5	S3S4B
Alder Flycatcher	*Empidonax alnorum*	G5	S5B
Dark-eyed Junco	*Junco hyemalis*	G5	S4S5
Red-eyed Vireo	*Vireo olivaceus*	G5	S5B
Common Yellowthroat	*Geothlypis trichas*	G5	S5B
American Redstart	*Setophaga ruticilla*	G5	S5B
Northern Parula	*Parula americana*	G5	S5B
Ruby-throated Hummingbird	*Archilochus colubris*	G5	S5B
Ruffed Grouse	*Bonasa umbellus*	G5	S4S5B
Ring-necked Pheasant	*Phasianus colchicus*	G5	SNA
Red-tailed Hawk	*Buteo jamaicensis*	G5	S5

*** S3B** - Uncommon, or found only in a restricted range, even if abundant at some locations (21 to 100 occurrences), Breeding (Migratory species).

*** S4B** - Usually widespread, fairly common, and apparently secure with many occurrences, but of longer-term concern (100+ occurrences), Breeding (Migratory species).

*** S5B** - Widespread, abundant, and secure, under present conditions, Breeding (Migratory species).

*** G5** - Very common, secure under present conditions.

* **NA** - Not Applicable: A conservation status is not applicable because the species is either: a) exotic, b) not definitively known to occur in the province or c) a hybrid not considered to be conservation significance.

Figure 2 shows the population trends throughout the duration of the study. The highest population count was found during May with approximately 400 birds recorded. The population then drops slightly each month, with the largest drop in population from August at approximately 380 birds, to September at approximately 160 birds. The lowest population count was found during February and March with approximately 10 birds recorded.

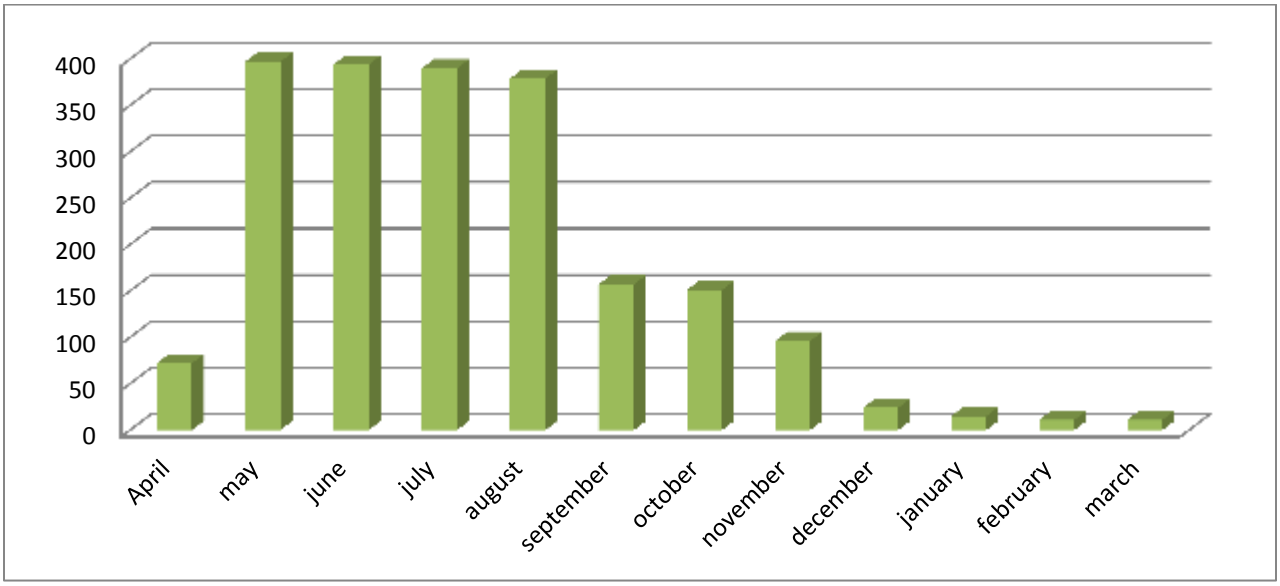

Figure 2. Total bird counts found during the study of the 52 week Greenfield survey, Colchester County, Nova Scotia, data collected by Black Bird Environmental Consulting, April – March 2012-2013.

Three different habitat types were observed within the Greenfield study area; over mature hardwood, immature softwood, and mature hardwood. Total bird count percentages were highest in the immature softwood habitat type with approximately 45% of the total count found within this habitat. The lowest percentage of the bird count was found within the mature hardwood habitat with approximately 27% of the total birds recorded. The over mature softwood contained approximately 28% of the population recorded.

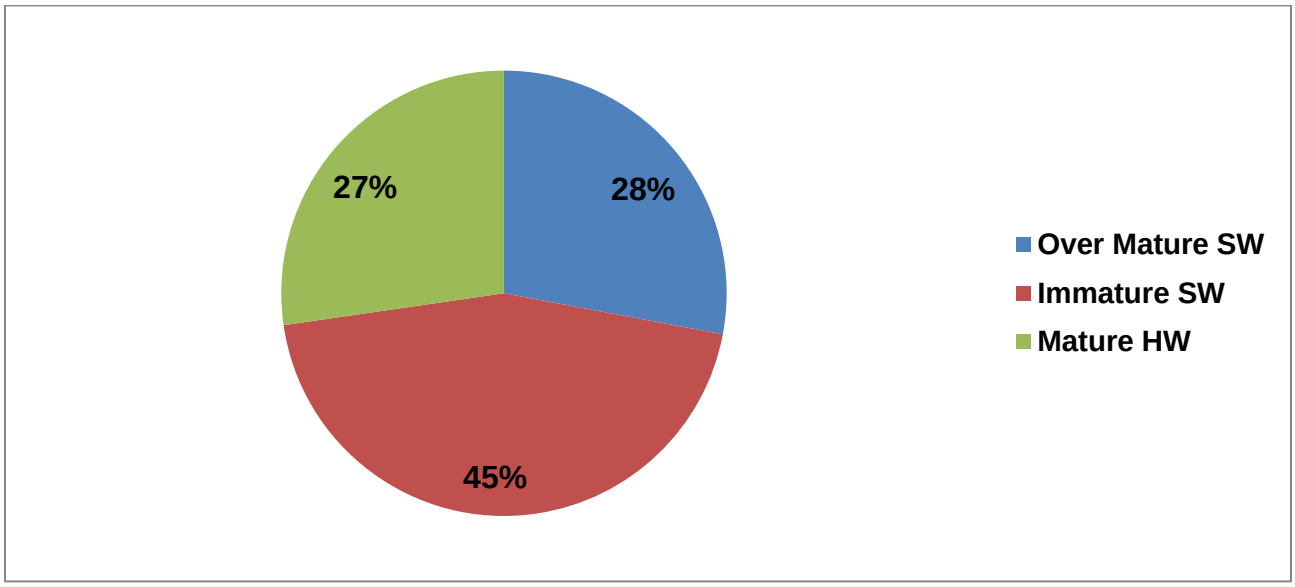

Figure 3. Percentage of total birds recorded throughout three habitat types found within the Greenfield survey location, Colchester County, NS, data collected by Black Bird Environmental Consulting April – March 2012-2013

* HW- Hardwood
* SW - Softwood

DISCUSSION

SPECIES OF CONCERN

During the study at the Greenfield location, 38 avian species were observed. Within this 38, three species were listed below the S-rank of S4. The Eastern Wood Pewee (*Contopus virens*) as well as the Yellow- Bellied Flycatcher (*Empidonax flaviventris*) both shared an S-Rank of S3S4B. The ACCDC defines S4 as: Usually widespread**,** fairly common, and apparently secure with many occurrences, but of longer-term concern (100+ occurrences). S3 as: Uncommon, or found only in a restricted range, even if abundant at some locations (21 to 100 occurrences). The Eastern Wood Pewee breeds in about every type of wooded habitat, and will use both deciduous and coniferous forest. It is often associated with forest clearings and edges all of which are present throughout this study area. The Yellow-Bellied Flycatcher breeds in boreal coniferous forests and nests in cool, moist forests, bogs and swamps. They winter in a variety of habitats from forests to semi-open habitats. The Boreal Chickadee (*Poecile hudsonica*) had an S-rank of S3. This species will use both young and mature forests, as long as they are nominated with evergreens. Their ability to use both mature and younger forests helps the Boreal Chickadees withstand the effects of logging and other effects within their range. Although these species are not at a critical level of risk, pressure on these species may push their ranks down and result in further diminishing their populations.

POPULATION TRENDS

The migration period of birds found throughout Atlantic Canada can extend over several months; however, population increases dramatically during May and June, this coincides with the breeding season of most native species. It is extremely difficult to predict the exact migration times of species. Many factors such as weather conditions or other environmental factors may push migration times ahead or behind slightly. There was a dramatic increase in population during the months of May and June, which are the core migration periods, as well as the breeding season of the majority of species found within Nova Scotia. This tells us that there is a breeding population of various species within the Greenfield study area. There was also a slow drop in population each month as the temperature dropped, and the winter weather moved in. This is typical behavior for birds at this time of year, as the colder weather moves in; the migratory species finish breeding and start migrating south for the winter months. For a complete list of species total counts, refer to appendix 1.

HABITAT TYPES

The Greenfield survey location consisted of three habitat types. Mature hardwood, which consisted of red maple (*Acer rubrum*), sugar maple (*Acer saccharum*), trembling aspen (*Populous Tremuloides*), large-tooth aspen (*Populous grandidentata*), and white birch (*Betula papyrifera*), and scattered immature balsam fir (*Abies balsamea*). Over mature softwood consisted of red spruce (*Picea rubens*), white spruce (*Picea glauca*), and balsam fir (*Abieas balsemea*), all of which were reaching their state of maturity and dying off. Immature softwood consisted of red spruce (*Picea rubens*) and white spruce (*Picea glauca*). The majority of the immature softwood habitat was plantations that had been pre-commercially thinned in the previous years.

Almost 50% of the total bird count found within the study period was found in the immature softwood habitat type. This type of habitat attracts a variety of bird. This could

be attributible to an abundant food source as well as adequate cover. Immature softwood stands are home to millions of species of insects which are the most common food source of bird species found in Nova Scotia. The thick canopies of the softwood trees provide excellent cover for birds both for avoiding prey, as well as building nests.

The least populated habitat type found within this study area was the mature hardwood habitat type. Although some species such as the ruffed grouse (*Bonasa umbellus*), and the northern flicker (*Colaptes auratus*) thrive in mature hardwood stands, the majority of woodland species seek out the dense canopy of softwood trees for cover. The large open canopies of mature hardwood forests do not provide the cover or protection required for most woodland species.

SUPPLEMENTAL MONITORING

The original project site was chosen due to its proximity to homes, adherence to municipal bylaws, elevation, power production potential and use of previously disturbed areas. Throughout the development of the Greenfield project, pressure from local opposition arose based on turbine in proximity to homes. Although the original site location adhered to municipal bylaws regarding distances from homes, the choice was made to move site locations to allow double the setback distance from homes. This change is less than 700m in the difference but the habitat types are different. The developer felt an additional breeding survey in June and the new locations was necessary. During the month of June 2013, two additional monitoring sessions took place. The new survey location coordinates are: 489069E 5021467N. All of the same methods and monitoring procedures were used at the new site location. For a complete list of results found during the supplemental monitoring sessions refer to appendix 2.

CONCLUSION

If the wind turbine project continues as planned, a post monitoring period will commence immediately after construction. There will then be a correlation between the pre and post population assessments, which will help to determine whether there was an effect on population numbers in the study area and any necessary mitigation measure that may be required of the development.

After concluding this 52 week pre-assessment, it was found that there was only one species of special concern found in the area. As stated above, the eastern wood pewee has a stable population (100+ occurrences) throughout NS. This stability in population numbers indicates that there is no need for special precautions to be set into place. However, during the post-assessment treatment, technicians should pay extra attention while monitoring for this species. The access roads and turbine areas will not impact a great amount of actual disturbance, and should not be cleared during the months of May – August to avoid unnecessary impacts to the local avian population.

The original Greenfield survey location is an adequate representation of a heavily harvested Acadian forests found throughout Nova Scotia. There are no habitat types or bird species of a unique nature found throughout this study area. There are no threatened or endangered species found throughout the area. Although there are breeding populations of birds found within the Greenfield area, the habitat types are not unique in nature. There are suitable habitat types in close proximity where birds may locate nesting grounds.

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APPENDICES

Appendix 1. List of species and total counts found throughout the Greenfield wind farm study area, Greenfield, Colchester County, NS. Drawn by Black Bird Environmental Consulting, April 2012-March 2013.

TOTAL COUNT BY SPECIES			
Species	**Total Count**	**Species**	**Total Count**
Black-capped Chickadee	214	Song Sparrow	40
white-throated Sparrow	140	Yellow Bellied Flycatcher	40
American Goldfinch	131	Common Yellowthroat	32
Dark-eyed Junco	126	Hairy Woodpecker	27
American Robin	125	European Starling	21
Blue Jay	118	Magnolia Warbler	20
Swainson's Thrush	115	Northern Flicker	16
American crow	108	Black Throated Blue Warbler	6

Black-throated Green Warbler	82	Yellow-bellied Sapsucker	5
Mourning Dove	80	American Redstart	4
Winter Wren	71	Boreal Chickadee	3
Ruffed Grouse	59	Pileated Woodpecker	3
Alder Flycatcher	56	Ring-necked Pheasant	3
Red-eyed Vireo	54	American Woodcock	1
Ovenbird	52	Common Raven	1
Black-and-White Warbler	51	Eastern Wood Pewee	1
Golden crowned kinglet	47	Red-tailed Hawk	1
Northern Parula	46	Red-winged Blackbird	1
Red-breasted Nuthatch	42	Ruby-throated Hummingbird	1
Yellow-rumped Warbler	42		

Appendix 2. Two week supplemental study done on new Greenfield location, Colchester County, NS. Created by Black Bird Environmental Consulting, June 2013.

GREENFIELD SUPPLEMENTAL RESULTS

Throughout the two week supplemental study done at the new Greenfield location, there was a total of 17 bird species recorded. All of these species had as S-Rank of S4S5 or higher. In comparison, in the supplemental survey there was no observances of the Eastern Wood Pee-wee (*Contopus virens*), the Boreal Chickadee (*Poecile hudsonica*) and the Yellow-Bellied Flycatcher (*Empidonax flaviventris*). For a complete list of species recorded at supplemental location see table 1.

Table 1. Complete list of bird species observed during the two week supplemental study of the Greenfield wind project location, Colchester County, Nova Scotia, data collected by Black Bird Environmental Consulting, July 2013.

COMPLETE SPECIES LIST			
Common Name	**Scientific Name**	**Global Ranks**	**Sub-National Ranks**
American Robin	*Turdus migratorius*	G5	S5B
Mourning Dove	*Zenaida macroura*	G5	S5
American crow	*Corvus brachyrhynchos*	G5	S5
white-throated Sparrow	*Zonotrichia albicollis*	G5	S5B
Red-breasted Nuthatch	*Sitta canadensis*	G5	S4S5
American Goldfinch	*Carduelis tristis*	G5	S5
Swainson's Thrush	*Catharus ustulatus*	G5	S4S5
Yellow-rumped Warbler	*Dendroica coronata*	G5	S5
Black Throated Blue Warbler	*Setophaga caerulescens*	G5	S5B
Black-throated Green Warbler	*Dendroica virens*	G5	S5B
Black-and-White Warbler	*Mniotilta varia*	G5	S4S5B
Ovenbird	*Seiurus aurocapillus*	G5	S5B
Black-capped Chickadee	*Poecile atricapilla*	G5	S5
Alder Flycatcher	*Empidonax alnorum*	G5	S5B

Dark-eyed Junco	*Junco hyemalis*	G5	S4S5
Red-eyed Vireo	*Vireo olivaceus*	G5	S5B
Common Yellowthroat	*Geothlypis trichas*	G5	S5B

During the two week supplemental study of the Greenfield location that took place throughout the month of June 2013. A total of 92 birds were recorded at the new Greenfield location. In June 2012, there were 98 birds recorded. There were 6 fewer birds recorded at the new site location (figure 1).

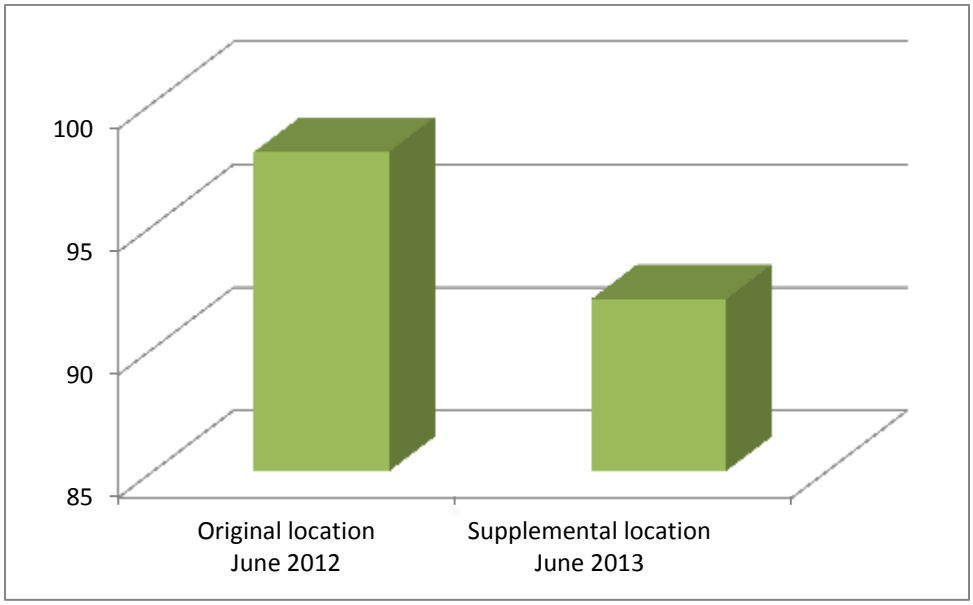

Figure 1. Comparison between mean bird totals found at the Greenfield original site location and supplemental site location during study, Greenfield, Colchester County, Nova Scotia, data collected by Black Bird Environmental Consulting.

During the two week supplemental study that took place throughout the month of June 2013, three habitat types were found at the new Greenfield location. The two habitat types consisted of open field, and cutover. 68 % of the total birds recorded were found in the cutover habitat type while 32 % of the total birds were found in the open field habitat type.

CONCLUSION

When comparing the previous and supplemental Greenfield locations, many factors indicate the supplemental location has potential to be the more desirable location for turbine development. There were no species of concern as listed by the ACCDC found in the supplemental Greenfield location. At the original locations, three species were listed with S-ranks below S4 which is defined by the ACCDC as: usually widespread**,** fairly common, and apparently secure with many occurrences, but of longer-term concern (100+ occurrences). If the turbines were to be constructed in the previous locations, the pressure put on the species with S-ranks below S4 could possibly push the S-ranks lower.

When comparing the previous locations and the supplemental locations, fewer birds were recorded in the supplemental location in June. The supplemental location is in a very open area and does not provide the necessary cover that most avian species require.

The habitat types at the original locations are typical of heavily harvested Acadian forest found throughout Nova Scotia. The supplemental location is in a cutover stand with the landowner intending to increase the entire property to more cow pasture. However, the surrounding standing woods are the same in nature to those found in the previous location.

These factors combined indicate that the supplemental location has fewer species of concern, as well as a lower total count of birds recorded during the month of June. Due to these important factors, the new location is a more desirable location and will put less impact on the avian species in the area.

It is recommended that the supplemental location be used for turbine construction. Although no habitat impact would be the best case scenario, if access roads and turbine locations are constructed outside of the major migratory and breeding bird seasons, and are built with minimal new clearing, the development has an extremely low potential to impact the avian population in the area.

Appendix 3. Tally sheets used throughout the Greenfield wind farm study area, Greenfield, Colchester County, NS. Created by Black Bird Environmental Consulting, April 2012-March 2013.

Date: April 6, 2012				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	10	-4		clear
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
American Robin	*Turdus migratorius*	7	G5	S5B*
American crow	*Corvus brachyrhynchos*	2	G5	S5
white-throated Sparrow	*Zonotrichia albicollis*	4	G5	S5B
Golden crowned kinglet	*Regulus satrapa*	1	G5	S4
Swainson's Thrush	*Catharus ustulatus*	2	G5	S4S5
Winter Wren	*Troglodytes troglodytes*	1	G5	S5B
Black-capped Chickadee	*Poecile atricapilla*	5	G5	S5
Dark-eyed Junco	*Junco hyemalis*	3	G5	S4S5
Ruffed Grouse	*Bonasa umbellus*	1	G5	S4S5B
	TOTAL	**26**		

Date: April 23, 2012				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	10	1		clear
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
American Robin	*Turdus migratorius*	10	G5	S5B*
Mourning Dove	*Zenaida macroura*	2	G5	S5
American crow	*Corvus brachyrhynchos*	1	G5	S5
white-throated Sparrow	*Zonotrichia albicollis*	12	G5	S5B
American Goldfinch	*Carduelis tristis*	2	G5	S5
Swainson's Thrush	*Catharus ustulatus*	5	G5	S4S5
Black-throated Green Warbler	*Dendroica virens*	1	G5	S4S5B
Winter Wren	*Troglodytes troglodytes*	2	G5	S5B
Black-capped Chickadee	*Poecile atricapilla*	4	G5	S5
Dark-eyed Junco	*Junco hyemalis*	3	G5	S4S5
Common Yellowthroat	*Geothlypis trichas*	2	G5	S5B

Ruffed Grouse	*Bonasa umbellus*	2	G5	S4S5B
	TOTAL	**46**		

Date: May 6, 2012				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	10	12		clear
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
American Robin	*Turdus migratorius*	12	G5	S5B*
Mourning Dove	*Zenaida macroura*	2	G5	S5
American crow	*Corvus brachyrhynchos*	1	G5	S5

white-throated Sparrow	*Zonotrichia albicollis*	18	G5	S5B
American Goldfinch	*Carduelis tristis*	2	G5	S5
Golden crowned kinglet	*Regulus satrapa*	2	G5	S4
Swainson's Thrush	*Catharus ustulatus*	7	G5	S4S5
Black-and-White Warbler	*Mniotilta varia*	1	G5	S4S5B
Winter Wren	*Troglodytes troglodytes*	3	G5	S5B
Black-capped Chickadee	*Poecile atricapilla*	3	G5	S5
Dark-eyed Junco	*Junco hyemalis*	5	G5	S4S5
Common Yellowthroat	*Geothlypis trichas*	2	G5	S5B
Ruffed Grouse	*Bonasa umbellus*	3	G5	S4S5B
	TOTAL	**61**		

Date: May 13, 2012				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	17	13		overcast
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
American Robin	*Turdus migratorius*	10	G5	S5B*
Blue Jay	*Cyanocitta cristata*	1	G5	S5
Mourning Dove	*Zenaida macroura*	3	G5	S5
Common Raven	*Corvus corax*	1	G5	S5
American crow	*Corvus brachyrhynchos*	3	G5	S5
white-throated Sparrow	*Zonotrichia albicollis*	9	G5	S5B
Song Sparrow	*Melospiza melodia*	6	G5	S5B
Pileated Woodpecker	*Dryocopus pileatus*	1	G5	S5
Hairy Woodpecker	*Picoides villosus*	2	G5	S5
Northern Flicker	*Colaptes auratus*	1	G5	S5B
Red-breasted Nuthatch	*Sitta canadensis*	1	G5	S4S5
American Goldfinch	*Carduelis tristis*	6	G5	S5
Golden crowned kinglet	*Regulus satrapa*	3	G5	S4
Swainson's Thrush	*Catharus ustulatus*	8	G5	S4S5
Yellow-rumped Warbler	*Dendroica coronata*	3	G5	S5
Black-throated Green Warbler	*Dendroica virens*	3	G5	S4S5B
Black-and-White Warbler	*Mniotilta varia*	2	G5	S4S5B
Ovenbird	*Seiurus aurocapillus*	4	G5	S5B

Winter Wren	*Troglodytes troglodytes*	2	G5	S5B
Black-capped Chickadee	*Poecile atricapilla*	5	G5	S5
Dark-eyed Junco	*Junco hyemalis*	7	G5	S4S5
Red-eyed Vireo	*Vireo olivaceus*	4	G5	S5B
Northern Parula	*Parula americana*	6	G5	S5B
Ruffed Grouse	*Bonasa umbellus*	4	G5	S4S5B
American Woodcock	*Scolopax minor*	1	G5	S4
	TOTAL	**96**		

Date: May 18, 2012				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	12	10		clear
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
American Robin	*Turdus migratorius*	6	G5	S5B*
Blue Jay	*Cyanocitta cristata*	4	G5	S5
Red-winged Blackbird	*Agelaius phoeniceus*	1	G5	S4S5B*
Mourning Dove	*Zenaida macroura*	4	G5	S5
American crow	*Corvus brachyrhynchos*	2	G5	S5
white-throated Sparrow	*Zonotrichia albicollis*	7	G5	S5B
American Goldfinch	*Carduelis tristis*	12	G5	S5
Golden crowned kinglet	*Regulus satrapa*	3	G5	S4
Swainson's Thrush	*Catharus ustulatus*	7	G5	S4S5

Yellow-rumped Warbler	*Dendroica coronata*	4	G5	S5
Black-throated Green Warbler	*Dendroica virens*	11	G5	S4S5B
Black-and-White Warbler	*Mniotilta varia*	3	G5	S4S5B
Ovenbird	*Seiurus aurocapillus*	10	G5	S5B
Winter Wren	*Troglodytes troglodytes*	3	G5	S5B
Black-capped Chickadee	*Poecile atricapilla*	3	G5	S5
Alder Flycatcher	*Empidonax alnorum*	9	G5	S5B
Dark-eyed Junco	*Junco hyemalis*	6	G5	S4S5
Red-eyed Vireo	*Vireo olivaceus*	3	G5	S5B
Common Yellowthroat	*Geothlypis trichas*	1	G5	S5B
	TOTAL	**99**		

Date: May 25, 2012				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	18	11		clear
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
American Robin	*Turdus migratorius*	7	G5	S5B*
Blue Jay	*Cyanocitta cristata*	6	G5	S5
Mourning Dove	*Zenaida macroura*	3	G5	S5
American crow	*Corvus brachyrhynchos*	3	G5	S5
white-throated Sparrow	*Zonotrichia albicollis*	9	G5	S5B
Hairy Woodpecker	*Picoides villosus*	2	G5	S5

Northern Flicker	*Colaptes auratus*	1	G5	S5B
Red-breasted Nuthatch	*Sitta canadensis*	1	G5	S4S5
American Goldfinch	*Carduelis tristis*	8	G5	S5
Golden crowned kinglet	*Regulus satrapa*	4	G5	S4
Swainson's Thrush	*Catharus ustulatus*	9	G5	S4S5
Yellow-rumped Warbler	*Dendroica coronata*	5	G5	S5
Black-throated Green Warbler	*Dendroica virens*	11	G5	S4S5B
Black-and-White Warbler	*Mniotilta varia*	5	G5	S4S5B
Ovenbird	*Seiurus aurocapillus*	9	G5	S5B
Winter Wren	*Troglodytes troglodytes*	4	G5	S5B
Black-capped Chickadee	*Poecile atricapilla*	5	G5	S5
Yellow Bellied Flycatcher	*Empidonax flaviventris*	4	G5	S5
Alder Flycatcher	*Empidonax alnorum*	9	G5	S5B
Dark-eyed Junco	*Junco hyemalis*	5	G5	S4S5
Red-eyed Vireo	*Vireo olivaceus*	5	G5	S5B
Common Yellowthroat	*Geothlypis trichas*	5	G5	S5B
Northern Parula	*Parula americana*	2	G5	S5B
Ruffed Grouse	*Bonasa umbellus*	1	G5	S4S5B
	TOTAL	**123**		

Date: June 1, 2012

Location: Greenfield	Wind speed (km/h)	Temperature (^{0}C)		Sky
	13	12		clear
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
American Robin	*Turdus migratorius*	9	G5	S5B*
Blue Jay	*Cyanocitta cristata*	7	G5	S5
Mourning Dove	*Zenaida macroura*	4	G5	S5
American crow	*Corvus brachyrhynchos*	2	G5	S5
white-throated Sparrow	*Zonotrichia albicollis*	7	G5	S5B
Hairy Woodpecker	*Picoides villosus*	2	G5	S5
Northern Flicker	*Colaptes auratus*	1	G5	S5B
Red-breasted Nuthatch	*Sitta canadensis*	2	G5	S4S5
American Goldfinch	*Carduelis tristis*	7	G5	S5
Golden crowned kinglet	*Regulus satrapa*	4	G5	S4
Swainson's Thrush	*Catharus ustulatus*	9	G5	S4S5
Yellow-rumped Warbler	*Dendroica coronata*	4	G5	S5
Black-throated Green Warbler	*Dendroica virens*	12	G5	S4S5B
Black-and-White Warbler	*Mniotilta varia*	6	G5	S4S5B
Ovenbird	*Seiurus aurocapillus*	10	G5	S5B
Winter Wren	*Troglodytes troglodytes*	4	G5	S5B
Black-capped Chickadee	*Poecile atricapilla*	6	G5	S5
Yellow Bellied Flycatcher	*Empidonax flaviventris*	6	G5	S5
Alder Flycatcher	*Empidonax alnorum*	8	G5	S5B

Dark-eyed Junco	*Junco hyemalis*	5	G5	S4S5
Red-eyed Vireo	*Vireo olivaceus*	4	G5	S5B
Common Yellowthroat	*Geothlypis trichas*	5	G5	S5B
Northern Parula	*Parula americana*	4	G5	S5B
Ruby-throated Hummingbird	*Archilochus colubris*	1	G5	S5B
Ruffed Grouse	*Bonasa umbellus*	2	G5	S4S5B
	TOTAL	**131**		

Date: June 9, 2012				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	13	13		clear
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
American Robin	*Turdus migratorius*	10	G5	S5B*
Blue Jay	*Cyanocitta cristata*	6	G5	S5
Mourning Dove	*Zenaida macroura*	5	G5	S5
American crow	*Corvus brachyrhynchos*	4	G5	S5
European Starling	*Sturnus vulgaris*	0	G5	SNA*
white-throated Sparrow	*Zonotrichia albicollis*	7	G5	S5B
Northern Flicker	*Colaptes auratus*	1	G5	S5B
Red-breasted Nuthatch	*Sitta canadensis*	2	G5	S4S5
American Goldfinch	*Carduelis tristis*	9	G5	S5
Golden crowned kinglet	*Regulus satrapa*	4	G5	S4

Swainson's Thrush	*Catharus ustulatus*	8	G5	S4S5
Yellow-rumped Warbler	*Dendroica coronata*	4	G5	S5
Black-throated Green Warbler	*Dendroica virens*	9	G5	S4S5B
Black-and-White Warbler	*Mniotilta varia*	7	G5	S4S5B
Ovenbird	*Seiurus aurocapillus*	7	G5	S5B
Winter Wren	*Troglodytes troglodytes*	4	G5	S5B
Black-capped Chickadee	*Poecile atricapilla*	7	G5	S5
Yellow Bellied Flycatcher	*Empidonax flaviventris*	6	G5	S5
Alder Flycatcher	*Empidonax alnorum*	9	G5	S5B
Dark-eyed Junco	*Junco hyemalis*	6	G5	S4S5
Red-eyed Vireo	*Vireo olivaceus*	4	G5	S5B
Common Yellowthroat	*Geothlypis trichas*	5	G5	S5B
American Redstart	*Setophaga ruticilla*	1	G5	S5B
Northern Parula	*Parula americana*	4	G5	S5B
Ruffed Grouse	*Bonasa umbellus*	2	G5	S4S5B
	TOTAL	**131**		

Date: June 17, 2012				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	16	14		overcast
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**

American Robin	*Turdus migratorius*	5	G5	S5B*
Mourning Dove	*Zenaida macroura*	8	G5	S5
American crow	*Corvus brachyrhynchos*	1	G5	S5
white-throated Sparrow	*Zonotrichia albicollis*	2	G5	S5B
Song Sparrow	*Melospiza melodia*	2	G5	S5B
Yellow-bellied Sapsucker	*phyrapicus varius*	1	G5	S4S5B
American Goldfinch	*Carduelis tristis*	5	G5	S5
Golden crowned kinglet	*Regulus satrapa*	4	G5	S4
Swainson's Thrush	*Catharus ustulatus*	11	G5	S4S5
Black-throated Green Warbler	*Dendroica virens*	1	G5	S4S5B
Ovenbird	*Seiurus aurocapillus*	2	G5	S5B
Winter Wren	*Troglodytes troglodytes*	3	G5	S5B
Yellow Bellied Flycatcher	*Empidonax flaviventris*	1	G5	S5
Dark-eyed Junco	*Junco hyemalis*	2	G5	S4S5
Red-eyed Vireo	*Vireo olivaceus*	7	G5	S5B
Ruffed Grouse	*Bonasa umbellus*	1	G5	S4S5B
	TOTAL	**56**		

Date: June 29, 2012

Location: Greenfield	Wind speed (km/h)	Temperature (^{0}C)		Sky
	5	20		clear
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
American Robin	*Turdus migratorius*	2	G5	S5B*
Mourning Dove	*Zenaida macroura*	4	G5	S5
American crow	*Corvus brachyrhynchos*	5	G5	S5
white-throated Sparrow	*Zonotrichia albicollis*	7	G5	S5B
Red-breasted Nuthatch	*Sitta canadensis*	2	G5	S4S5
American Goldfinch	*Carduelis tristis*	6	G5	S5
Swainson's Thrush	*Catharus ustulatus*	6	G5	S4S5
Yellow-rumped Warbler	*Dendroica coronata*	5	G5	S5
Black Throated Blue Warbler	*Setophaga caerulescens*	3	G5	S5B
Black-throated Green Warbler	*Dendroica virens*	2	G5	S4S5B
Black-and-White Warbler	*Mniotilta varia*	3	G5	S4S5B
Magnolia Warbler	*Setophaga magnolia*	5	G5	S5B
Ovenbird	*Seiurus aurocapillus*	1	G5	S5B
Black-capped Chickadee	*Poecile atricapilla*	1	G5	S5
Yellow Bellied Flycatcher	*Empidonax flaviventris*	6	G5	S5
Alder Flycatcher	*Empidonax alnorum*	1	G5	S5B
Dark-eyed Junco	*Junco hyemalis*	6	G5	S4S5
Red-eyed Vireo	*Vireo olivaceus*	4	G5	S5B
Common Yellowthroat	*Geothlypis trichas*	3	G5	S5B

	TOTAL	**72**		

Date: July 8, 2012				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	8	13		clear
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
American Robin	*Turdus migratorius*	3	G5	S5B*
Blue Jay	*Cyanocitta cristata*	1	G5	S5
Mourning Dove	*Zenaida macroura*	3	G5	S5
American crow	*Corvus brachyrhynchos*	2	G5	S5
white-throated Sparrow	*Zonotrichia albicollis*	3	G5	S5B
Song Sparrow	*Melospiza melodia*	4	G5	S5B
Yellow-bellied Sapsucker	*phyrapicus varius*	1	G5	S4S5B
Red-breasted Nuthatch	*Sitta canadensis*	3	G5	S4S5
American Goldfinch	*Carduelis tristis*	5	G5	S5
Golden crowned kinglet	*Regulus satrapa*	4	G5	S4
Swainson's Thrush	*Catharus ustulatus*	7	G5	S4S5
Black-throated Green Warbler	*Dendroica virens*	1	G5	S4S5B
Black-and-White Warbler	*Mniotilta varia*	1	G5	S4S5B
Ovenbird	*Seiurus aurocapillus*	1	G5	S5B
Winter Wren	*Troglodytes troglodytes*	5	G5	S5B
Yellow Bellied Flycatcher	*Empidonax flaviventris*	1	G5	S5

Dark-eyed Junco	*Junco hyemalis*	5	G5	S4S5
Red-eyed Vireo	*Vireo olivaceus*	3	G5	S5B
Northern Parula	*Parula americana*	1	G5	S5B
Ruffed Grouse	*Bonasa umbellus*	1	G5	S4S5B
	TOTAL	**55**		

Date: July 15, 2012				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	10	16		overcast
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
American Robin	*Turdus migratorius*	4	G5	S5B*
Blue Jay	*Cyanocitta cristata*	3	G5	S5
Mourning Dove	*Zenaida macroura*	4	G5	S5
white-throated Sparrow	*Zonotrichia albicollis*	5	G5	S5B
Song Sparrow	*Melospiza melodia*	1	G5	S5B
Red-breasted Nuthatch	*Sitta canadensis*	2	G5	S4S5
American Goldfinch	*Carduelis tristis*	8	G5	S5
Golden crowned kinglet	*Regulus satrapa*	5	G5	S4
Swainson's Thrush	*Catharus ustulatus*	6	G5	S4S5
Yellow-rumped Warbler	*Dendroica coronata*	3	G5	S5
Black-throated Green Warbler	*Dendroica virens*	6	G5	S4S5B
Black-and-White Warbler	*Mniotilta varia*	5	G5	S4S5B

Ovenbird	*Seiurus aurocapillus*	2	G5	S5B
Winter Wren	*Troglodytes troglodytes*	3	G5	S5B
Yellow Bellied Flycatcher	*Empidonax flaviventris*	3	G5	S5
Alder Flycatcher	*Empidonax alnorum*	5	G5	S5B
Dark-eyed Junco	*Junco hyemalis*	4	G5	S4S5
Red-eyed Vireo	*Vireo olivaceus*	3	G5	S5B
Common Yellowthroat	*Geothlypis trichas*	2	G5	S5B
American Redstart	*Setophaga ruticilla*	1	G5	S5B
Northern Parula	*Parula americana*	5	G5	S5B
Ruffed Grouse	*Bonasa umbellus*	1	G5	S4S5B
	TOTAL	**81**		

Date: July 25, 2012				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	5	14		clear
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
American Robin	*Turdus migratorius*	2	G5	S5B*
Blue Jay	*Cyanocitta cristata*	2	G5	S5
Mourning Dove	*Zenaida macroura*	1	G5	S5
American crow	*Corvus brachyrhynchos*	1	G5	S5
white-throated Sparrow	*Zonotrichia albicollis*	6	G5	S5B
Red-breasted Nuthatch	*Sitta canadensis*	3	G5	S4S5

American Goldfinch	*Carduelis tristis*	3	G5	S5
Golden crowned kinglet	*Regulus satrapa*	3	G5	S4
Swainson's Thrush	*Catharus ustulatus*	7	G5	S4S5
Yellow-rumped Warbler	*Dendroica coronata*	1	G5	S5
Black-throated Green Warbler	*Dendroica virens*	3	G5	S4S5B
Black-and-White Warbler	*Mniotilta varia*	4	G5	S4S5B
Ovenbird	*Seiurus aurocapillus*	1	G5	S5B
Winter Wren	*Troglodytes troglodytes*	2	G5	S5B
Yellow Bellied Flycatcher	*Empidonax flaviventris*	1	G5	S5
Alder Flycatcher	*Empidonax alnorum*	5	G5	S5B
Dark-eyed Junco	*Junco hyemalis*	4	G5	S4S5
Red-eyed Vireo	*Vireo olivaceus*	2	G5	S5B
Common Yellowthroat	*Geothlypis trichas*	2	G5	S5B
American Redstart	*Setophaga ruticilla*	2	G5	S5B
Northern Parula	*Parula americana*	6	G5	S5B
Ruffed Grouse	*Bonasa umbellus*	1	G5	S4S5B
	TOTAL	**62**		

Date: July 31, 2012				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	15	17		clear
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**

American Robin	*Turdus migratorius*	5	G5	S5B*
Blue Jay	*Cyanocitta cristata*	3	G5	S5
Mourning Dove	*Zenaida macroura*	4	G5	S5
white-throated Sparrow	*Zonotrichia albicollis*	9	G5	S5B
Song Sparrow	*Melospiza melodia*	5	G5	S5B
Hairy Woodpecker	*Picoides villosus*	1	G5	S5
Yellow-bellied Sapsucker	*phyrapicus varius*	1	G5	S4S5B
Red-breasted Nuthatch	*Sitta canadensis*	2	G5	S4S5
American Goldfinch	*Carduelis tristis*	9	G5	S5
Golden crowned kinglet	*Regulus satrapa*	2	G5	S4
Swainson's Thrush	*Catharus ustulatus*	6	G5	S4S5
Yellow-rumped Warbler	*Dendroica coronata*	4	G5	S5
Black Throated Blue Warbler	*Setophaga caerulescens*	1	G5	S5B
Black-throated Green Warbler	*Dendroica virens*	2	G5	S4S5B
Black-and-White Warbler	*Mniotilta varia*	2	G5	S4S5B
Magnolia Warbller	*Setophaga magnolia*	5	G5	S5B
Winter Wren	*Troglodytes troglodytes*	3	G5	S5B
Black-capped Chickadee	*Poecile atricapilla*	1	G5	S5
Yellow Bellied Flycatcher	*Empidonax flaviventris*	4	G5	S5
Alder Flycatcher	*Empidonax alnorum*	3	G5	S5B
Dark-eyed Junco	*Junco hyemalis*	2	G5	S4S5
Red-eyed Vireo	*Vireo olivaceus*	4	G5	S5B

Common Yellowthroat	*Geothlypis trichas*	2	G5	S5B
Northern Parula	*Parula americana*	3	G5	S5B
Ruffed Grouse	*Bonasa umbellus*	1	G5	S4S5B
	TOTAL	**84**		

Date: August 4, 2012				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	19	17		clear
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
American Robin	*Turdus migratorius*	4	G5	S5B*
Mourning Dove	*Zenaida macroura*	1	G5	S5
white-throated Sparrow	*Zonotrichia albicollis*	5	G5	S5B
Song Sparrow	*Melospiza melodia*	5	G5	S5B
Hairy Woodpecker	*Picoides villosus*	2	G5	S5
Northern Flicker	*Colaptes auratus*	1	G5	S5B
Yellow-bellied Sapsucker	*phyrapicus varius*	1	G5	S4S5B
Red-breasted Nuthatch	*Sitta canadensis*	3	G5	S4S5
American Goldfinch	*Carduelis tristis*	7	G5	S5
Golden crowned kinglet	*Regulus satrapa*	1	G5	S4
Swainson's Thrush	*Catharus ustulatus*	5	G5	S4S5
Yellow-rumped Warbler	*Dendroica coronata*	3	G5	S5
Black Throated Blue Warbler	*Setophaga caerulescens*	1	G5	S5B

Black-throated Green Warbler	*Dendroica virens*	5	G5	S4S5B
Black-and-White Warbler	*Mniotilta varia*	2	G5	S4S5B
Magnolia Warblller	*Setophaga magnolia*	3	G5	S5B
Eastern Wood Pewee	*Contopus virens*	1	G5	S3S4B
Ovenbird	*Seiurus aurocapillus*	2	G5	S5B
Winter Wren	*Troglodytes troglodytes*	4	G5	S5B
Black-capped Chickadee	*Poecile atricapilla*	1	G5	S5
Yellow Bellied Flycatcher	*Empidonax flaviventris*	2	G5	S5
Alder Flycatcher	*Empidonax alnorum*	2	G5	S5B
Dark-eyed Junco	*Junco hyemalis*	4	G5	S4S5
Red-eyed Vireo	*Vireo olivaceus*	2	G5	S5B
Common Yellowthroat	*Geothlypis trichas*	1	G5	S5B
Northern Parula	*Parula americana*	2	G5	S5B
Ruffed Grouse	*Bonasa umbellus*	2	G5	S4S5B
	TOTAL	**72**		

Date: August 11, 2012				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	12	14		clear
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
American Robin	*Turdus migratorius*	6	G5	S5B*
Blue Jay	*Cyanocitta cristata*	2	G5	S5

Mourning Dove	*Zenaida macroura*	2	G5	S5
American crow	*Corvus brachyrhynchos*	2	G5	S5
white-throated Sparrow	*Zonotrichia albicollis*	7	G5	S5B
Song Sparrow	*Melospiza melodia*	3	G5	S5B
Hairy Woodpecker	*Picoides villosus*	1	G5	S5
Northern Flicker	*Colaptes auratus*	2	G5	S5B
Red-breasted Nuthatch	*Sitta canadensis*	1	G5	S4S5
American Goldfinch	*Carduelis tristis*	10	G5	S5
Golden crowned kinglet	*Regulus satrapa*	1	G5	S4
Swainson's Thrush	*Catharus ustulatus*	4	G5	S4S5
Yellow-rumped Warbler	*Dendroica coronata*	3	G5	S5
Black Throated Blue Warbler	*Setophaga caerulescens*	1	G5	S5B
Black-throated Green Warbler	*Dendroica virens*	4	G5	S4S5B
Black-and-White Warbler	*Mniotilta varia*	3	G5	S4S5B
Magnolia Warbller	*Setophaga magnolia*	1	G5	S5B
Ovenbird	*Seiurus aurocapillus*	3	G5	S5B
Winter Wren	*Troglodytes troglodytes*	5	G5	S5B
Black-capped Chickadee	*Poecile atricapilla*	3	G5	S5
Alder Flycatcher	*Empidonax alnorum*	1	G5	S5B
Dark-eyed Junco	*Junco hyemalis*	4	G5	S4S5
Red-eyed Vireo	*Vireo olivaceus*	3	G5	S5B

Common Yellowthroat	*Geothlypis trichas*	1	G5	S5B
Northern Parula	*Parula americana*	4	G5	S5B
Ruffed Grouse	*Bonasa umbellus*	1	G5	S4S5B
	TOTAL	**78**		

Date: August 18, 2012				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	19	9		overcast
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
American Robin	*Turdus migratorius*	3	G5	S5B*
Blue Jay	*Cyanocitta cristata*	4	G5	S5
Mourning Dove	*Zenaida macroura*	3	G5	S5
American crow	*Corvus brachyrhynchos*	3	G5	S5
European Starling	*Sturnus vulgaris*	5	G5	SNA*
white-throated Sparrow	*Zonotrichia albicollis*	6	G5	S5B
Song Sparrow	*Melospiza melodia*	4	G5	S5B
Northern Flicker	*Colaptes auratus*	1	G5	S5B
Yellow-bellied Sapsucker	*phyrapicus varius*	1	G5	S4S5B
Red-breasted Nuthatch	*Sitta canadensis*	4	G5	S4S5
American Goldfinch	*Carduelis tristis*	9	G5	S5
Golden crowned kinglet	*Regulus satrapa*	3	G5	S4
Swainson's Thrush	*Catharus ustulatus*	4	G5	S4S5

Yellow-rumped Warbler	*Dendroica coronata*	2	G5	S5
Black-throated Green Warbler	*Dendroica virens*	5	G5	S5B
Black-and-White Warbler	*Mniotilta varia*	2	G5	S4S5B
Magnolia Warblller	*Setophaga magnolia*	4	G5	S4S5B
Winter Wren	*Troglodytes troglodytes*	3	G5	S5B
Black-capped Chickadee	*Poecile atricapilla*	4	G5	S5
Yellow Bellied Flycatcher	*Empidonax flaviventris*	3	G5	S5
Alder Flycatcher	*Empidonax alnorum*	1	G5	S5B
Dark-eyed Junco	*Junco hyemalis*	5	G5	S4S5
Red-eyed Vireo	*Vireo olivaceus*	1	G5	S5B
Common Yellowthroat	*Geothlypis trichas*	1	G5	S5B
Northern Parula	*Parula americana*	4	G5	S5B
Ruffed Grouse	*Bonasa umbellus*	2	G5	S4S5B
	TOTAL	**87**		

Date: August 25, 2012				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	17	23		clear
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
American Robin	*Turdus migratorius*	2	G5	S5B*
Blue Jay	*Cyanocitta cristata*	5	G5	S5
Mourning Dove	*Zenaida macroura*	2	G5	S5

European Starling	*Sturnus vulgaris*	7	G5	SNA*
white-throated Sparrow	*Zonotrichia albicollis*	5	G5	S5B
Song Sparrow	*Melospiza melodia*	5	G5	S5B
Hairy Woodpecker	*Picoides villosus*	3	G5	S5
Northern Flicker	*Colaptes auratus*	2	G5	S5B
Red-breasted Nuthatch	*Sitta canadensis*	4	G5	S4S5
American Goldfinch	*Carduelis tristis*	10	G5	S5
Golden crowned kinglet	*Regulus satrapa*	2	G5	S4
Swainson's Thrush	*Catharus ustulatus*	3	G5	S4S5
Yellow-rumped Warbler	*Dendroica coronata*	1	G5	S5
Black-throated Green Warbler	*Dendroica virens*	3	G5	S5B
Black-and-White Warbler	*Mniotilta varia*	2	G5	S4S5B
Magnolia Warblller	*Setophaga magnolia*	1	G5	S4S5B
Winter Wren	*Troglodytes troglodytes*	4	G5	S5B
Black-capped Chickadee	*Poecile atricapilla*	5	G5	S5
Yellow Bellied Flycatcher	*Empidonax flaviventris*	2	G5	S5
Alder Flycatcher	*Empidonax alnorum*	2	G5	S5B
Dark-eyed Junco	*Junco hyemalis*	3	G5	S4S5
Red-eyed Vireo	*Vireo olivaceus*	3	G5	S5B
Northern Parula	*Parula americana*	3	G5	S5B
Ruffed Grouse	*Bonasa umbellus*	2	G5	S4S5B
	TOTAL	**81**		

Date: August 31, 2012				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	15	16		clear
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
American Robin	*Turdus migratorius*	3	G5	S5B*
Blue Jay	*Cyanocitta cristata*	8	G5	S5
Mourning Dove	*Zenaida macroura*	5	G5	S5
American crow	*Corvus brachyrhynchos*	2	G5	S5
European Starling	*Sturnus vulgaris*	9	G5	SNA*
white-throated Sparrow	*Zonotrichia albicollis*	3	G5	S5B
Song Sparrow	*Melospiza melodia*	4	G5	S5B
Hairy Woodpecker	*Picoides villosus*	3	G5	S5
Northern Flicker	*Colaptes auratus*	3	G5	S5B
Red-breasted Nuthatch	*Sitta canadensis*	3	G5	S4S5
American Goldfinch	*Carduelis tristis*	8	G5	S5
Golden crowned kinglet	*Regulus satrapa*	1	G5	S4
Swainson's Thrush	*Catharus ustulatus*	1	G5	S4S5
Black-throated Green Warbler	*Dendroica virens*	2	G5	S5B
Black-and-White Warbler	*Mniotilta varia*	3	G5	S4S5B
Magnolia Warbller	*Setophaga magnolia*	1	G5	S4S5B

Winter Wren	*Troglodytes troglodytes*	3	G5	S5B
Black-capped Chickadee	*Poecile atricapilla*	6	G5	S5
Yellow Bellied Flycatcher	*Empidonax flaviventris*	1	G5	S5
Alder Flycatcher	*Empidonax alnorum*	1	G5	S5B
Dark-eyed Junco	*Junco hyemalis*	4	G5	S4S5
Red-eyed Vireo	*Vireo olivaceus*	1	G5	S5B
Northern Parula	*Parula americana*	2	G5	S5B
Ruffed Grouse	*Bonasa umbellus*	1	G5	S4S5B
Ring-necked Pheasant	*Phasianus colchicus*	1	G5	SNA
	TOTAL	**79**		

Date: September 6, 2012				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	6	19		clear
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
American Robin	*Turdus migratorius*	3	G5	S5B*
Blue Jay	*Cyanocitta cristata*	6	G5	S5
Mourning Dove	*Zenaida macroura*	3	G5	S5
American crow	*Corvus brachyrhynchos*	1	G5	S5
white-throated Sparrow	*Zonotrichia albicollis*	2	G5	S5B
Hairy Woodpecker	*Picoides villosus*	1	G5	S5

Winter Wren	*Troglodytes troglodytes*	2	G5	S5B
Black-capped Chickadee	*Poecile atricapilla*	10	G5	S5
Ruffed Grouse	*Bonasa umbellus*	7	G5	S4S5B
	TOTAL	**35**		

Date: September 13, 2012				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	14	17		overcast
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
American Robin	*Turdus migratorius*	4	G5	S5B*
Blue Jay	*Cyanocitta cristata*	7	G5	S5
Mourning Dove	*Zenaida macroura*	2	G5	S5
American crow	*Corvus brachyrhynchos*	2	G5	S5
white-throated Sparrow	*Zonotrichia albicollis*	2	G5	S5B
Pileated Woodpecker	*Dryocopus pileatus*	1	G5	S5
Hairy Woodpecker	*Picoides villosus*	1	G5	S5
Northern Flicker	*Colaptes auratus*	1	G5	S5B
Black-throated Green Warbler	*Dendroica virens*	1	G5	S5B
Winter Wren	*Troglodytes troglodytes*	1	G5	S5B
Black-capped Chickadee	*Poecile atricapilla*	14	G5	S5
Ruffed Grouse	*Bonasa umbellus*	6	G5	S4S5B

	TOTAL	**42**		

Date: September 19, 2012				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	10	15		clear
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
American Robin	*Turdus migratorius*	3	G5	S5B*
Blue Jay	*Cyanocitta cristata*	4	G5	S5
Mourning Dove	*Zenaida macroura*	1	G5	S5
American crow	*Corvus brachyrhynchos*	5	G5	S5
white-throated Sparrow	*Zonotrichia albicollis*	1	G5	S5B
Winter Wren	*Troglodytes troglodytes*	1	G5	S5B
Black-capped Chickadee	*Poecile atricapilla*	12	G5	S5
Ruffed Grouse	*Bonasa umbellus*	8	G5	S4S5B
	TOTAL	**35**		

Date: September 27, 2012			
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**	**Sky**
	18	16	clear

Common Name	Scientific Name	Total species count	ACCDC Global Rank	ACCDC Sub-National Rank
American Robin	*Turdus migratorius*	2	G5	S5B*
Blue Jay	*Cyanocitta cristata*	7	G5	S5
Mourning Dove	*Zenaida macroura*	3	G5	S5
American crow	*Corvus brachyrhynchos*	2	G5	S5
white-throated Sparrow	*Zonotrichia albicollis*	3	G5	S5B
Hairy Woodpecker	*Picoides villosus*	2	G5	S5
Northern Flicker	*Colaptes auratus*	1	G5	S5B
Red-breasted Nuthatch	*Sitta canadensis*	2	G5	S4S5
Winter Wren	*Troglodytes troglodytes*	1	G5	S5B
Black-capped Chickadee	*Poecile atricapilla*	15	G5	S5
Dark-eyed Junco	*Junco hyemalis*	3	G5	S4S5
Ruffed Grouse	*Bonasa umbellus*	3	G5	S4S5B
	TOTAL	**44**		

Date: October 4, 2012				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	10	13		clear
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
American Robin	*Turdus migratorius*	1	G5	S5B*
Blue Jay	*Cyanocitta cristata*	10	G5	S5
Mourning Dove	*Zenaida macroura*	1	G5	S5

American crow	*Corvus brachyrhynchos*	6	G5	S5
white-throated Sparrow	*Zonotrichia albicollis*	1	G5	S5B
Song Sparrow	*Melospiza melodia*	1	G5	S5B
Hairy Woodpecker	*Picoides villosus*	2	G5	S5
Red-breasted Nuthatch	*Sitta canadensis*	1	G5	S4S5
Winter Wren	*Troglodytes troglodytes*	3	G5	S5B
Black-capped Chickadee	*Poecile atricapilla*	10	G5	S5
Dark-eyed Junco	*Junco hyemalis*	1	G5	S4S5
	TOTAL	**37**		

Date: October 10, 2012				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	5	9		overcast
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**

Blue Jay	*Cyanocitta cristata*	7	G5	S5
American crow	*Corvus brachyrhynchos*	5	G5	S5
Hairy Woodpecker	*Picoides villosus*	1	G5	S5
Northern Flicker	*Colaptes auratus*	1	G5	S5B
Winter Wren	*Troglodytes troglodytes*	2	G5	S5B
Black-capped Chickadee	*Poecile atricapilla*	9	G5	S5
Boreal Chickadee	*Poecile hudsonicus*	1	G5	S3
Dark-eyed Junco	*Junco hyemalis*	3	G5	S4S5
Ruffed Grouse	*Bonasa umbellus*	1	G5	S4S5B
	TOTAL	**30**		

Date: October 18, 2012				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	12	11		clear
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
American Robin	*Turdus migratorius*	2	G5	S5B*
Blue Jay	*Cyanocitta cristata*	5	G5	S5
Mourning Dove	*Zenaida macroura*	2	G5	S5
American crow	*Corvus*	5	G5	S5

	brachyrhynchos			
Hairy Woodpecker	*Picoides villosus*	2	G5	S5
Winter Wren	*Troglodytes troglodytes*	3	G5	S5B
Black-capped Chickadee	*Poecile atricapilla*	12	G5	S5
Boreal Chickadee	*Poecile hudsonicus*	2	G5	S3
Dark-eyed Junco	*Junco hyemalis*	2	G5	S4S5
Red-eyed Vireo	*Vireo olivaceus*	1	G5	S5B
Ruffed Grouse	*Bonasa umbellus*	2	G5	S4S5B
	TOTAL	**38**		

Date: October 23, 2012				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	10	7		overcast
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
Blue Jay	*Cyanocitta cristata*	2	G5	S5
Mourning Dove	*Zenaida macroura*	1	G5	S5
American crow	*Corvus brachyrhynchos*	4	G5	S5
Black-capped Chickadee	*Poecile atricapilla*	9	G5	S5
Dark-eyed Junco	*Junco hyemalis*	6	G5	S4S5

	TOTAL	**22**		

Date: October 27, 2012				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	12	4		clear
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
Blue Jay	*Cyanocitta cristata*	2	G5	S5
Mourning Dove	*Zenaida macroura*	1	G5	S5
American crow	*Corvus brachyrhynchos*	8	G5	S5
Black-capped Chickadee	*Poecile atricapilla*	8	G5	S5
Dark-eyed Junco	*Junco hyemalis*	5	G5	S4S5
	TOTAL	**24**		

Date: November 2, 2012				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	12	4		clear
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
Blue Jay	*Cyanocitta cristata*	1	G5	S5

American crow	*Corvus brachyrhynchos*	9	G5	S5
Black-capped Chickadee	*Poecile atricapilla*	5	G5	S5
Dark-eyed Junco	*Junco hyemalis*	2	G5	S4S5
	TOTAL	**17**		

Date: November 10, 2012				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	12	10		clear
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
Blue Jay	*Cyanocitta cristata*	4	G5	S5
American crow	*Corvus brachyrhynchos*	8	G5	S5
Pileated Woodpecker	*Dryocopus pileatus*	1	G5	S5
Black-capped Chickadee	*Poecile atricapilla*	8	G5	S5
Dark-eyed Junco	*Junco hyemalis*	3	G5	S4S5
Ruffed Grouse	*Bonasa umbellus*	1	G5	S4S5B
	TOTAL	**25**		

Date: November 17, 2012

Location: Greenfield	Wind speed (km/h)	Temperature (^{0}C)		Sky
	10	2		clear
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
Blue Jay	*Cyanocitta cristata*	2	G5	S5
American crow	*Corvus brachyrhynchos*	4	G5	S5
Red-breasted Nuthatch	*Sitta canadensis*	2	G5	S4S5
Black-capped Chickadee	*Poecile atricapilla*	6	G5	S5
Dark-eyed Junco	*Junco hyemalis*	2	G5	S4S5
Ruffed Grouse	*Bonasa umbellus*	1	G5	S4S5B
Ring-necked Pheasant	*Phasianus colchicus*	2	G5	SNA
	TOTAL	**19**		

Date: November 22, 2012				
Location: Greenfield	Wind speed (km/h)	Temperature (^{0}C)		Sky
	16	-1		overcast
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
Blue Jay	*Cyanocitta cristata*	3	G5	S5
Red-breasted Nuthatch	*Sitta canadensis*	3	G5	S4S5
Black-capped Chickadee	*Poecile atricapilla*	7	G5	S5

Dark-eyed Junco	*Junco hyemalis*	4	G5	S4S5
Ruffed Grouse	*Bonasa umbellus*	2	G5	S4S5B
	TOTAL	**19**		

Date: November 27, 2012				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	18	1		clear
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
Blue Jay	*Cyanocitta cristata*	2	G5	S5
Mourning Dove	*Zenaida macroura*	1	G5	S5
American crow	*Corvus brachyrhynchos*	3	G5	S5
Hairy Woodpecker	*Picoides villosus*	1	G5	S5
American Goldfinch	*Carduelis tristis*	3	G5	S5
Black-capped Chickadee	*Poecile atricapilla*	4	G5	S5
Dark-eyed Junco	*Junco hyemalis*	2	G5	S4S5
	TOTAL	**16**		

Date: December 7, 2012			
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**	**Sky**

	16	-5		overcast
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
Blue Jay	*Cyanocitta cristata*	1	G5	S5
American crow	*Corvus brachyrhynchos*	4	G5	S5
Black-capped Chickadee	*Poecile atricapilla*	5	G5	S5
Dark-eyed Junco	*Junco hyemalis*	1	G5	S4S5
	TOTAL	**11**		

Date: December 29, 2012				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	17	-3		flurries
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
Blue Jay	*Cyanocitta cristata*	2	G5	S5
Mourning Dove	*Zenaida macroura*	1	G5	S5
American crow	*Corvus brachyrhynchos*	2	G5	S5
Hairy Woodpecker	*Picoides villosus*	1	G5	S5
Red-breasted Nuthatch	*Sitta canadensis*	1	G5	S4S5
Black-capped Chickadee	*Poecile atricapilla*	4	G5	S5

Dark-eyed Junco	*Junco hyemalis*	2	G5	S4S5
	TOTAL	**13**		

Date: January 18, 2013				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	15	-9		flurries
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
Blue Jay	*Cyanocitta cristata*	1	G5	S5
Mourning Dove	*Zenaida macroura*	1	G5	S5
American crow	*Corvus brachyrhynchos*	3	G5	S5
American Goldfinch	*Carduelis tristis*	2	G5	S5
Black-capped Chickadee	*Poecile atricapilla*	6	G5	S5
Dark-eyed Junco	*Junco hyemalis*	2	G5	S4S5
	TOTAL	**15**		

Date: February 16, 2013				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	11	-4		clear
Common Name	**Scientific Name**	**Total species**	**ACCDC Global**	**ACCDC Sub-National Rank**

		count	Rank	
Mourning Dove	*Zenaida macroura*	1	G5	S5
American crow	*Corvus brachyrhynchos*	2	G5	S5
Black-capped Chickadee	*Poecile atricapilla*	6	G5	S5
Dark-eyed Junco	*Junco hyemalis*	2	G5	S4S5
	TOTAL	**11**		

Date:March 9, 2013				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	9	-2		clear
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
Mourning Dove	*Zenaida macroura*	2	G5	S5
American crow	*Corvus brachyrhynchos*	1	G5	S5
Black-capped Chickadee	*Poecile atricapilla*	3	G5	S5
Dark-eyed Junco	*Junco hyemalis*	2	G5	S4S5
	TOTAL	**8**		

Date:March 23 , 2013

Location: Greenfield	Wind speed (km/h)	Temperature (^{0}C)		Sky
	6	11		clear
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
Black-capped Chickadee	*Poecile atricapilla*	2	G5	S5
Dark-eyed Junco	*Junco hyemalis*	1	G5	S4S5
	TOTAL	**14**		

Date:June 15 , 2013				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	10	14		overcast
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
American Robin	*Turdus migratorius*	3	G5	S5B*
Mourning Dove	*Zenaida macroura*	6	G5	S5
American crow	*Corvus brachyrhynchos*	1	G5	S5
white-throated Sparrow	*Zonotrichia albicollis*	2	G5	S5B
Song Sparrow	*Melospiza melodia*	1	G5	S5B
Yellow-bellied Sapsucker	*phyrapicus varius*	1	G5	S4S5B
American Goldfinch	*Carduelis tristis*	2	G5	S5
Golden crowned kinglet	*Regulus satrapa*	4	G5	S4

Swainson's Thrush	*Catharus ustulatus*	9	G5	S4S5
Black-throated Green Warbler	*Dendroica virens*	1	G5	S5B
Ovenbird	*Seiurus aurocapillus*	2	G5	S5B
Winter Wren	*Troglodytes troglodytes*	1	G5	S5B
Dark-eyed Junco	*Junco hyemalis*	2	G5	S4S5
Red-eyed Vireo	*Vireo olivaceus*	3	G5	S5B
Ruffed Grouse	*Bonasa umbellus*	1	G5	S4S5B
	TOTAL	**39**		

Date:June 22 , 2013				
Location: Greenfield	**Wind speed (km/h)**	**Temperature (^{0}C)**		**Sky**
	12	15		overcast
Common Name	**Scientific Name**	**Total species count**	**ACCDC Global Rank**	**ACCDC Sub-National Rank**
American Robin	*Turdus migratorius*	2	G5	S5B*
Mourning Dove	*Zenaida macroura*	2	G5	S5
American crow	*Corvus brachyrhynchos*	3	G5	S5
white-throated Sparrow	*Zonotrichia albicollis*	5	G5	S5B
Red-breasted Nuthatch	*Sitta canadensis*	2	G5	S4S5

American Goldfinch	*Carduelis tristis*	4	G5	S5
Swainson's Thrush	*Catharus ustulatus*	4	G5	S4S5
Yellow-rumped Warbler	*Dendroica coronata*	4	G5	S5
Black Throated Blue Warbler	*Setophaga caerulescens*	2	G5	S5B
Black-throated Green Warbler	*Dendroica virens*	2	G5	S5B
Black-and-White Warbler	*Mniotilta varia*	3	G5	S4S5B
Ovenbird	*Seiurus aurocapillus*	1	G5	S5B
Black-capped Chickadee	*Poecile atricapilla*	1	G5	S5
Alder Flycatcher	*Empidonax alnorum*	1	G5	S5B
Dark-eyed Junco	*Junco hyemalis*	10	G5	S4S5
Red-eyed Vireo	*Vireo olivaceus*	4	G5	S5B
Common Yellowthroat	*Geothlypis trichas*	3	G5	S5B
	TOTAL	**53**		

Appendix H

Archaeological Resource Impact Assessment

Greenfield Wind Project

Archaeological Resource Impact Assessment

Heritage Research Permit A2013NS086

Davis MacIntyre & Associates Limited
109 John Stewart Drive, Dartmouth, NS B2W 4J7

Greenfield Wind Project

Archaeological Resource Impact Assessment

Heritage Research Permit A2013NS086

Principal Investigator: Courtney Glen
Report Compiled by: Courtney Glen & Laura de Boer

Submitted to:
RMS Energy
1383 Mt. Thom Road
Salt Springs, NS B0K 1P0

-and-

Coordinator, Special Places
Communities, Culture and Heritage
PO Box 456, STN Central
Halifax, NS B3J 2R5

Cover Image: The met tower at the proposed Greenfield Wind Farm, looking east through a cow field.

Executive Summary

Davis MacIntyre & Associates Limited conducted an archaeological resource impact assessment of the proposed Greenfield Wind Project in Colchester County. The purpose of the assessment was to determine the potential for archaeological resources within the study area and to provide recommendations for mitigation, if necessary. The assessment included a historic background study and reconnaissance.

The study concluded that only one potential archaeological resource is located near the development. This resource, a saw mill, appears to be located to the north of the access road along the watercourse crossing. Provided the access road layout does not change, impact to the saw mill site should be avoidable.

No active mitigation is recommended for the development area at this time. However, in the event that additional archaeological resources are encountered during ground disturbance activities, it is required that all activity cease and the Coordinator of Special Places (902-424-6475) be contacted immediately. In the event that development plans change so that areas not assessed during this investigation are to be impacted, it is recommended that those areas be subjected to an archaeological assessment.

Table of Contents

List of Figures

List of Plates

1.0 Introduction

Davis MacIntyre & Associates Limited was contracted by RMS Energy to conduct an archaeological resource impact assessment of a proposed wind project near Lower Harmony, Colchester County. The purpose of the assessment was to determine the potential for archaeological resources within the impact area, and to provide recommendations for further mitigation if necessary.

The assessment was conducted under Category C Heritage Research Permit A2013NS087(Appendix A). This report conforms to the standards of the Nova Scotia Department of Communities, Culture and Heritage and the Heritage Research Permit requirements as per the Special Places Protection Act (*R.S., c. 438, s. 1.)*.

2.0 Study Area

The study area is located approximately 1.3 kilometers east of Lower Harmony and 2.5 kilometers south of Greenfield in Colchester County. RMS Energy proposes to construct a 3.36 MW wind farm that will include two turbines and necessary access roads. The foundation excavation for each turbine will be approximately 2 meters deep and 15 meters in diameter. Access roads will be 10 meters wide. A portion of the access road will follow an existing road to the extent practical and new roads will be required to link the turbines (Figure 2.0-1).

Lower Harmony is located in the St Mary's Fault Block sub-Unit of the Carboniferous Lowlands theme region (Figure 2.0-2). The site is located within the western half of the St. Marys Fault Block, a uniform upland that runs along the southern side of the Cobequid Hills. The study area is part of a large watershed draining the Stewiacke River into the Cobequid Bay. Soils in the region are derived from sandstones, quartzites and shales and in the S. Marys sub-Unit soils range from gravelly to clay. The poorly drained soil and extensive cutting has favoured the growth of White and Red Spruce, Balsam Fir and White Pine. Red Oak and mixed hardwood can be found in areas with better drainage. The freshwater rivers in the area typically have high diversity and productivity.[1]

[1] Davis and Browne, 1996: 134-136.

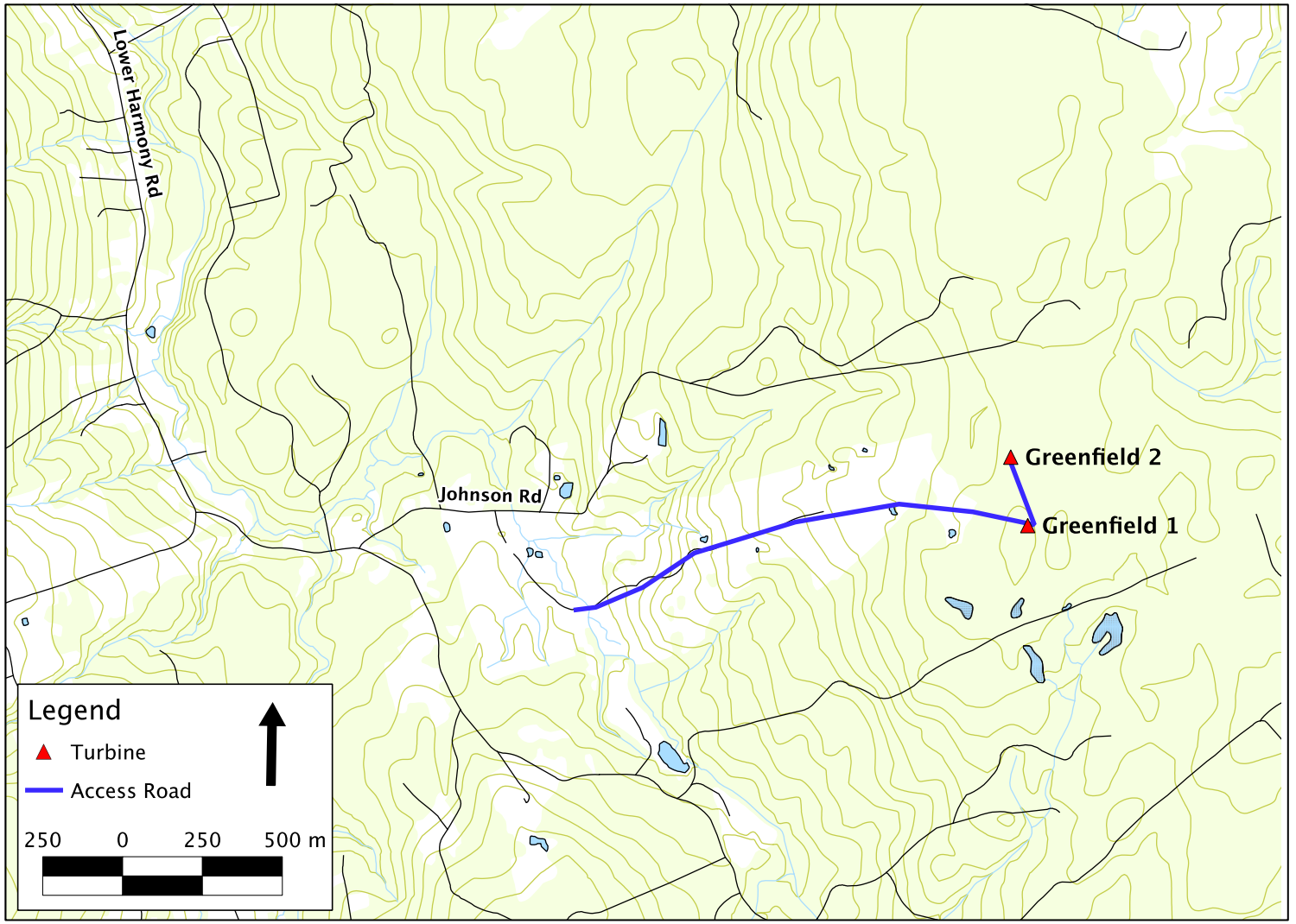

Figure 2.0-1: Map of the proposed wind project development.

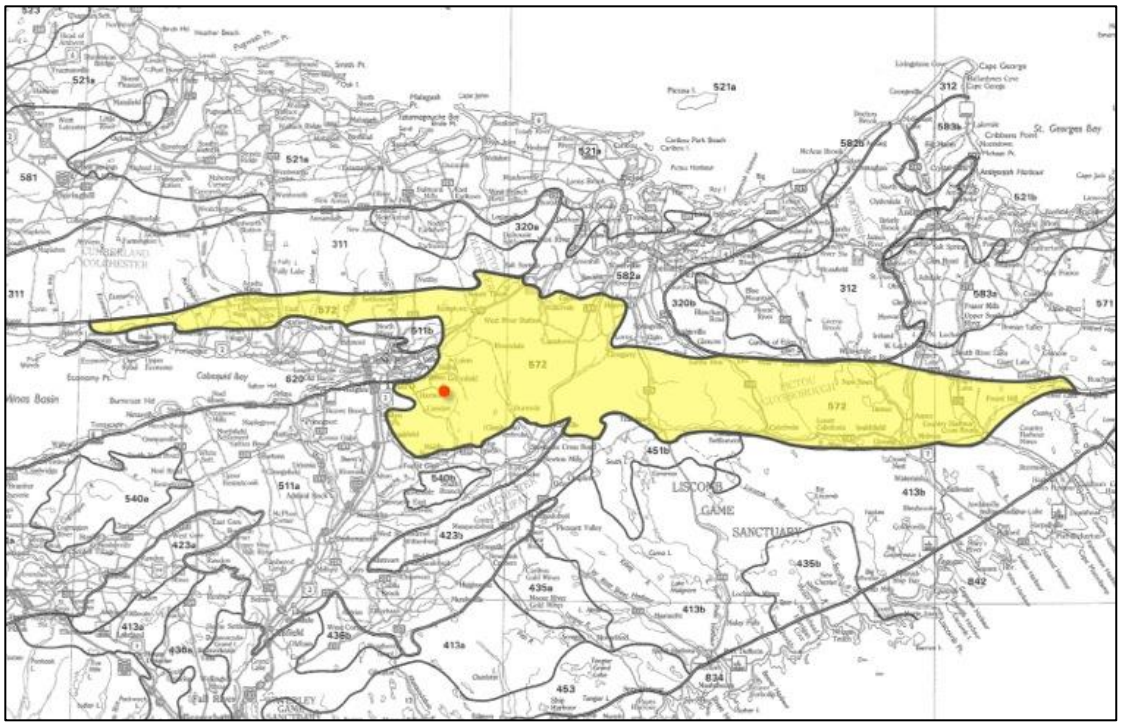

Figure 2.0-2: Natural Theme Regions of Nova Scotia, showing region #572 (highlighted in yellow) – Carboniferous Lowlands, St. Marys Fault Block sub-unit.[2] The approximate location of the study area is indicated in red.

3.0 Methodology

A historic background study was conducted by Davis MacIntyre & Associates Limited in October 2013. Historical maps and manuscripts and published literature were consulted as well as previous archaeological assessments in the general vicinity. The Maritime Archaeological Resource Inventory, a database of known archaeological resources in the Maritime region, was searched to understand prior archaeological research and known archaeological resources neighboring the study area. Finally, a field reconnaissance was conducted in order to further evaluate the potential for archaeological resources.

3.1 Maritime Archaeological Resource Inventory

The Maritime Archaeological Resource Inventory was consulted in order to determine if known archaeological sites or resources exist within or near the study area. Eleven sites were found in the general area of Colchester County, although none were found in close proximity to the study area.

[2] Adapted from Davis and Browne, 1996.

A celt fragment was recovered as an isolated find in the Salmon River near Valley Station (BiCt-01), and a biface was also reported eroding from the bank of the same watercourse at Riversdale (BiCs-01). Another isolated find, a spurred end scraper, was recovered from Bible Hill at the site of the former Nova Scotia Agricultural College (now a branch of Dalhousie University) (BiCt-04). This find suggests the presence of a Palaeo-Indian site.

A general activity precontact site is known in Truro, near the shopping mall east of the Robie Street Cemetery (BiCt-02). A second general activity site has been identified on Churchill Street based upon a quartzite biface fragment and other detritus recovered from a garden plot (BiCt-03).

A mill and smithy complex is known in Bible Hill along Farnham brook, originating in the late eighteenth or early nineteenth century (BiCt-05). Three historic domestic sites are known in Kemptown, near the Colchester Waste Management Facility (BiCs-02, 03, and 04).

Lithic material indicating two more general activity precontact sites were reported in Middle Stewiacke (BhCt-01) and Brookfield (BhCt-02) to the south of the study area.

The lack of recorded archaeological resources in close proximity to the study area is likely an indication of a lack of detailed archaeological surveys being completed in the region, rather than a lack of archaeological resources.

3.2 Historic Background

3.2.1 The Precontact Period

The history of human occupation in Nova Scotia has been traced back approximately 11,000 years ago, to the Palaeo-Indian period or *Sa'qewe'k L'nu'k* (11,000 – 9,000 years BP). The only significant archaeological evidence of Palaeo-Indian settlement in the province exists at Debert/Belmont in Colchester County.

The *Saqiwe'k Lnu'k* period was followed by the *Mu Awsami Kejikawe'k L'nu'k* (Archaic period) (9,000 – 2,500 years BP), which included several traditions of subsistence strategy. The Maritime Archaic people exploited mainly marine resources while the Shield Archaic concentrated on interior resources such as caribou and salmon. The Laurentian Archaic is generally considered to be a more diverse hunting and gathering population.

The Archaic period was succeeded by the Woodland/Ceramic period or *Kejikawek L'nu'k* (2,500 – 500 years BP). Much of the Archaic way of subsistence remained although it was during this period that the first exploitation of marine molluscs is seen in the

archaeological record. It was also during this time that ceramic technology was first introduced.

The Woodland period ended with the arrival of Europeans and the beginning of recorded history. The initial phase of contact between First Nations people and Europeans, known as the Protohistoric period, was met with various alliances particularly between the Mi'kmaq and French.

The Mi'kmaq inhabited the territory known as *Mi'kma'ki* or *Megumaage*, which included all of Nova Scotia including Cape Breton, Prince Edward Island, New Brunswick (north of the Saint John River), the Gaspé region of Quebec, part of Maine and southwestern Newfoundland (Figure 3.2-1). A significant portion of Nova Scotia including Halifax, Lunenburg, Kings, Hants and Colchester Counties was known as *Sipekni'katik* meaning "wild potato area".[3]

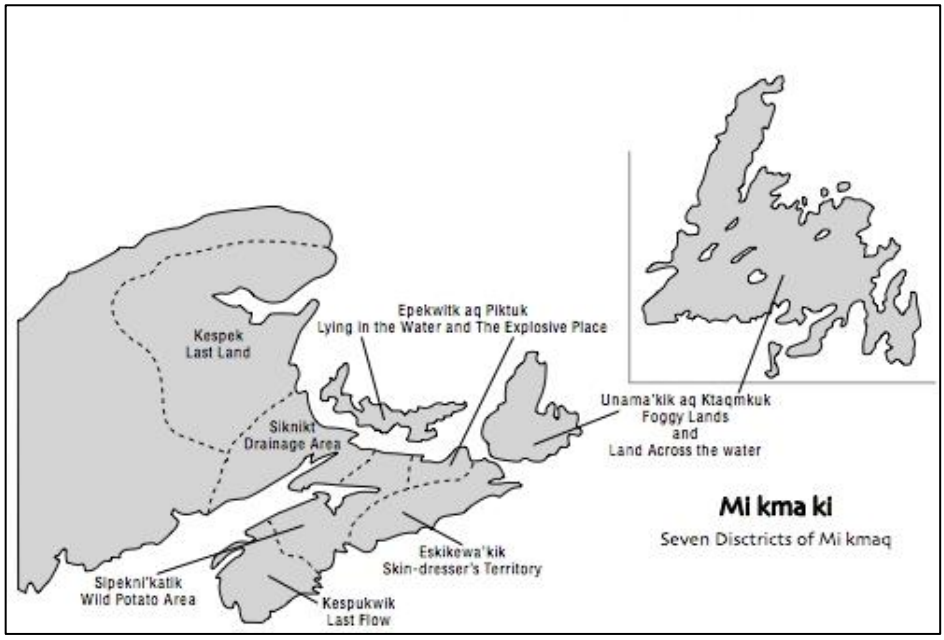

Figure 3.1- 1: Map of the Mi'kmaki territories.[4]

The Mi'kmaq inhabited several areas of the Cobequid region when the first Europeans arrived. Most notably were their occupations at Bible Hill, along the shore of Salmon River and in the midst of the present-day town of Truro.[5] There was also Mi'kmaq occupation on the north side of Cobequid Bay at Newville Lake near Halfway River and at Franklin Manor, which is now a designated reserve.

In the 18th and early part of the 19th century, Mi'kmaq were encamped along the shores of the Salmon River. The land on which they were situated was sold in 1855 to the School

[3] Confederacy of Mainland Mi'kmaq, 2007:11.
[4] Confederacy of Mainland Mi'kmaq, 2007:11.
[5] Creighton, 1979:11.

of Agriculture and the Mi'kmaq were subsequently moved to property on King Street in the town and it became known as Christmas Crossing. As the town of Truro grew throughout the late 18th and 19th centuries, woodlands traditionally used by the Mi'kmaq began to disappear. In 1873, the Mi'kmaq petitioned the Federal Government, through the Indian Agent, to have their settlement removed to a more desirable location in the Hilden area. In 1875, the Millbrook reserve was set off for the inhabitants and took in 35 acres. It was later expanded to encompass a further 120 acres. Today, the reserve is still located to the southwest of the town of Truro and takes in land on the east and west sides of Highway 102, as well as land in Cole Harbour, Sheet Harbour, and Beaver Dam.[6]

3.2.2 European Settlement

The earliest European activity in the Cobequid Bay area consisted of early 18th century Acadian settlements. In 1689, King Louis XVI of France granted 12 miles of land, including the present day area of Truro, to Matheui Martin. [7] By 1703, nineteen families are listed as living in the Cobequid area according to the French census. [8] These settlements grew throughout the 18th century, and Acadian villages were found all along the Cobequid Bay. The closest villages to the study area were *Vil Bois Brule* and *Vil Aucoin*.

In 1755, the deportation of the Cobequid area occurred in two phases. In the first phase, two separate British forces were sent though the area in August. One, lead by Abijah Willard, crossed overland from Fort Cumberland and emerged along the Minas Basin shore at Portapique. Willard and his men were under orders to burn and destroy the Tatamagouche area of Cobequid so as to stop the flow of goods and supplies to Louisbourg. However, they did not touch the other area of Cobequid along the Minas Basin, probably to avoid prematurely warning the other Acadian settlements of the deportation plan. Willard and his men returned to Fort Cumberland on August 26.[9]

Captain Thomas Lewis made a second trip to the Cobequid area on September 15, to carry out deportation plans and burn all the buildings and Acadian infrastructure. Sometime later, he drew a map of the area, showing the location of the Acadian settlements (Figure 3.2-1). By the time Lewis reached the area, however, all of the Acadians had fled the area, presumably warned of what had happened in Grand Pré, Pisiquid and Tatamagouche. *Vil Bois Brule* and *Vil Aucoin* are not specifically mentioned to have been found deserted, but it is assumed that any inhabitants who had not previously departed the area for French territory did so in August and September 1755. Lewis burned down all the Acadian structures he could find.[10]

[6] Millbrook First Nation <url>.
[7] Creighton, 1979:15.
[8] Hebert <url>
[9] Landry <url>
[10] Landry <url>

Figure 3.2- 1: Captain Lewis' 1755 map of the Cobequid area with the approximate study area shown in red.[11]

After the Deportation of the Acadians, the British desired to settle the former Acadian farmlands. In 1758, an official proclamation was made in the "Boston Gazette" with the promise of free passage, free land, and provisions for one year.[12]

In the fall of 1759, about 20 men came from New England to settle in Truro and nearby Onslow. They erected small huts on the site where the town of Truro now stands, and in nearby areas. They removed to New England for the winter and returned to Nova Scotia in the spring of 1761 with their families. On October 9, 1761 Colonel Alexander McNutt arrived in Halifax with a shipload of Irish immigrants who set out for the Cobequid region in the spring of 1762. The fertile intervales of Truro and Onslow along with the marsh and uplands on both sides of Cobequid Bay were dotted with houses. In 1763, there were 60 families reported in Truro and in 1765, there were 70. It was in that year they obtained a grant for the whole of the Township which contained about 80,000 acres of land.[13]

The study area falls just to the east of the Truro Township on land that was originally granted to William, Thomas, Charles and Robert Pearson (Figure 3.2-2). It is unclear the date of this grant, as record of it could not be found at the Nova Scotia Archives. The

[11] Lewis 1755.
[12] Creighton, 1979:19-22.
[13] Miller 1873:14-15.

Harmony and Greenfield area was, however, settled in the early 19th century. The first settlers in Greenfield received their grants in 1814-1815. They were mainly Scottish and the surnames Whidden, Dickson and Braynoin were common ones in early Greenfield. In Harmony, the first settler, John Smith, received his grant in 1821.[14]

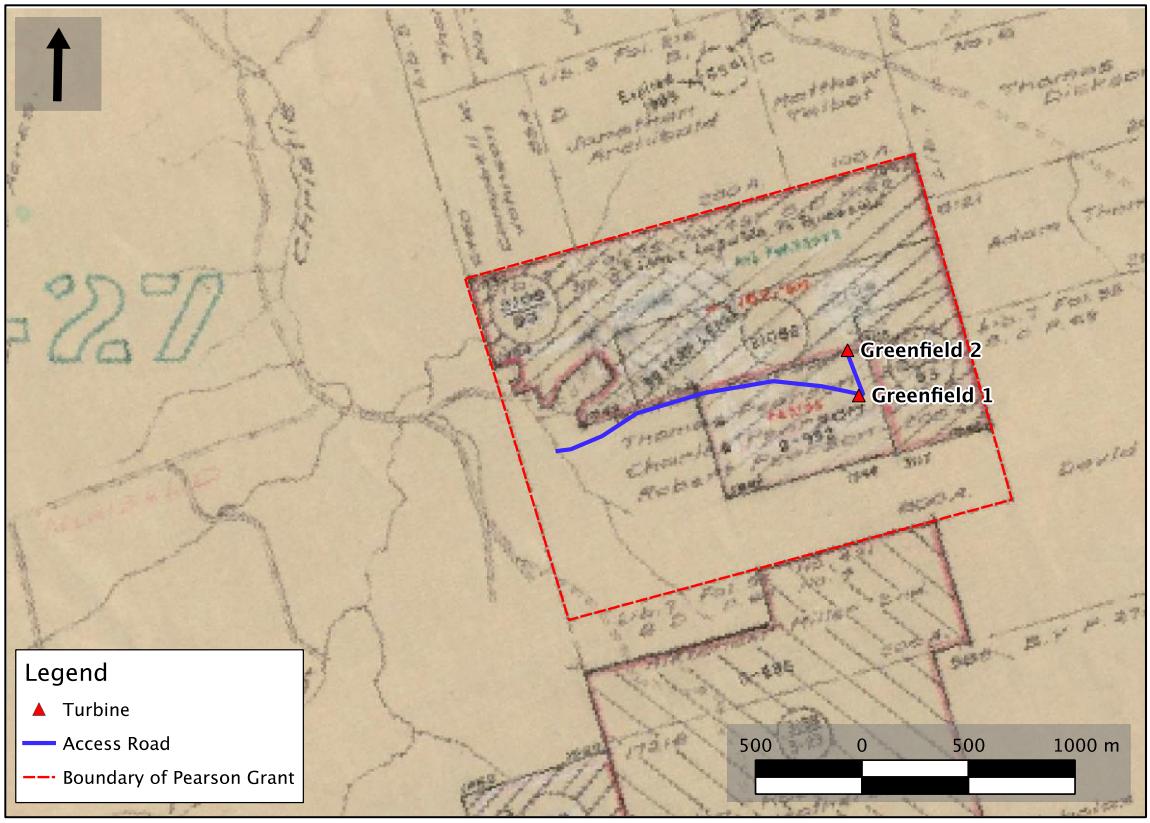

Figure 3.2- 2: Georeferenced map of original land grants in Colchester from the Crown with the proposed development overlaid.[15]

Ambrose F. Church's map of Colchester County in 1874 indicates that there was little settlement in the vicinity of the study area. The A.F. Church map of 1874 indicates that the area was not extensively settled in the 19th century (Figure 3.2-3). While houses and a few sawmills are depicted in the area, the location of the wind farm development is depicted as empty.

[14] Fergusson 1967: 259, 280.
[15] Nova Scotia Department of Lands and Forests, 2009.

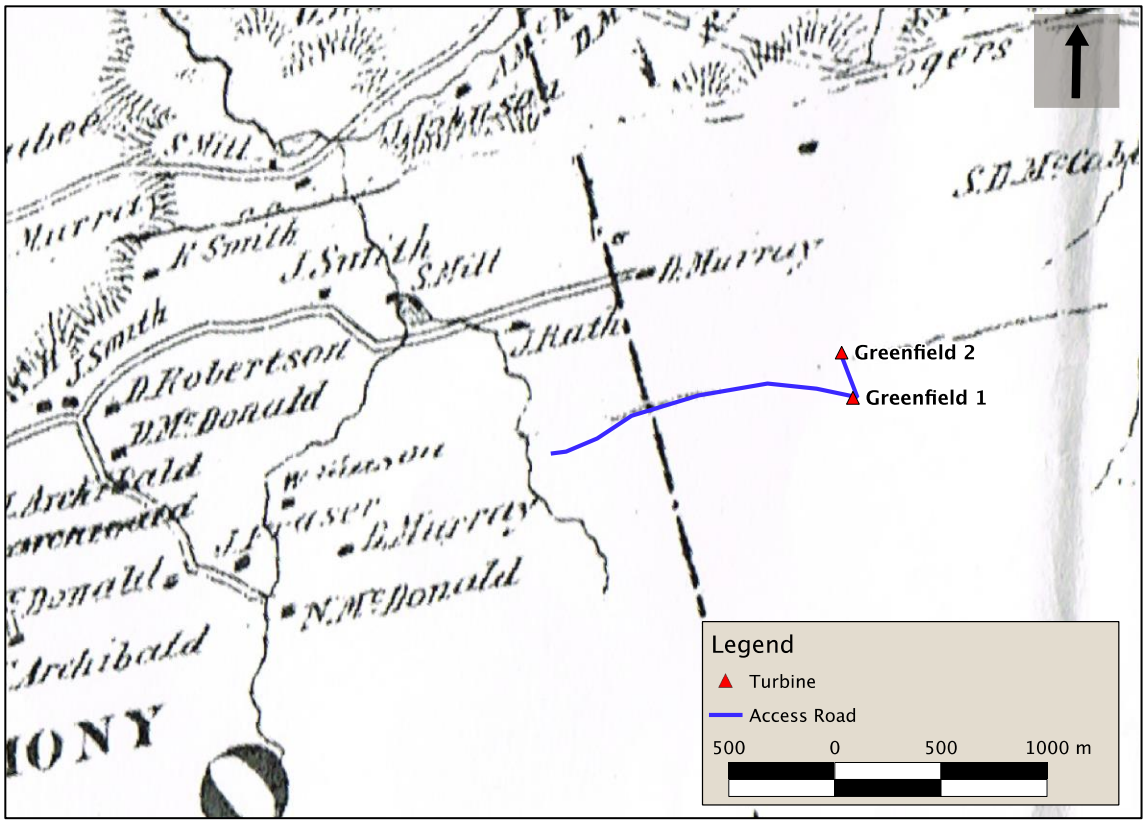

Figure 3.2- 3: Georeferenced part of Ambrose F. Church's map of Colchester County in 1874 with the proposed development overlaid.

By the end of the 19th century, the area had begun to grow, probably due to an expanding lumber industry. A Presbyterian church was built in Harmony in 1881 and a meeting house for Baptists, Presbyterians and Methodists was built in Greenfield in 1889.The main industries in the area were farming and lumbering. The longstanding importance of the lumber industry is reflected in the Geological Survey Map of Canada, 1902, which depicts multiple saw mills throughout the area (Figure 3.2-4). The Geological Survey Map also highlights the expanding habitation in the area, with more roads and buildings depicted. The study area itself, however, is mainly outside of any depicted settlement. The beginning of the access road is located near to a sawmill site.

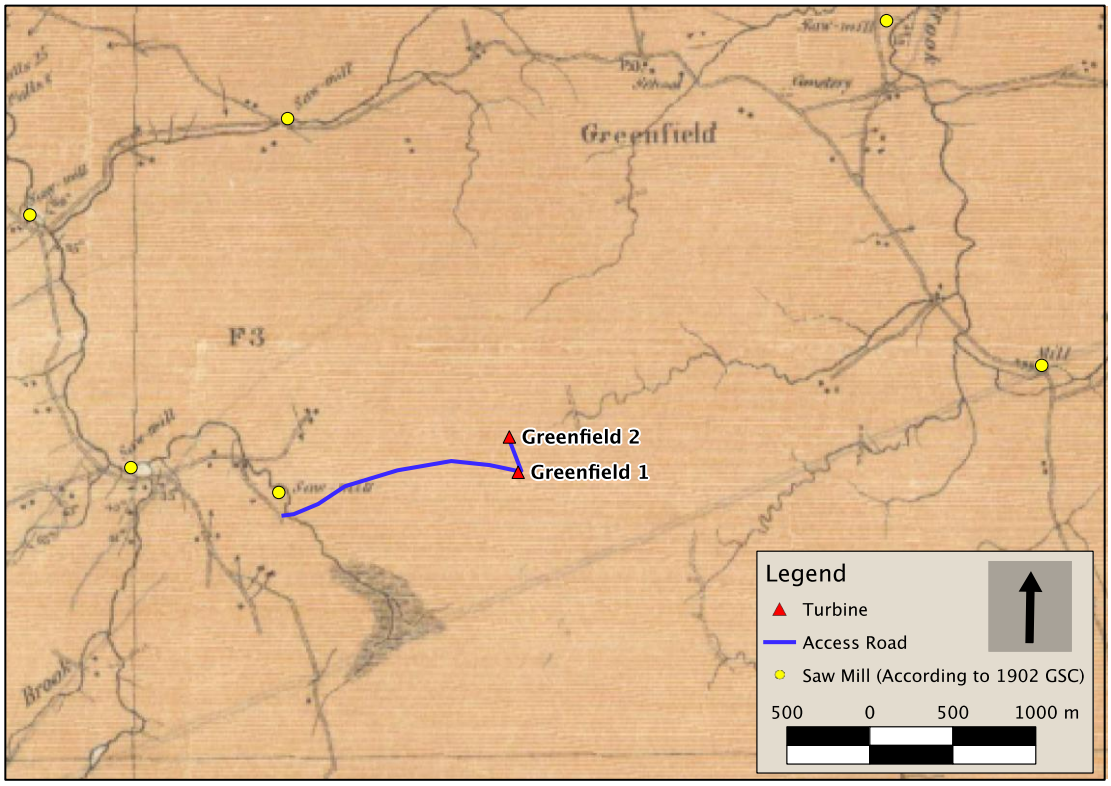

Figure 3.2- 4: The 1902 Geological Survey of Canada map of the Truro area, Colchester County with the georeferenced location of the development. Note the presence of multiple saw mills in the area, including one in close proximity to the access road.

Parts of the study area were leased in the 1940s (Figure 3.2-5). While the leasee is listed only as "Riverdale", a search of the Truro phone directory for 1949 revealed a logging company called Riverdale Logging that operated out of Truro.

3.3 Field Reconnaissance

An archaeological field reconnaissance was conducted on 7 October 2013. The reconnaissance was facilitated by a hand-held GPS and GPS data supplied by the proponent. Detailed field notes and photographs were taken. A total of 1.7 kilometers of proposed access road was surveyed, including approximately 1.07 kilometers of access road located along an existing dirt farm road. The two proposed turbine sites were also surveyed.

The access road connects to a farm driveway, which in turn, connects to Johnson Road. The beginning of the access road was marked by a watercourse that did not appear to be navigable (Plate 1). This watercourse is where the saw mill depicted on the 1902 Geological Survey Map was located, although there were no observable signs of the mill.

Based on the georeferencing, the mill appears to have been located to the north of the access road, where cattle fields, farm equipment and barns are currently located (Plate 2).

The access road continued up the slope, roughly following a dirt farm track. The access road continues through several cow pastures (Plate 3) and ends at the edge of an area of low wetland where the meteorological tower is located (Plate 4). Investigation of the exposed soils in the area of the MET tower indicated very rocky soil with exposed till (Plate 5). No heritage resources were noted in the disturbed soils.

The access road continues through the area of wetland to a high ridge where it connects with a dirt ATV track. Turbine 1 candidate site is located on the ATV trail on this ridge (Plate 6). The area has been clear cut and the vegetation is mainly scrub maple, with grass and fern understory. The soil appears to be derived from red sandstone and contained some pieces of natural quartz. No signs of agriculture or other cultural activity were noted, aside from the fairly recent logging and the ATV trail.

The access road continues to the northwest of the turbine 1 candidate site into a low-lying wet area and then onto another high ridge of land. The turbine 2 candidate site is located on this second ridge of high land (Plate 7). The ridge is surrounded by low wetland on the southeast side and an ATV trail cuts through the ridge. The area has been clear cut and the vegetation is mainly scrub trees with grass understory. Small pieces of natural quartz were observed in the rocky soil, which was sandstone derived. No signs of ploughing or agriculture were noted and the only observable cultural activities were the ATV trail and signs of logging.

4.0 Results and Discussion

There is no evidence of historic cultural activity in the impact areas, aside from existing pasture currently in use. The only other indications of cultural activity were found to be fairly modern, consisting of ATV trails and signs of logging within the past decade.

Although the 1902 Geological Survey Map depicts a saw mill close to the beginning of the access road, no indication of the saw mill was observed during the reconnaissance. Based on the georeferencing, it is likely that the saw mill was located where cow barns, farm buildings and equipment are currently situated.

5.0 Conclusions and Recommendations

Avoidance is the preferred method of mitigation in all instances where archaeological resources are present. The field survey and background study identified only one potential archaeological resource near the development. This resource, a saw mill, appears to be located to the north of the access road along the watercourse crossing. Provided the access road layout does not change, impact to the saw mill site should be avoidable.

No further mitigation is recommended. However, in the event that additional archaeological features are encountered during ground disturbing activities, it is required that all activity cease and the Coordinator of Special Places (902-424-6475) be contacted immediately regarding a suitable method of mitigation.

Finally, should development plans change so that areas not previously assessed by archaeologists are to be impacted, it is recommended that those areas be subjected to an archaeological assessment by a qualified archaeologist. Likewise, if it is anticipated that those resources of archaeological significance are expected to be impacted, it is recommended that a strategy for their mitigation be developed prior to ground disturbance.

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PLATES

Plate 1: Looking southeast over culverts and watercourse at the beginning of the access road.

Plate 2: Looking north down the watercourse. The saw mill is believed to be located further north on the western bank (out of frame).

Plate 3: A view of the dirt farm road looking west through a cow field towards the met tower.

Plate 4: The met tower (right) and end of the dirt farm road, approximately marked by the gold truck (left), looking east over the wetland area.

Plate 5: Exposed soil around the met tower, looking east.

Plate 6: Proposed site of Turbine 1, looking south.

Plate 7: Proposed site of Turbine 2, looking northeast.

APPENDIX A:
Heritage Research Permit

NOVA SCOTIA

Heritage Research Permit (Archaeology)

Office Use Only
Permit Number:
A2013NS086

Special Places Protection Act 1989

(Original becomes Permit when approved by Communities, Culture and Heritage)

Greyed out fields will be made publically available. Please choose your project name accordingly

Surname Glen	First Name Courtney
Project Name Greenfield Wind Farm	
Name of Organization Davis MacIntyre & Associates Limited	
Representing (if applicable)	
Permit Start Date 02 October 2013	Permit End Date 31 December 2013
General Location: Lower Harmony, Colchester County	

Specific Location: *(cite Borden numbers and UTM designations where appropriate and as described separately in accordance with the attached Project Description. Please refer to the appropriate Archaeological Heritage Research Permit Guidelines for the appropriate Project Description format)*

20 T 489054 E 5021679 N (Turbine #1)

Permit Category:
Please choose one

- ☐ Category A – Archaeological Reconnaissance
- ☐ Category B – Archaeological Research
- ☑ Category C – Archaeological Resource Impact Assessment
- ☑ I certify that I am familiar with the provisions of the *Special Places Protection Act* of Nova Scotia and that I have read, understand and will abide by the terms and conditions listed in the Heritage Research Permit Guidelines for the above noted category.

Signature of applicant MacIntyre for Courtney Glen — Date 18 September 2013

Approved by Executive Director — Date Sept 23-13

Appendix I

Bat Population Study

Characterization of the magnitude of bat activity at the proposed Greenfield (Weatherby Ridge) Wind Energy Project, Colchester County, NS

Final Report Prepared for:
RMS Energy
1383 Mt. Thom Rd.
Salt Springs, Nova Scotia

Attn: Lisa Fulton
Environmental Lead and Project Coordinator

Prepared By:
Lynne Burns, M.Sc.
Hugh Broders, Ph.D.

Department of Biology
Saint Mary's University
Halifax, Nova Scotia
B3H 3C3

November 2013

Table of Contents

Table of Figures

Table of Tables

Context

Project Background

Affinity Renewables (LLC), with oversight from RMS Energy, is proposing to install two GE 1.6 megawatt (MW) wind turbines on Weatherby Ridge, near the community of Greenfield, Colchester County, Nova Scotia. The project is in an early phase with wind monitoring onsite at a meteorological tower.

Commercial scale wind energy production is one of the fastest growing sectors of the global energy industry as the demand for renewable energy sources for electricity generation continues to increase (Nelson 2009). This demand, combined with recent advances in wind turbine technology that have improved the cost-competitiveness of wind energy, has led to a global increase in the number of wind energy installations. In Canada, energy production and regulation falls under provincial jurisdiction and thus most renewable energy targets are set at the provincial level. In the province's Renewable Electricity Plan , the Provincial Government of Nova Scotia has set an aggressive target of 40% of the province's electricity needs to be met by renewable energy by the year 2020 (Nova Scotia Department of Energy 2010). Of this amount, 25% has been set as coming from made-in-Nova Scotia sources by 2015, and the wind energy sector is anticipated to be the largest contributor in meeting these goals. The Greenfield project is part of the Community Feed-In Tariff program (COMFIT) of the Renewable Electricity Plan which facilitates small-scale, local renewable projects that involve community groups.

Despite the many environmental benefits of electrical generation via wind energy, the rapid global growth of the wind energy sector has raised concerns regarding the impacts of these developments on both resident and migratory populations of wildlife (Arnett et al. 2008b). The documentation of large numbers of bat fatalities at wind energy facilities is a relatively recent development (Johnson 2005a), although is gaining considerable global attention. As a result, fatalities of bats have become a primary environmental concern associated with wind energy development.

Efforts to minimize conflicts between wildlife and wind energy have focused mainly on two areas: risk avoidance and impact mitigation (Weller and Baldwin 2012). Impact mitigation refers to those efforts focused on developing methods to reduce wildlife fatalities at operational wind facilities and does not apply to this project at this time. Risk avoidance involves conducting surveys prior to construction to avoid sites, or areas within sites, with high levels of usage by wildlife. The assumption of this approach is that low indices of activity prior to construction should result in low fatality rates post-construction since there should be fewer animals 'available' to be killed assuming that bats are not attracted to the infrastructure once built (Baerwald and Barclay 2009). As the planning phase proceeds for the development of the project, surveys of the wildlife at the proposed site are being undertaken to address any potential wildlife issues related to the development of the site. This document provides a summary of the echolocation survey undertaken for bats at the Greenfield Wind Energy Project in 2013.

Regulatory Context

The following legislation and policy were considered in relation to the proposed survey at the Greenfield Wind Energy Project:

- Federal Species at Risk Act (http://laws-lois.justice.gc.ca/eng/acts/S-15.3/page-1.html)
- Nova Scotia *Wildlife Act* (http://nslegislature.ca/legc/statutes/wildlife.pdf)
- Nova Scotia *Endangered Species Act* (http://www.novascotia.ca/legislature/legc/statutes/endspec.htm)

Additional resources that are relevant to the proposed surveys used include:

- Atlantic Canada Conservation Data Centre (http://www.accdc.com/)
- Wild Species The General Status of Species in Canada (http://www.wildspecies.ca/home.cfm?lang=e)
- Global Species Rankings (http://www.natureserve.org/explorer/)

Study Objectives

The objectives of this project were to:

(1) Provide information on the occurrence and relative magnitude of bat activity in the proposed development area, based on analysis of acoustic survey results;

(2) Provide relevant information on the resource requirements of local bat species that may be useful for the decision-making process on the proposed development; and

(3) Make relevant recommendations based on the results of this project and recent developments in the field of bats and wind energy.

Review of Key Issues

Background

Currently in Nova Scotia there are >150 wind turbines in operation (CanWEA 2013) and, as of yet, we are not aware of any incidents of major mortality, though bats have been killed. For context and qualification, most of these turbines have been in operation for only a short period of time (months to 7 years or less) and it is not known how thoroughly all existing operational turbines have been surveyed for bat fatalities or how well documented and reported the findings are. In the following sections we discuss the various means by which bats may be impacted by wind energy developments, including direct mortality, changes to habitat availability, and disruption of movement patterns (e.g., foraging, mating, migrations, or abandonment of sites).

Direct Mortality

Proximate causes of bat fatalities at wind energy developments may be due to direct strike by rotating turbine blades, collision with turbine towers, barotrauma or any combination of the three. Barotrauma involves tissue damage to the lungs due to rapid or excessive air-pressure reduction near moving

turbines blades (Baerwald et al. 2008, Cryan and Barclay 2009) and the discussion of the relative role of barotrauma in the death of bats at wind energy developments remains on-going (Grodsky et al. 2011, Capparella et al. 2012, Rollins et al. 2012). In North America, significant bat fatality events at wind energy developments occur primarily in the late summer and early fall, peaking during the period that coincides with fall migration (Johnson 2005b, Cryan and Brown 2007, Arnett et al. 2008a). These trends have led researchers to believe that migration plays a key role in the susceptibility of certain bat species to wind turbine fatalities (Cryan and Barclay 2009). Although some fatality has also been documented during the spring (Brown and Hamilton 2006, Arnett et al. 2008a), numbers are much lower, thought to be a result of more scattered migratory behaviour, or possibly the use of different routes compared to fall migration.

The species that have the largest number of kills at wind farms are the long-distance migratory bats, including the hoary bat (*Lasiurus cinereus*), the eastern red bat (*L. borealis*), and the silver-haired bat (*Lasionycteris noctivagans*). In North America, these species make up about 75-80% of the documented fatalities at wind energy developments, with the hoary bat alone comprising almost half (Kunz et al. 2007, Arnett et al. 2008a). The cumulative impacts of current mortality rates as a result of wind turbines on these affected species could have long-term population effects (Kunz et al. 2007). Bat fatalities have also been reported for resident hibernating bat species, including the big brown bat (*Eptesicus fuscus*), the little brown bat (*Myotis lucifugus*), the northern long-eared bat (*M. septentrionalis*), and the tri-colored bat (*Perimyotis subflavus*) (Nicholson 2003, Johnson 2005b, Jain et al. 2007, Arnett et al. 2008a). At some sites in the eastern United States high numbers of fatalities of these resident, hibernating species have been reported (Kunz et al. 2007).

Various explanations for the high incidence of bat fatalities at wind energy developments have been proposed (Johnson 2005b, Kunz et al. 2007, Arnett et al. 2008a, Cryan and Barclay 2009). Estimates of the number of bat fatalities vary widely from less than 3 bats/turbine/year (Johnson et al. 2003, Johnson et al. 2004) to upwards of 50 bats/turbine/year (Nicholson 2003, Kerns et al. 2005, Jain et al. 2007). Given the considerable variability in species composition and rates of bat fatalities among wind energy facilities, it is likely that location-specific qualities of individual facilities are important (e.g., located along migration routes or other flight corridors). It has also been proposed that the use of turbines with increasing height has extended developments further into the flight space used by migrating bats (Barclay et al. 2007). However, behavioural observations of bats displaying flight patterns typical of foraging activity prior to collisions with turbines (Horn et al. 2008) may suggest that bats are actively foraging which may mean that foraging while migrating may take place for some individuals. Others have hypothesized that collisions may result from bats being attracted to turbines out of curiosity, misperception (failure to avoid a detected obstacle or interference with perception of an obstacle), or as potential feeding, roosting, and mating opportunities (reviewed in Cryan and Barclay 2009). To date, the cause(s) of bat fatalities at turbines remains unclear and is an active area of research.

As mortalities may be the result of site-specific and design-specific characteristics and conditions, it is important to conduct site-specific monitoring studies to make reliable inferences on the potential impacts of a wind energy development on local bat populations (American Society of Mammalogists 2008).

Habitat Availability

In forested landscapes, habitat availability for bats may be impacted by the alteration or removal of vegetation to accommodate roads and wind turbine installations. This may include the direct loss of

resources (e.g., roost trees), fragmentation of habitat components (e.g., foraging and roosting areas), or other disturbance that may cause bats to vacate certain areas, likely acting to degrade the local environment for bat colonies/populations that reside in the area during the summer. This negative impact of new wind energy developments is likely to occur, and will contribute to the cumulative effect of habitat loss that is occurring throughout the range of most bat species.

At the site level, small-scale clearings in forested landscapes have been shown to attract certain bat species, which use these areas for foraging (Grindal and Brigham 1998, Hayes and Loeb 2007). Removal of vegetation can create edges and small clearings which can act to concentrate prey for bats. The extent to which this loss of vegetation can be perceived to be beneficial to bats is not known and will vary from site to site, as there must be a balance between the availability of suitable roosting resources with the availability of suitable foraging areas within commuting distance to provide conditions that favour the occupancy of resident bat species (Henderson and Broders 2008).

Movement Patterns

From the perspective of bat movement, resident bats may be affected by wind energy developments through alterations to foraging areas and possible disruption of commuting movements between roosting and foraging areas. There is some genetic evidence to suggest that bat movements can be impeded by fragmentation of habitat, which can scale up to population or distributional level effects (Kerth and Petit 2005, Meyer et al. 2009). However, this is not well understood for most species.

Little is known about the dynamics of movement (e.g., altitude, travel routes, frequency of visitation) of resident, hibernating bats to and from hibernation sites. Anecdotal evidence suggests that bats likely use ridges and other linear landscape elements (e.g., riparian corridors) as travel routes, depending on the landscape (Arnett 2005, Lausen 2007, Furmankiewicz and Kucharska 2009). In the late summer and early autumn large numbers of bats congregate at the entrances to underground hibernacula in an activity referred to as ‘swarming’ (Davis and Hitchcock 1965, Fenton 1969, Thomas and Fenton 1979, Glover and Altringham 2008). During the swarming period bats do not roost in hibernacula; research being conducted in Nova Scotia indicates that resident bats are ‘on the move’, roosting transiently on the landscape (Lowe 2012), though we do not have a full understanding of the dynamics of these behaviours. Swarming may serve several functions, including courtship, copulation, and orienting young-of-the-year to over-wintering sites (Fenton 1969, Thomas and Fenton 1979).

Movement data from Ontario and Manitoba suggests that resident bats may move up to at least 120 km between hibernacula within a year, and up to at least 500 km between years (Fenton 1969, Norquay et al. 2013). In New England, there are records of bats moving 214 km between hibernacula within one year, with one female moving 128 km in only three nights during spring emergence from hibernation (Davis and Hitchcock 1965). Obviously these resident hibernating species are at least capable of large scale migratory movements on the order of hundreds of kilometers. It is not known whether flight behaviour (e.g., height, routes, etc.) during this time differs from when resident species are in their summering area; the paucity of information on this aspect of their biology would appear to be one of the largest impediments in accurately predicting the impact of wind energy developments on local bat populations (Weller et al. 2009).

Bats in Nova Scotia

Nova Scotia Bat species

In Nova Scotia there are occurrence records for seven species of bats (Table 1; van Zyll de Jong 1985, Broders et al. 2003, Segers et al. 2013), and each have been documented to have experienced fatalities at wind turbine sites (Arnett et al. 2008a). There are three species of long-distance migratory bats recorded in the province, the hoary bat, the eastern red bat, and the silver-haired bat. These three species have extensive distributional ranges throughout North America, with Nova Scotia at or near their northern range limit (van Zyll de Jong 1985). Low numbers of echolocation recordings of the long-distance migratory species in Nova Scotia by Broders (2003) and other unpublished work suggests that there are no significant populations or large scale migratory movements of these species in the province, but they do occur regularly and are often associated with coastal or off-shore occurrences (Cryan and Brown 2007, Czenze et al. 2011, Segers et al. 2013). Two species of bats in the genus Myotis, the little brown bat and the northern long-eared bat, are the only abundant and widely distributed bats in Nova Scotia (Broders et al. 2003, Henderson et al. 2009). These 5–8g insectivorous bats are sympatric over much of their range (Fenton and Barclay 1980, van Zyll de Jong 1985, Caceres and Barclay 2000). A third species, the tri-coloured bat, has a significant population in the province, however they are likely restricted to southwest Nova Scotia (Broders et al. 2003, Rockwell 2005, Farrow and Broders 2011). These three species are gregarious species that over-winter in caves and abandoned mines in the region (Moseley 2007, Randall 2011). There is only one unconfirmed observation of the big brown bat, also a gregarious species, hibernating at a cave in central mainland Nova Scotia (Taylor 1997).

Ecology of Resident Species

Northern long-eared and little brown bats are expected to be the most likely species to occupy the proposed development area. The life history of both of these species is typical for temperate, insectivorous bats. Their annual cycle consists of a period of activity (reproduction) in the summer, and a hibernation period in the winter. Females of the two species bear the full cost of reproduction in the summer, from pregnancy to providing sole parental care to juveniles (Barclay 1991, Hamilton and Barclay 1994, Broders 2003).

The northern long-eared bat is a forest interior species that primarily roosts and forages in the interior of forests (Broders 2003, Jung et al. 2004, Henderson and Broders 2008). Females form maternity colonies, roosting in coniferous or deciduous trees, depending on availability (Foster and Kurta 1999, Broders et al. 2006, Garroway and Broders 2008). Males typically roost solitarily in either deciduous or coniferous trees (Lacki and Schwierjohann 2001, Jung et al. 2004, Ford et al. 2006). The little brown bat is a generalist species that is associated with forests, as well as human-dominated environments (Barclay 1982, Jung et al. 1999). This species has been found to forage over water and in forests (Anthony and Kunz 1977, Fenton and Barclay 1980), and both males and females (i.e., maternity colonies) have been documented roosting in both buildings and trees (Crampton and Barclay 1998, Broders and Forbes 2004). During the summer, it appears that most of the commuting and foraging activity of northern long-eared and little brown bats occurs close to the ground (Broders 2003). Nonetheless, our ability to survey bat activity at high altitudes is extremely limited, and therefore our ability to make inference on the vertical distribution of bats is also limited.

A third species that occurs in significant numbers in Nova Scotia, the tri-colored bat, is not likely to occur in the proposed development area (Farrow and Broders 2011). In Nova Scotia, work that we have done in Kejimkujik National Park suggests that this species roost in Usnea lichen species and forages over waterways (Poissant et al. 2010).

White Nose Syndrome

In 2012, three species of bats found in Nova Scotia were listed by COSEWIC as Endangered, and in 2013 were listed as Endangered by the Province of Nova Scotia. This is primarily due to the spread of an emerging infectious disease known as White Nose Syndrome (WNS) that is responsible for unprecedented mortality in hibernating bats through much of eastern North America (Blehert et al. 2009, United States Fish & Wildlife Service 2012). The condition is caused by *Pseudogymnoascus destructans* (formerly *Geomyces destructans)*, a cold-loving fungus that thrives in cave conditions and as such, impacts bat population directly during the winter hibernation period (Lorch et al. 2011, Blehert 2012, Minnis and Lindner 2013). It is thought to disrupt patterns of torpor which results in death by starvation or dehydration (Cryan et al. 2010, Reeder et al. 2012, Warnecke et al. 2013). First documented in New York State in 2006 (Blehert et al. 2009), WNS spread rapidly to 19 states and four Canadian provinces by 2011 and is thought to be responsible for the death of more than 5.5 million bats (United States Fish & Wildlife Service 2012). White Nose Syndrome has been confirmed among populations of seven species of bats; the little brown bat, the most abundant species in the region currently affected by WNS, has experienced the most dramatic population declines (Frick et al. 2010). Some hibernacula have seen mortality rates of 90 to 100 percent of resident hibernating bats as a result of infection with WNS (United States Fish & Wildlife Service 2012), leading researchers to believe that WNS could lead to local extinctions of the little brown bat, as well as other species (Frick et al. 2010).

White Nose Syndrome was first documented in Nova Scotia in April 2011 and declines of 80% to 99.9% have since been recorded in winter populations (Broders and Burns, unpublished data). Therefore it would be prudent to protect any surviving animals that may be genetically predisposed to surviving the infection. Even prior to WNS, bats were increasingly recognized as a conservation priority in North America. Now, in consideration of the sharp declines and rapid spread of WNS, serious concerns have been raised about the impact of WNS on the population viability of affected bat species, consequently impacting the conservation status of bat species at the local, national and global level (Table 1). Given that hibernacula represent one of the more critical resources for bats, as they allow successful over-wintering, they are important to protect.

Potential for Hibernacula

The Nova Scotia Proponent's Guide to Wind Power Projects (Nova Scotia Environment 2012) states that wind farm sites within 25 km of a known bat hibernacula have a 'very high' site sensitivity. There are no known hibernacula within 25 km of the Greenfield Wind Energy Project area (Moseley 2007, Randall 2011). The nearest known major bat hibernaculum is Hayes Cave, the largest hibernaculum in NS, which is located in Maple Grove approximately 32 km from the proposed development area. At approximately 43 km away is Lear Shaft, located in Londonderry in an area with extensive underground mine workings and a number of mine openings. There are no underground records of hibernating bats from this site (owing to the structure of the site, a now-gated vertical shaft). In sampling on 7 nights in the autumns of 2009 and 2010, bat captures using harp traps resulted in an average of 8 bats captured per sampling

hour indicating this is a fall swarming site (Burns unpublished data). Overwinter surveys for white-nose syndrome monitoring in 2012 yielded the collection of bat carcasses around the mine opening in winter demonstrating this site is a hibernaculum.

According to the Nova Scotia Abandoned Mine Openings Database (Fisher and Hennick 2009), there are 26 underground abandoned mine opening records in the vicinity of the Greenfield project (within 25 km) . Of these, the records suggest that 21 of the records have original depths of 21m or less and/or filled in suggesting they would be unsuitable as hibernacula. Of the remaining 5 sites, 2 have been filled in (KPT-1-025 and EMM-1-001) leaving three openings to be potentially explored for bat activity (BRF-1-002, SPB-1-003 and KPT-1-007). In 2010, Randall (2011) conducted ultrasonic monitoring at five sites in the vicinity of the proposed development area; at three closely situated adits at New Lairg, Pictou County, McLellan's Brook Cave, Pictou County and at Natural Bridge Cave, Colchester County. She concluded that none of these exhibited strong evidence of fall swarming activity by bats although there were captures of bats at Natural Bridge Cave on one sampling night.

Table 1. Over-wintering strategy and conservation status of bat species recorded in Nova Scotia

Species	Overwintering Strategy	Global Ranking[1]	COSEWIC Status	ACCDC status[3]	NSESA[4]
Little brown bat	Resident hibernator	G5	Endangered[2]	S1	Endangered
Northern long-eared bat	Resident hibernator	G4	Endangered[2]	S1	Endangered
Tri-coloured bat	Resident hibernator	G5	Endangered[2]	S1	Endangered
Big brown bat	Resident hibernator	G5	Not assessed	N/A	Not listed
Hoary bat	Migratory	G5	Not assessed	S1	Not listed
Silver-haired bat	Migratory	G5	Not assessed	S1	Not listed
Eastern red bat	Migratory	G5	Not assessed	S1	Not listed

[1] Global Ranking based on the NatureServe Explorer: G1 = Critically Imperiled, G2 = Imperiled, G3 = Vulnerable, G4 = Apparently Secure, G5 = Secure. All the above species were reassessed in July 2012.

[2] Assessed by COSEWIC and designated in an emergency assessment on February 3, 2012.

[3] Atlantic Canada Conservation Data Centre ranking, based on occurrence records from NB and NS: S1 = Extremely rare: May be especially vulnerable to extirpation (typically five or fewer occurrences or very few individuals).

[4] Listing status under the Nova Scotia Endangered Species Act: Endangered = a species facing imminent extirpation or extinction; species were reassessed in July 2013.

Methods

Study Area

The project area is located near the communities of Lower Harmony and Greenfield, Colchester County which is situated approximately 11 km from the town of Truro which has a population of 12,500 people. This area is within the Rolling Upland District of the Carboniferous Lowlands Theme Region (Davis and Browne 1996) and the Nova Scotia Highlands Ecoregion and St. Mary's Block Ecodistrict (Webb and Marshall 1999). This area contains upland slopes ranging from 100 to 300 m in elevation. Softwood forests dominate the area with scattered sugar maple, beech and yellow birch occurring on low ridges and spruces, balsam fir, red maple and eastern hemlock common on well-drained mid-slopes. Forestry is the dominant land use activity in the area with some small mixed farming.

Ultrasonic Surveys

We used two automated bat detectors (model Song Meter SM2Bat+, Wildlife Acoustics, Concord, MA) to sample at two locations within the proposed development area (Table 2). One detector was deployed adjacent to a meteorological tower with two microphones: one microphone recorded at 2 m off the ground and another microphone recorded at approximately 40 m above ground (high microphone). The second detector was deployed at a forest edge and used one microphone that was placed at about 3 m above ground. Microphones were oriented parallel to the ground, or slightly down to shed rain. The seasonal timing of sampling likely corresponded to the end of the summer residency period, movement of resident species to local hibernacula, and to fall migration by migratory species.

Three other bat detectors (Anabat, Titley Electronics, Ballina, NSW, Australia) were placed in the vicinity of the identified abandoned mine openings (AMO) from the Nova Scotia Abandoned Mine Openings Database (Brookfield, BRF-1-002; Smithfield, SPB-1-003; Kemptown, KPT-1-007: Table 2). These openings are approximately 11.3, 10.2 and 14.2km away from the proposed wind energy development, respectively.

Identification of many bat species is possible because of the distinctive nature of their echolocation calls (Fenton and Bell 1981, O'Farrell et al. 1999). Species were qualitatively identified from recorded echolocation call sequences by comparison with known echolocation sequences recorded in this and other geographic regions. All recorded bat call sequences from SM2Bat units were converted to zero-crossing file formats using Kaleidoscope™ software (Wildlife Acoustics) and were imported into AnalookW software (Titley Electronics, vs3.8v) for identification and analysis. Calls from Anabat units were directly used in AnalookW. In the case of species in the genus Myotis (northern long-eared and little brown bat), we did not identify sequences to the species level as their calls are too similar to be reliably separated. Call sequences that were clearly bat generated ultrasound, but could not be confidently classified due to poor quality of the recordings were classified as 'unknown'. As the unit of bat activity, we used the number of recorded echolocation files, which approximate an echolocation call sequence, defined as a continuous series of greater than two calls (Johnson et al. 2004). Because an individual bat may be recorded making multiple passes, the data presented represent a measure of bat activity, and cannot be used as a direct measure of the number of bats within or passing through an area.

Differences in bat call sequence detections, call quality and ultimately species identifications are known among different models of bat detectors. Recent comparisons have shown that Wildlife Acoustics SM2Bat units record more bat call sequence files than Anabat units (Allen et al. 2011, Adams et al. 2012) and these differences must be incorporated into the interpretations and inferences of data when using both detectors.

Table 2. Locations of ultrasonic survey sites for the 2013 survey of bat activity at the proposed Greenfield Wind Energy Project area, Colchester County, Nova Scotia. Coordinates are NAD83 UTM Zone 20T.

Site	Location	Site type	Coordinates		Deployed	Retrieved
1	Greenfield forest	Project Area	489050 E	5021380 N	30 Jul 2013	11 Oct 2013
2	Greenfield tower	Project Area	488927 E	5012647 N	30 Jul 2013	11 Oct 2013
3	Brookfield	Mine opening	481526 E	5013245 N	30 Jul 2013	21 Sep 2013
4	Smithfield	Mine opening	494061 E	5012824 N	30 Jul 2013	21 Sep 2013
5	Kemptown	Mine opening	494234 E	5034854 N	28 Aug 2013	09 Nov 2013

Table 3. Site descriptions for ultrasonic survey sites for the 2013 survey of bat activity at the proposed Greenfield Wind Energy Project area, Colchester County, Nova Scotia.

Site	Description
1	Forest edge site with the microphone located 3 m AGL oriented perpendicular to the edge.
2	Located at the meteorological tower which was in a clearing. One microphone was deployed 2 m off the ground and a second was 40 m AGL on the tower.
3	The exact location of the mine opening could not be located and was possibly filled in or collapsed. Regardless there was evidence of mine workings and a detector was deployed along a forest edge at the expected location of the opening and among the mine workings.
4	The exact location of the candidate mine opening could not be located but there were a number of locations where there was evidence of mine workings within 40 m of the GPS location which straddled a narrow patch of forest bounded by a road and a large field. The detector was deployed at the edge of the forest and the microphone was pointed into the field.
5	The exact location of the candidate mine opening could not be located and it was not clear. It is quite possible that the opening has been filled in. The detector was deployed in a small gap in a patch of forest approximately 20 m from the adjacent road.

Results

Bat detectors within the proposed wind energy development were deployed from July 30 through to October 11′ 2013 and recorded continuously throughout this period. Detectors at the abandoned mine openings were deployed and recorded continuously from July 30 to the September 21, 2013.

Within the proposed wind energy development area there were 521 acoustic files recorded on the 3 microphones (2 detectors) with 19 classified as bat-generated ultrasound files and the remaining

classified as extraneous noise (Table 4). Of these, 14 were recorded at the forest edge site (site 1), 5 recorded at the base of the meterological tower (site 2) and no bat call sequence files were recorded on the high microphone on the meteorological tower. The majority of call sequences (18/19; 94.7 %) were classified as Myotis species (i.e., includes northern long-eared and little brown bats); as stated above no attempt was made to identify these call sequences to the species level given the difficulty in achieving such identifications. There was one call sequence attributed to a hoary bat that was recorded on the night of 23 August 2013.

The bat detector at the Brookfield AMO recorded 46 acoustic files with 21 classified as bat-generated ultrasound files (Table 5). Sixty-six percent (n= 14) of the bat call sequences were classified as Myotis species, 28.6 % (n=6) were classified as hoary bat and there was one call sequence that was classified as unknown (4.7%). The hoary bat sequences were recorded on three nights with one sequence on the evening of Aug 21, two sequences on Sept 1st within 18 minutes of each other and three sequences on Sept 2nd within 28 minutes of each other. This suggests an individual bat on each night made the calls. The unknown sequence recorded was short in duration (5.14 milliseconds) consisting of 8 calls which lacked the distinctive frequency modulated sweep typical of bat calls and thus encompassed a maximum and minimum frequency of 39.54 kHz and 38.54 kHz, respectively. These characteristics fall within known parameters for Myotis species or potentially a red bat however the missing shape parameters precluded a positive identification to a particular species group although do represent discrete bat call pulses. The bat detector at the Smithfield AMO recorded 210 acoustic files with 87 classified as bat-generated ultrasound files (Table 5). Myotis species again dominated the call sequences at 97.7% followed by 2.3% attributable to hoary bat call sequences. The hoary bat sequences at Smithfield were recorded on 2 separate nights with a single recorded on each of August 27 and September 8th. At the Kemptown AMO there was 1204 acoustic files recorded with10 classified as bat-generated ultrasound files. Myotis species comprised 60% of the call sequences and the remaining 40% were attributable to hoary bat call sequences. The hoary bat sequences were recorded on three nights with one sequence on the evening of Aug 28, two sequences on September 2 and one sequence on September 3rd. This is suggestive of an individual bat on each night.

The average number of recorded bat call sequences per night in the proposed development area (average for the two sites) was 0.26 (SD =0.61) during the sampling period. To place the relative magnitude of activity recorded in the study area into context, in 129 nights of monitoring along five forested edges in the Greater Fundy National Park Ecosystem from June to August 1999, the average number of sequences per night was 27 (SD = 44; Broders unpublished data). In 650 nights of monitoring at river sites in forested landscapes in southwest Nova Scotia from June to August of 2005-2006, the average number of sequences per night was 128 (SD = 232; Farrow unpublished data), though note that rivers act to concentrate bat activity, as they are used as foraging and commuting corridors (Laval et al. 1977, Fenton and Barclay 1980, Fujita and Kunz 1984, Krusic et al. 1996, Zimmerman and Glanz 2000, Lacki et al. 2007). Both of these previous comparisons were conducted prior to the emergence of white nose syndrome and therefore may not be directly comparable. In a forested landscape in Colchester County, Nova Scotia, we detected an approximate 99% decrease in bat echolocation activity from 2012 to 2013 at forested and riparian sites that were monitored for bat activity following the confirmation of mortality from white nose syndrome in Nova Scotia (Segers and Broders, unpublished data).

The average number of recorded bat call sequences per night for the Brookfield, Smithfield and Kemptown abandoned mine openings were 0.40 (SD = 0.91), 1.64 (SD = 2.72), 0.14 (SD = 0.42), respectively. The Smithfield AMO had the highest level of bat activity of the four study areas and

although bat activity was low, there was a trend of bat activity increasing towards the end of August and early September (Figure 1) as predicted for swarming sites.

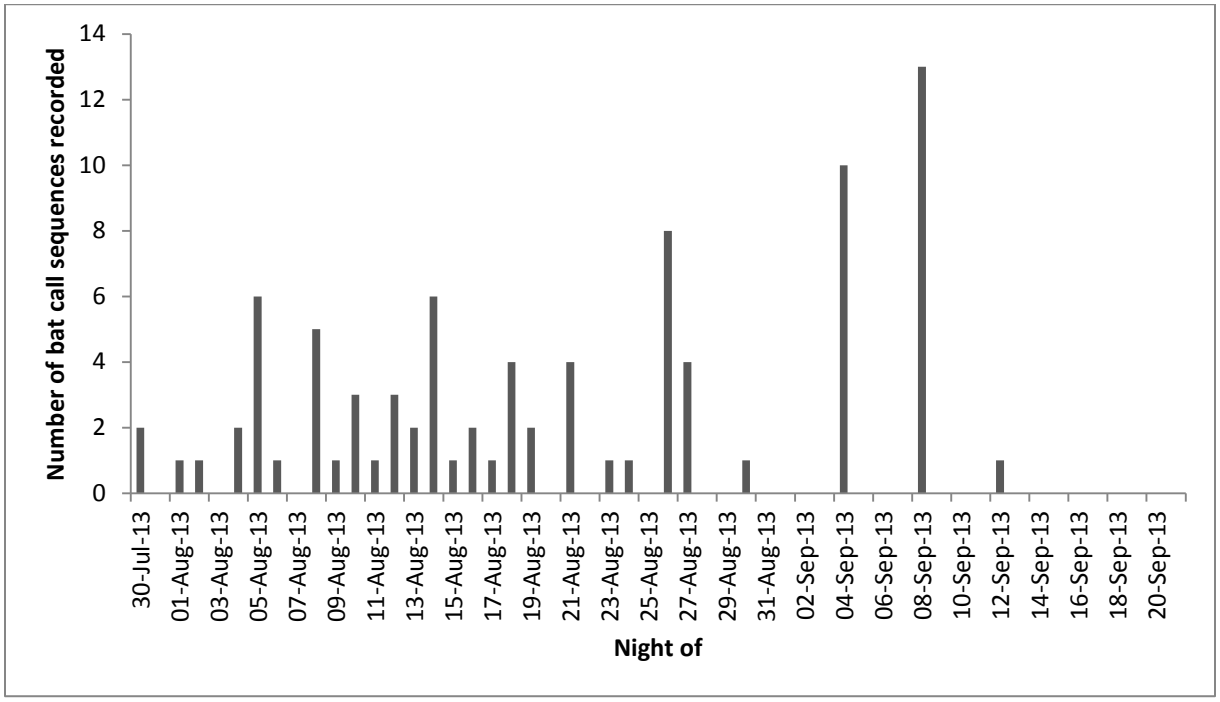

Figure 1. Number of bat call sequences recorded, by night, at the Smithfield abandoned mine opening, July 30 to September 20, 2013.

Table 4. Number of echolocation bat call sequence files recorded per night for the 2013 survey of bat activity at the proposed Greenfield Wind Energy Project area, Colchester County, Nova Scotia. MYO = Myotis species, LACI = *Lasiurus cinereus.*

	Site 1	**Site 2 (low mic)**		**Site 2 (high mic)**	**Nightly Total**
Night of	MYO	MYO	LACI	All bats	(all sites)
30-Jul-13	0	0	0	0	0
31-Jul-13	0	1	0	0	1
01-Aug-13	1	1	0	0	2
02-Aug-13	0	0	0	0	0
03-Aug-13	0	0	0	0	0
04-Aug-13	0	0	0	0	0
05-Aug-13	0	0	0	0	0
06-Aug-13	0	0	0	0	0
07-Aug-13	0	0	0	0	0
08-Aug-13	0	0	0	0	0
09-Aug-13	0	0	0	0	0
10-Aug-13	0	0	0	0	0
11-Aug-13	1	0	0	0	1
12-Aug-13	1	0	0	0	1
13-Aug-13	0	0	0	0	0
14-Aug-13	0	0	0	0	0
15-Aug-13	1	0	0	0	1
16-Aug-13	0	0	0	0	0
17-Aug-13	1	0	0	0	1
18-Aug-13	3	0	0	0	3
19-Aug-13	0	0	0	0	0
20-Aug-13	0	0	0	0	0
21-Aug-13	0	1	0	0	1
22-Aug-13	0	1	0	0	1
23-Aug-13	0	0	1	0	1
24-Aug-13	0	0	0	0	0
25-Aug-13	2	0	0	0	2
26-Aug-13	0	0	0	0	0
27-Aug-13	0	0	0	0	0
28-Aug-13	1	0	0	0	1
29-Aug-13	0	0	0	0	0
30-Aug-13	0	0	0	0	0
31-Aug-13	0	0	0	0	0
01-Sep-13	0	0	0	0	0
02-Sep-13	0	0	0	0	0
03-Sep-13	0	0	0	0	0

Continued on next page

	Site 1	Site 2 (low mic)		Site 2 (high mic)	Nightly Total
Night of	MYO	MYO	LACI	All bats	(all sites)
04-Sep-13	2	0	0	0	2
05-Sep-13	0	0	0	0	0
06-Sep-13	0	0	0	0	0
07-Sep-13	0	0	0	0	0
08-Sep-13	0	0	0	0	0
09-Sep-13	0	0	0	0	0
10-Sep-13	0	0	0	0	0
11-Sep-13	0	0	0	0	0
12-Sep-13	0	0	0	0	0
13-Sep-13	0	0	0	0	0
14-Sep-13	0	0	0	0	0
15-Sep-13	0	0	0	0	0
16-Sep-13	0	0	0	0	0
17-Sep-13	0	0	0	0	0
18-Sep-13	0	0	0	0	0
19-Sep-13	1	0	0	0	1
20-Sep-13	0	0	0	0	0
21-Sep-13	0	0	0	0	0
22-Sep-13	0	0	0	0	0
23-Sep-13	0	0	0	0	0
24-Sep-13	0	0	0	0	0
25-Sep-13	0	0	0	0	0
26-Sep-13	0	0	0	0	0
27-Sep-13	0	0	0	0	0
28-Sep-13	0	0	0	0	0
29-Sep-13	0	0	0	0	0
30-Sep-13	0	0	0	0	0
01-Oct-13	0	0	0	0	0
02-Oct-13	0	0	0	0	0
03-Oct-13	0	0	0	0	0
04-Oct-13	0	0	0	0	0
05-Oct-13	0	0	0	0	0
06-Oct-13	0	0	0	0	0
07-Oct-13	0	0	0	0	0
08-Oct-13	0	0	0	0	0
09-Oct-13	0	0	0	0	0
10-Oct-13	0	0	0	0	0
Site total	14	4	1	0	19
Site Average					0.26
Num nights					73

Table 5. Number of echolocation bat call sequence files recorded per night for the 2013 survey of bat activity at abandoned mine openings near the proposed Greenfield Wind Energy Project area, Colchester County, Nova Scotia. MYO = Myotis species, LACI = *Lasiurus cinereus*, UNKN = unknown species of bat.

	Brookfield AMO				Smithfield AMO			Kemptown AMO		
Night of	**MYO**	**LACI**	**UNKN**	**Nightly Total**	**MYO**	**LACI**	**Nightly Total**	**MYO**	**LACI**	**Nightly Total**
30-Jul-13	1	0	0	1	2	0	2	-	-	-
31-Jul-13	0	0	0	0	0	0	0	-	-	-
01-Aug-13	1	0	0	1	1	0	1	-	-	-
02-Aug-13	0	0	0	0	1	0	1	-	-	-
03-Aug-13	0	0	0	0	0	0	0	-	-	-
04-Aug-13	2	0	0	2	2	0	2	-	-	-
05-Aug-13	0	0	0	0	6	0	6	-	-	-
06-Aug-13	0	0	0	0	1	0	1	-	-	-
07-Aug-13	0	0	1	1	0	0	0	-	-	-
08-Aug-13	3	0	0	3	5	0	5	-	-	-
09-Aug-13	0	0	0	0	1	0	1	-	-	-
10-Aug-13	0	0	0	0	3	0	3	-	-	-
11-Aug-13	0	0	0	0	1	0	1	-	-	-
12-Aug-13	0	0	0	0	3	0	3	-	-	-
13-Aug-13	0	0	0	0	2	0	2	-	-	-
14-Aug-13	0	0	0	0	6	0	6	-	-	-
15-Aug-13	0	0	0	0	1	0	1	-	-	-
16-Aug-13	0	0	0	0	2	0	2	-	-	-
17-Aug-13	0	0	0	0	1	0	1	-	-	-
18-Aug-13	0	0	0	0	4	0	4	-	-	-
19-Aug-13	0	0	0	0	2	0	2	-	-	-
20-Aug-13	0	0	0	0	0	0	0	-	-	-
21-Aug-13	0	1	0	1	4	0	4	-	-	-
22-Aug-13	0	0	0	0	0	0	0	-	-	-

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	Brookfield AMO				Smithfield AMO			Kemptown AMO		
Night of	MYO	LACI	UNKN	Nightly total	MYO	LACI	Nightly total	MYO	LACI	Nightly total
23-Aug-13	1	0	0	1	1	0	1	-	-	-
24-Aug-13	0	0	0	0	1	0	1	-	-	-
25-Aug-13	0	0	0	0	0	0	0	-	-	-
26-Aug-13	0	0	0	0	8	0	8	-	-	-
27-Aug-13	1	0	0	1	3	1	4	-	-	-
28-Aug-13	0	0	0	0	0	0	0	1	1	2
29-Aug-13	0	0	0	0	0	0	0	0	0	0
30-Aug-13	1	0	0	1	1	0	1	1	0	1
31-Aug-13	0	0	0	0	0	0	0	0	0	0
01-Sep-13	0	2	0	2	0	0	0	1	0	1
02-Sep-13	0	3	0	3	0	0	0	0	2	2
03-Sep-13	0	0	0	0	0	0	0	0	1	1
04-Sep-13	0	0	0	0	10	0	10	0	0	0
05-Sep-13	0	0	0	0	0	0	0	0	0	0
06-Sep-13	0	0	0	0	0	0	0	0	0	0
07-Sep-13	0	0	0	0	0	0	0	0	0	0
08-Sep-13	0	0	0	0	12	1	13	0	0	0
09-Sep-13	0	0	0	0	0	0	0	1	0	1
10-Sep-13	0	0	0	0	0	0	0	0	0	0
11-Sep-13	0	0	0	0	0	0	0	0	0	0
12-Sep-13	1	0	0	1	1	0	1	0	0	0
13-Sep-13	2	0	0	2	0	0	0	0	0	0
14-Sep-13	0	0	0	0	0	0	0	0	0	0
15-Sep-13	0	0	0	0	0	0	0	0	0	0
16-Sep-13	0	0	0	0	0	0	0	0	0	0
17-Sep-13	0	0	0	0	0	0	0	0	0	0
18-Sep-13	0	0	0	0	0	0	0	0	0	0

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	Brookfield AMO				Smithfield AMO			Kemptown AMO		
Night of	**MYO**	**LACI**	**UNKN**	**Nightly total**	**MYO**	**LACI**	**Nightly total**	**MYO**	**LACI**	**Nightly total**
19-Sep-13	1	0	0	1	0	0	0	0	0	0
20-Sep-13	0	0	0	0	-	-	-	0	0	0
21-Sep-13	-	-	-	-	-	-	-	0	0	0
22-Sep-13	-	-	-	-	-	-	-	1	0	1
23-Sep-13	-	-	-	-	-	-	-	0	0	0
24-Sep-13	-	-	-	-	-	-	-	0	0	0
25-Sep-13	-	-	-	-	-	-	-	1	0	1
*								Data not shown*		
Site total	14	6	1	21	85	2	87	6	4	10
Site average				0.40			1.64			0.14
Num nights				53			53			73

Discussion

Interpretation of these data are problematic for assessing relative risk to bats at the proposed development given our knowledge of the devastating impacts that white nose syndrome has had, and is having, on local bat populations. Elsewhere, white nose syndrome reduced the summer bat activity by >75% (Dzal et al. 2011). This past winter (2012-2013), there were hundreds of fatalities recorded at several known hibernacula in the province and annual monitoring counts of bats at such hibernacula down, on average, by 94% (Broders and Burns, unpublished data). The disease is now confirmed in seven counties in central Nova Scotia, including the proposed development area. These observations are suggestive of a major mortality event in the area, potentially decreasing the magnitude of bat activity in the area in the summer of 2013. This is supported by other work we are conducting in the region suggesting a >99% reduction in the magnitude of echolocation activity in 2013, relative to 2012 (Segers and Broders, unpublished), and decimation of a number of maternity colonies in the region. For these reasons this dataset must be interpreted with caution.

Despite the above, there was no acoustic evidence of a significant movement or concentration of bats through the area investigated during this pre-construction survey of bat activity. The magnitude of activity was low compared to baseline levels (collected prior to 2007) expected in a forested ecosystem in the region. Although we cannot rule out the possibility that mortality events associated with this development will occur, we have found no evidence to suggest that the proposed project will cause large numbers of direct mortality of bats. That being said, in light of white nose syndrome and the recent listing of the species as endangered, the significance of any mortality is greater than just a couple of years ago.

The majority of the identified echolocation sequences recorded for this project was attributable to the two species of Myotis bats known to occur in Nova Scotia, the little brown bat and the northern long-eared bat. This was expected as they are the only abundant and widely-distributed species in the province, and are two of only three species with significant populations in the province (Broders et al. 2003). Although we did not distinguish the calls of Myotis species, the majority of the recorded sequences likely represent the little brown bat, as this species is known to forage in open areas and over water. The northern long-eared bat is a recognized forest interior species (Jung et al. 1999, Henderson and Broders 2008), and is less likely to use open areas for foraging and commuting (Henderson and Broders 2008). Additionally, the northern long-eared bat has lower intensity echolocation calls and is thus not recorded as well as the little brown bat (Miller and Treat 1993, Broders et al. 2004). There were no echolocation sequences that were attributable to the tri-colored bat, which was expected as this species is only locally abundant in southwest Nova Scotia and the proposed development is outside of the known provincial distribution for this species (Farrow and Broders 2011).

Myotis bats are relatively new to the list of species among fatalities at wind turbines sites. This may be due to the fact that the first large scale wind developments were located primarily in western North America, typically in agricultural and open prairie landscapes (reviewed in Johnson 2005b). Fatalities of these resident, non-migratory species were largely absent from these sites, likely due to the association of these species with forested landscapes. More recently, evidence of Myotis fatalities resulting from collisions with wind turbines have been noted at sites in eastern North America (reviewed in Johnson 2005b, Jain et al. 2007, Arnett et al. 2008a). Although there are fewer documented fatalities of Myotis bats compared to long-distance migratory species, there is still a risk of direct mortality.

Other than direct bat mortality as a result of collisions with turbines, there is also the potential that disruption of the forest structure (e.g., removal of trees and fragmentation of forest stands for roads and clearings) will degrade the local environment for colonies/populations of Myotis bats that reside in the area during the summer. This can occur by the elimination of existing roost trees, the isolation of trees left standing, as well as the elimination or degradation of foraging areas for bats. These negative impacts will almost certainly occur and will add to the cumulative impact of habitat loss that is occurring throughout the ranges of these species. Additionally, these resident bat species make what are generally considered to be short distance migrations, in comparison to long-distance migratory behaviour by other bats species, from their summering areas to underground sites where they hibernate. Little is known about the flight behaviour and dynamics of these movements (i.e., height of travel, and routes); therefore, it is difficult to predict the specific effects that wind developments will have on the movements of local populations of bats.

The low number of call sequences attributed to the hoary bat, a long-distance migratory bat species, suggests that there are no large populations or migratory movements of these species at the study area. This fits with our current knowledge of their status in the province, but they do occur regularly but in low frequency although are especially vulnerable to wind facilities. This species is a solitary, tree-roosting species with an extensive distributional range throughout North American (van Zyll de Jong 1985). This species, in addition to red and silver-haired bats, have received the greatest attention with regards to wind energy developments because they make up the large majority of documented fatalities at existing developments in North America. Any mortality of this species would be significant to Nova Scotia given there low numbers in the region. Significant bat fatality events at wind energy developments occur primarily in the late summer and early fall, peaking during the period that coincides with the long-distance fall migration of these species (Johnson 2005b, Cryan and Brown 2007, Arnett et al. 2008a), leading researchers to believe that migration plays a key role in the susceptibility of certain bat species to wind turbine fatalities (Cryan and Barclay 2009). It has been proposed that this may be because these species travel at a height that puts them at increased risk of collisions with rotating turbine blades (Barclay et al. 2007, Arnett et al. 2008a).

The low number of bat call sequences recorded at the abandoned mine openings suggest they are not major hibernacula. However, given the impacts of WNS such low levels of activity are not unsurprising, even if the sites were important hibernacula. Although this activity is generally low and would not qualify for the criteria set out by Randall (2011) for designating swarming sites, this current work was carried out post-white nose syndrome which almost certainly reduced the overall magnitude of bat activity recorded. Further, Randall's work was carried out directly at the entrances of underground sites where activity is highest as the animals interact, whereas the detector at Smithfield was placed on a forest edge near presumed entrances and therefore activity may be lower since it is not directly at the swarming site entrance. Despite this, the activity at the Brookfield and Kemptown AMO's suggest that they are not currently major autumn swarming sites for bats. The Smithfield AMO had the highest level of bat activity recorded of all three study areas sampled in this study and the seasonal trend of increasing activity fits the pattern of increased activity at swarming sites in the period of the end of August and early September that begins to decrease around the middle of September (Burns unpublished data; Tutty 2006). These data are more suggestive of the site being a swarming site and may also potentially be a hibernaculum. Alternatively, this site may not represent a swarming site but may be situated along a migration corridor for bats to other travel among swarming sites which may explain the trend in bat activity following the patterns known for the autumn swarming season. Further work would be required to assess the importance of this site as an autumn swarming site, migration corridor or over-wintering site (hibernaculum).

Recommendations

1. *Post-construction monitoring* – A rigorous post-construction monitoring program, appropriately designed to account for searcher efficiency and scavenger rates, needs to be established to quantify bat fatality rates. These surveys should be conducted over an entire season (April to October), but especially during the fall migration period (mid-August to late-September) for at least two years. Should fatalities occur, they should be investigated with respect to their spatial distribution relative to wind turbines, turbine lighting, weather conditions, and other site specific factors, and should trends be identified, operations should be adjusted in an adaptive management framework. In this manner, mitigation can be focused on any identified high risk areas/infrastructure to minimize future fatalities. These data are essential for assessing potential risks at future developments in the region; therefore it is critical that the results of these surveys be appropriately reported.

2. *Retain key bat habitat* – Key bat habitat should be identified and retained in the project area to continue to support existing summer colonies/populations of bats. Retention of these bat habitat resources should be in a spatial manner that provides connectivity in the project area and with the larger landscape to ensure foraging and roosting areas remain well connected. Consideration of the potential for fragmentation of bat habitat resources should also be taken with regards to the development of road networks and transmission lines in the project area.

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

4. *Return to pre-project state upon decommissioning* – The project area should be returned to the state that existed prior to the development of the site once the project is decommissioned. This should include planning to ensure the continuity of forest stand succession to provide and maintain appropriate roosting areas well into the future as existing roost trees die off. Retention of forest stands of a range of ages will provide mature trees for bat roosting resources in the future.

5. *Develop an operations fatality mitigation plan* – Recent experimental case studies in Alberta and the United States have demonstrated dramatic reductions in bat fatalities at operational wind energy facilities can be made by changing operational parameters during the peak fatality period (Baerwald et al. 2009, Arnett et al. 2010). These include changes to when turbine rotors begin turning in low winds via alterations to wind-speed triggers and blade angles to lower rotor speed. These studies have found decreases in bat mortalities ranging from 44% to as high as 93% reductions on a nightly basis at relatively low cost to annual power production loss, at approximately ≤ 1%. This plan should be adaptive as operations continue through time and be in place prior to operations commencing such that if any bat mortalities be observed at the site once operational, the plan can be implemented immediately.

6. *Remain up to date with current research* –There is presently an abundance of on-going research aimed at determining the impacts of wind energy developments on populations of bats. Other studies are focusing on investigating the efficacy of potential mitigation measures, including the effects of weather on bat activity patterns and collisions with wind turbines, and possible bat deterrents (including acoustic and radar emissions). As these are active areas of research, it is essential that the most current studies and guidelines are used to guide management decisions and development plans for wind energy projects.

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Appendix J

Mainland Moose PGI Study

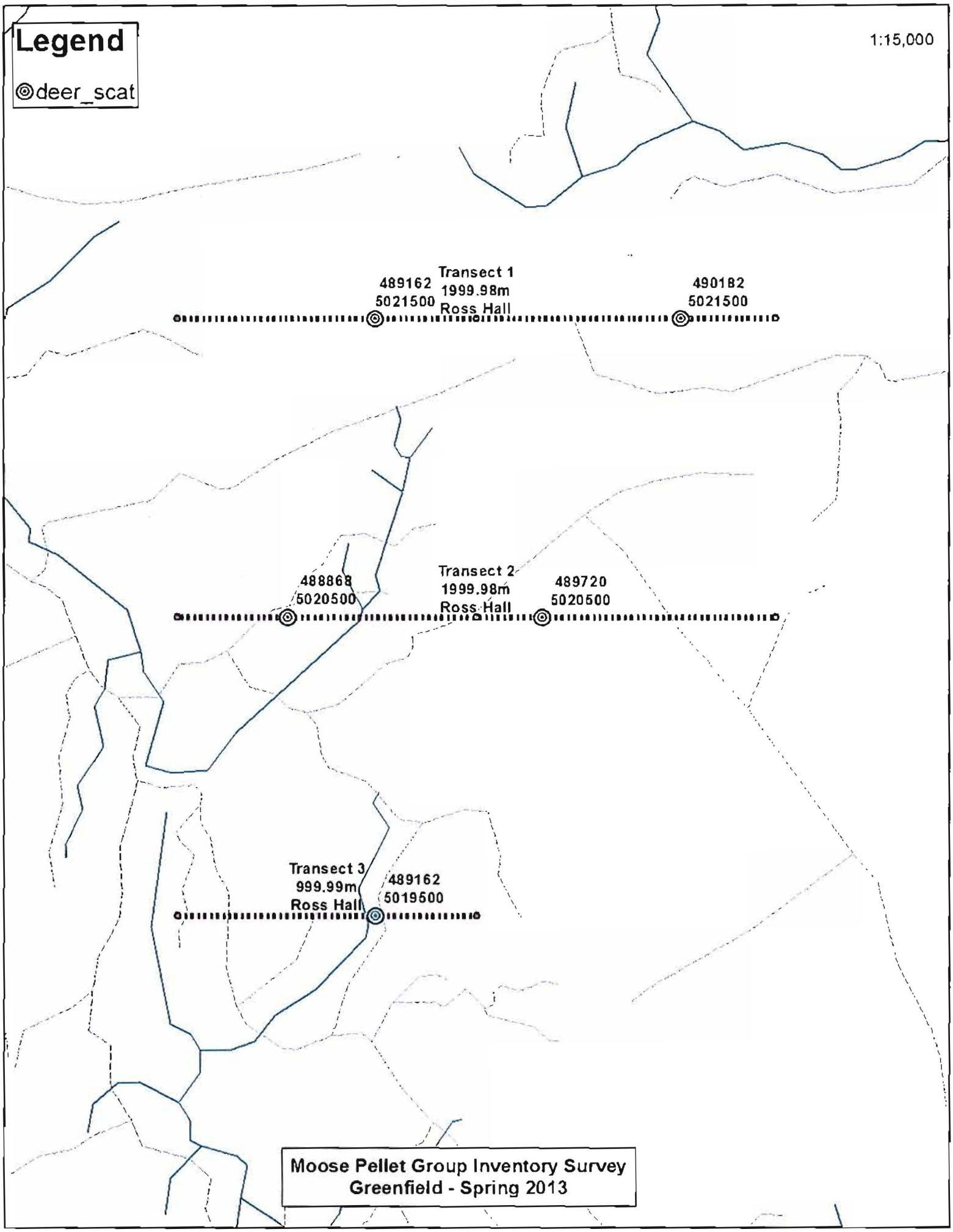
Spring Moose PGI Survey

Greenfield Proposed Wind Farm

Greenfield, Colchester County

This survey was conducted by Jody Hamper. These transects were set up by Ross Hall. One meter on each side was observed for signs off moose and deer. These transects went through many different stand types as well as habitats. Several piles of deer scat were found and there location and coordinates are on the attached map. While walking between transects one and two a black bear was observed. This survey was done on April 27, 2013, it was very warm spring day and the sun was out.

Greenfield is located west of the town of Truro. Greenfield is a small rural community surrounded by other small communities. The area surrounding these small communities has been heavily logged over the year by local sawmills and pulpmills. There is a local commercialized sawmill just to the west of the wind farm.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Moose Pellet Group Inventory Survey
Greenfield - Spring 2013

Appendix K

Colchester Municipal Wind Turbine By-law

Municipality of the County of Colchester

Chapter 56
Wind Turbine Development By-law

1. Title and Scope

1.1. This By-law is enacted pursuant to Section 172 of the *Municipal Government Act*, SNS 1998, c.18 and shall be known and may be cited as the "Wind Turbine Development By-law" of the Municipality of the County of Colchester and shall apply to all lands within the Municipality.

1.2. This By-law does not exempt any person from complying with the requirements of other by-laws or regulations in force within the Municipality of the County of Colchester and from obtaining any licence, permission, permit, authority or approval as otherwise required by the Municipality, the Province of Nova Scotia, and/or the Government of Canada.

1.3. This By-law shall apply to all Large Scale Wind Turbines and all Small Scale Wind Turbines including those existing prior to the effective date of this By-law, except Section 5 of this By-law which shall not apply so as to invalidate the location of any Large Scale Wind Turbine or Small Scale Wind Turbine existing prior to the effective date of this By-law.

1.4. This By-law shall not apply to Micro Scale Wind Turbines.

2. Definitions

For the purposes of this By-law:

2.1. "**A-Weighted Decibel**" or "**dB(A)**" means a measurement of Environmental Noise, whereby A-frequency weighting is used to compensate for the varying sensitivity of the human ear to sounds at different frequencies;

2.2. "**Ambient Degradation Noise Standard**" means the average noise level over a specified period of time, usually composed of sound from many sources, near and far;

2.3. "**Camp**" means a recreational shelter typically used for weekend or short term activities such as hunting, fishing or snowmobiling, which is not intended for regular human occupation or living;

2.4. "**Cottage**" means a seasonal home, which is typically but not necessarily serviced with running water, onsite sewage disposal system and electricity, and which is equipped to accommodate an extended period of stay of regular human occupation and living;

2.5. "**Council**" means the Council for the Municipality of the County of Colchester;

2.6. "**Decibel**" or "**dB**" means a measurement of sound, namely the scale in which sound pressure level is expressed. When measuring Environmental Noise, a weighting network is used which filters the frequency of sound, and is expressed as "**dB(A)**";

2.7. "**Decommission Plan**" means a plan approved for the Decommissioning of a Wind Power Project as part of the successful application for a License;

2.8. "**Decommissioning**" means the final closing down and dismantling of a Wind Power Project and associated infrastructure once a Wind Power Project has reached the end of its operation life;

2.9. "**Development Officer**" means the Development Officer appointed by the Council of the Municipality of the County of Colchester or their designate;

2.10. "**Dwelling**" means all structures intended for regular human occupation and living, such as a house or cottage but not a camp or an accessory structure such as a shed or storage area;

2.11. "**Environmental Assessment**" means all documentation required under the *Canadian Environmental Assessment Act* of Canada and any Regulations thereto and *Environment Act* of Nova Scotia and any Regulations thereto;

2.12. "**Environmental Noise**" means a measurement of the noise level already present within an environment in the absence of a Wind Power Project;

2.13. "**External Property Line**" means a common boundary with any parcel of land which is adjacent to those parcels of land which form part of a Wind Power Project;

2.14. "**kW**" means kilowatt;

2.15. "**Large Scale Wind Turbine**" means any Wind Turbine which has a Nameplate Capacity greater than 100 kW, which may be developed as a stand-alone Wind Turbine or in combination with other Wind Turbines in a Wind Farm;

2.16. "**Licence**" means a Licence issued pursuant to this By-law permitting the installation and operation of a Wind Power Project;

2.17. "**Nacelle**" means the frame and housing at the top of the tower that is part of a Wind Turbine which encloses components such as the gearbox and generator, protecting them from the weather;

2.18. "**Nameplate Capacity**" means the manufacturer's maximum rated output of the Wind Turbine expressed in kilowatts;

2.19. "**Micro Scale Wind Turbine**" means a Wind Turbine which has a Nameplate Capacity of less than 1 kW;

2.20. "**Municipality**" means the Municipality of the County of Colchester;

2.21. "**Owner**" and "**Operator**" mean respectively any owner or operator of a Wind Turbine licensed under this By-law;

2.22. "**Small Scale Wind Turbine**" means a Wind Turbine which has a Nameplate Capacity equal to or less than 100 kW but not less than 1 kW, which may be developed as a stand-alone Wind Turbine or in combination with other Wind Turbines in a Wind Farm;

2.23. "**Setback**" means the measured distance from the base of the Wind Turbine to any point referenced in this By-law;

2.24. "**Temporary Test Tower Facilities**" means temporary measurement towers for the assessment of potential wind energy resources;

2.25. "**Wind Farm**" means two or more Large Scale Wind Turbines electrically connected to the transmission grid or local distribution network;

2.26. "**Wind Power Project**" means a Wind Turbine or Wind Farm and associated property, substations and other utility systems;

2.27. "**Wind Turbine**" means a wind energy conversion system erected to produce electrical power by capturing the kinetic energy in wind and converting it into electricity;

2.28. "**Wind Turbine Height**" means the distance measured from grade to the highest point of the rotor blade's arc.

3. License Required to Install or Operate Wind Turbine in Municipality

3.1. No individual or organization shall install or operate a Wind Turbine in the Municipality without first having obtained a Licence from the Development Officer.

3.2. No individual or organization who obtains a License pursuant to this By-law shall install or operate a Wind Turbine except in accordance with the provisions of this By-law and with the terms of the License issued pursuant to this By-law.

4. Licensing

4.1. A Licence for a Wind Turbine shall be issued by the Development Officer subject to the following requirements:

a. The Owner or Operator shall submit a completed application in such form as is approved from time to time by the Development Officer;

b. The application shall be co-signed by the registered property owner if the land upon which a Wind Turbine is proposed to be installed and operated is not owned by the Owner and/or Operator of the Wind Turbine;

c. The completed application shall be accompanied with an application fee in an amount determined by Council from time to time by Policy;

d. The requirements contained in clauses 4, 5 and 7 of this By-law shall be satisfied by the applicant in their completed application, and no application shall be considered complete for the purposes of clause 4.3 until such time as clauses 4, 5 and 7 are satisfied by an applicant.

4.2. Duration of Licence:

a. A Licence issued under this By-law will be in effect for twenty-five (25) years unless otherwise cancelled or suspended. If a License is not renewed pursuant to this By-law before the License expires, a License shall automatically terminate at the end of the twenty-five (25) year period of the License.

b. An Owner or Operator may apply to renew a Licence by way of:

i. submitting a completed application to the Development Officer no less than thirty (30) days prior to the expiry date of the Licence in the same form and with the same requirements as set out in clause 4.1 of this By-law.

ii. submitting an application fee in an amount determined by Council from time to time by Policy.

c. An application for renewal of a License shall be considered by the Development Officer in accordance with the By-law in effect at the time that a completed application for renewal of such License is submitted.

d. If the renewal application is approved by the Development Officer, the License shall be renewed for a period of twenty (25) years.

e. A Licence issued or renewed under this By-law shall be automatically terminated if, in the opinion of the Development Officer:

i. construction of the Wind Power Project has not commenced within eighteen (18) months of the date the Licence was issued;

ii. substantial completion of the Wind Power Project has not occurred within five (5) years of the date that the Licence was issued;

iii. following the issuance of a Licence, new or corrected information that materially affects the application is brought to the attention of the Development Officer;

iv. the applicant fails to meet the requirements of Section 7 of this By-law; or

4.3. the entire Wind Power Project has ceased operation for a period of at least one (1) year, unless the Owner or Operator thereof can reasonably establish that additional time is needed to repair or rebuild part or all of the Wind Power Project if the repair is delayed as a result of circumstances beyond his control.

4.4. Notice of Decision:

a. Within a reasonable amount of time of receiving a completed application for a Licence or renewal of a License, the Development Officer shall either issue or renew the Licence or notify the applicant of a decision to refuse the issuance or renewal of the License.

b. A decision to refuse an application for a Licence or renewal of a License shall be made in writing and delivered to the applicant by ordinary mail to the mailing address designated in the application, and shall include the Development Officer's reasons for not issuing or renewing the License.

5. Location Conditions

A Wind Power Project shall meet the following conditions:

5.1. The minimum Setback for a Large Scale Wind Turbine from an External Property Line and public roads is one (1) times the Wind Turbine Height. This minimum Setback shall not apply where the adjoining property is part of the Wind Power Project, in which case there shall be provided to the Development Officer a letter of agreement from the adjoining property owner if different than the applicant.

5.2. The minimum Setback for the location of a Large Scale Wind Turbine from an existing Dwelling on a neighbouring property is 1,000 metres, subject to clause 5.3 of this By-law.

5.3. An increased setback may be required for certain Large Scale Wind Turbines, in excess of the minimum Setback of 1,000 metres as set out in clause 5.2 of this By-law, if an increased minimum Setback is necessary to satisfy the maximum Ambient Degradation Noise Standard in accordance with clause 5.4 of this By-law.

5.4. Large Scale Wind Turbines must not have an Ambient Degradation Noise Standard greater than 36 dB(A) as measured at existing Dwellings.

5.5. a) Subject to 5.5 (b), an applicant may request a reduction of the 1,000 metres minimum Setback provided by clause 5.2 of this By-law, to a minimum Setback of 700 metres, with written permission from all landowners who own parcels of land that share a common boundary with any parcels of land which form part of the Wind Power Project, in a form approved by the Development Officer from time to time. The Development Officer may, in their discretion, grant or refuse such request after considering whether the reduced Setback would be injurious or potentially injurious to any parcels of land or its occupants for any reason.

b) No request pursuant to Section 5.5 (a) shall be granted if it has the impact of reducing the protection of the Location Conditions for any other landowner who has not provided written permission.

5.6. a) Subject to 5.6 (b), an applicant may request a waiver of the maximum Ambient Degradation Noise Standard provided by clause 5.4 of this By-law, to a maximum Ambient Degradation Noise Standard of 40 dB(A), with written permission from all landowners who own parcels of land that share a common boundary with any parcels of land which form part of the Wind Power Project, in a form approved by the Development Officer from time to time. The Development Officer may, in their discretion, grant or refuse such request after considering whether the reduced Setback would be injurious or potentially injurious to any parcels of land or its occupants for any reason.

b) No request pursuant to Section 5.6 (a) shall be granted if it has the impact of reducing the protection of the Location Conditions for any other landowner who has not provided written permission.

5.7. The minimum Setback for the location of a Small Scale Wind Turbine from an External Property Line is two (2) times the Wind Turbine Height. This minimum Setback shall not apply where the adjoining property is part of the Wind Power Project, in which case there shall be provided to the Development Officer written permission from the adjoining property owner, if different than the applicant, in a form approved by the Development Officer from time to time.

6. Conditions of Operation

6.1. Finish

a. A Wind Turbine shall have a non-reflective matte finish in an unobtrusive colour.

6.2. Lettering and Signage

a. A Wind Turbine shall not contain any commercial advertising.

b. The Nacelle of a Wind Turbine may display the name or logo of the manufacturer of the Wind Turbine or the name or the logo of the Owner or Operator of the Wind Turbine.

c. Site signs will be limited to those which identify the Wind Power Project, those which locate access points and those which provide safety and educational information.

6.3. Lighting

a. A Wind Turbine shall not have artificial lighting, except for lighting that is required by Transport Canada or other Provincial or Federal regulatory authorities.

6.4. Access and Safety

a. A Wind Power Project shall be protected from unauthorized access by:

i. having a security fence, which shall have a minimum height of 1.8 metres and a lockable gate; or

ii. having any ladder or permanent tower access located no closer to the ground than 3.7 metres; or

iii. for monopole designs with internal access only, a lockable door.

b. The minimum ground clearance for a rotor blade shall be 7.5 metres.

6.5. Temporary Test Tower Facilities

a. Temporary Test Tower Facilities may remain erected for a maximum of two (2) years after the issuance of a License, after which time any such Temporary Test Tower Facilities must be dismantled unless an Owner and/or Operator satisfies the Development Officer that the Temporary Test Tower Facilities continue to be necessary. The Development Officer may, in their

discretion, permit the Temporary Test Tower Facilities to remain erected for such period of time as the Development Officer deems appropriate.

b. For the purposes of clarity, a failure to dismantle Temporary Test Tower Facilities as directed by clause 6.5(a) of this By-law shall be an offence punishable pursuant to Part 10 of this By-law.

6.6. Outdoor Storage

a. Outdoor storage shall be considered an accessory use to a Wind Power Project, and any such outdoor storage occurring after the completion of installation or construction of the Wind Power Project shall be screened from the view from adjacent Dwellings and public highways.

7. Information Required at Time of Application

7.1. Along with the application for a Licence, an applicant shall provide, both in hard copy and in digital format:

a. A site plan, drawn to scale by an engineer or surveyor who is licensed to practice in the Province of Nova Scotia, showing the proposed location of the Wind Turbines and accessory components of the Wind Power Project;

b. A plan, drawn to scale by an engineer or surveyor who is licensed to practice in the Province of Nova Scotia, showing the location of adjacent structures and land parcels and identifying all dwellings, structures and public roads within two (2) kilometres of any proposed Wind Turbine. The plan must also demonstrate compliance with the required minimum Setbacks, where applicable, for the entire Wind Power Project. The plan must also include tables which provide the distance, in metres, from each Wind Turbine to External Property Lines, public roads, Dwellings, Cottages and Camps;

c. The results of a Wind Turbine Noise Modelling Study or an equivalent study deemed satisfactory to the Development Officer, which demonstrates that the Wind Power Project will have an Ambient Degradation Noise Standard as required by clause 5 of this By-law;

d. If applicable, a copy of an Environmental Assessment and notice of the issuance of any Federal and/or Provincial approvals, along with any changes, comments or conditions imposed by Federal and/or Provincial regulatory authorities;

e. A certified copy of the complete manufacturer’s specifications for all proposed Wind Turbines;

f. A copy of the applicant's Decommission Plan, which must identify the following:

   i. any above ground components of the Wind Power Project to be removed from the site along with any site remediation, excluding roads, required to return the site to a natural state;

   ii. confirmation that Decommissioning will commence within one (1) year after the Owner or Operator has surrendered the License or the Owner or Operator's License has been terminated;

   iii. confirmation that Decommissioning will be completed within twelve (12) months after commencement; and

   iv. a cost estimate for carrying the Decommission Plan through to completion, prepared by an engineer who is licensed to practice in the Province of Nova Scotia or by another professional individual who has been deemed appropriate by the Development Officer to prepare the requisite cost estimate;

g. Written acknowledgement from the landowner(s) of the parcel(s) of land which form part of the proposed Wind Power Project that the Municipality shall not be liable for any costs, fees or expenses of any kind which may be incurred by the landowner in relation to the Decommissioning of the Wind Power Project in the event that the Decommission Plan is not completed to the landowner's satisfaction or in accordance with any agreement that may have been entered into between the landowner and the applicant;

h. If applicable, confirmation that the applicant has given notice to, and has received approval from, any Federal or Provincial regulatory authorities including but not limited to the Department of National Defense, Natural Resources Canada, Transportation Canada, NAV Canada and any other applicable department or agency with respect to any potential radio, telecommunications, radar and seismoacoustic interference that may result from the proposed Wind Power Project. Copies of all such approvals must be obtained and provided to the Development Officer before an application will be considered complete for the purposes of clause 4.3;

i. any other information that may be requested by the Development Officer to ensure compliance with the requirements of this By-law, including any other information that the Development Officer deems necessary as a result of any community meetings; and

j. demonstration that public notification has been, and will be, complied with as required by clause 9 of this By-law.

8. Requirements of the Applicant During the Construction Phase

The following shall be conditions of any License issued under this By-law:

8.1. Once determined, the applicant shall submit to the Development Officer drawings which demonstrate that the foundations to support a Wind Turbine will satisfy both manufacturer's specifications for the Wind Turbine as well as industry standards for foundations for the Wind Turbine, to be prepared by an engineer who is licensed to practice in the Province of Nova Scotia; and

8.2. Within two (2) months of the installation of a Wind Turbine or the completion of a phase in a multi-phased Wind Power Project, the applicant will submit a Location Certificate prepared by a surveyor who is licensed to practice in the Province of Nova Scotia or a drawing prepared by an engineer who is licensed to practice in the Province of Nova Scotia which confirms that the location of installed Wind Turbine(s), or preparation for the installation of Wind Turbine(s), is in compliance with the minimum Setbacks as required in this By-law.

9. Public Consultation and Notification

Public Notice prior to Installation of Temporary Test Tower Facilities

9.1. Prior to the installation of any Temporary Test Tower Facilities, the applicant must provide written notice to all land owners who own land within two (2) kilometres of the location on which Temporary Test Tower Facilities are intended to be installed, by way of regular mail to the registered address of the land owner, no later than three (3) weeks prior to the commencement of construction. Such written notice must identify:

a. What Temporary Test Tower Facilities are to be installed;

b. Where the Temporary Test Tower Facilities will be located;

c. When the Temporary Test Tower Facilities will installed and when the Temporary Test Tower Facilities will be active;

d. The purpose of the Temporary Test Tower Facilities, including but not limited to the purpose of completing testing in contemplation of a future Wind Power Project and a general description of such future Wind Power Project.

9.2. A copy of the written notice prescribed by clause 9.1 shall also be sent to the Mayor and all Councillors of the Municipality, no later than three (3) weeks prior to the commencement of construction.

9.3. Citizen Monitoring Committee

a. Upon receiving notice of the installation of Temporary Test Tower Facilities, Council may establish a Citizen Monitoring Committee which will be established with respect to the Temporary Test Tower Facilities, which may remain in existence for the life of the Temporary Test Tower Facilities, or for a shorter period if deemed necessary by Council.

b. A Citizen Monitoring Committee established pursuant to clause 9.3(a) may be continued pursuant to clause 9.6(a) in the event that Temporary Test Tower Facilities give rise to an application for a Wind Power Project.

c. The Citizen Monitoring Committee shall be chaired by the Municipal Councillor for the area in which the Temporary Test Tower Facilities are being installed.

d. The function of a Citizen Monitoring Committee established pursuant to clause 9.3(a) of this By-law shall be as determined from time to time by Policy.

Public Notice and Consultation as part of application for Wind Power Project

9.4. As part of the application for a Wind Power Project, the applicant must demonstrate that it has made plans to conduct a community meeting in accordance with this clause, held in the community where the proposed Wind Power Project is to be installed, where the applicant will present to the community on the application it has submitted to the Municipality to install and operate a Wind Power Project, including showing the site plan included with its application and answering any questions concerning the Wind Power Project for which the License has been applied for. This community meeting shall be held at the convenience of the applicant, however the applicant's application shall not be considered complete for the purposes of clause 4.3 of the By-law until such time as this community meeting is held.

9.5. Notice of Community Meeting

a. The applicant shall schedule the community meeting in consultation with the Development Officer and the Chair of the Citizen Monitoring Committee, no later than three (3) weeks before the applicant wishes to hold such community meeting. Immediately after the applicant, the Development Officer and the and the Chair of the Citizen Monitoring Committee reach agreement as to the date, time and location of the community meeting, the applicant shall give written notice of the community meeting to the Mayor and all Councillors of the Municipality, which notice shall include the date, time and location of the community meeting along with an explanation as to which proposed Wind Power Project the community meeting pertains.

b. The applicant shall provide written notice of a community meeting held pursuant to this clause to all land owners who own land within two (2) kilometres of the boundaries of the proposed Wind Power Project by way of regular mail to the registered address of the land owner, no later than three (3) weeks prior to any scheduled community meeting. This written notice shall include the date and time of the community meeting. The applicant shall provide the Development Officer with a complete list of land owners to whom written notice was given pursuant to this clause within two (2) days of such written notices being given.

c. Notice of a community meeting held pursuant to this clause will be advertised in the local daily newspaper at least two (2) times, the first notice to be published at least fourteen (14) days before the date of the meeting and the second notice being at least seven (7) days before the date of the meeting.

d. At the time of publishing a first notice pursuant to clause 9.5(c) of this By-law, the applicant shall provide to the Development Officer a copy of the newspaper in which the first notice was published.

e. At the time of publishing a second notice pursuant to clause 9.5(c) of this By-law, the applicant shall provide to the Development Officer a copy of the newspaper in which the second notice was published.

9.6. Citizen Monitoring Committee

a. During the community meeting, Council may give notice of the continuation of, or the establishment of, a Citizen Monitoring Committee which will be continued or established with respect to the proposed Wind Power Project after the issuance of the License or renewal of a License, which may remain in existence for five (5) years or for a different time period if deemed necessary by the Chair of the Citizen Monitoring Committee.

b. The Citizen Monitoring Committee shall be chaired by the Municipal Councillor for the area in which in which the proposed Wind Power Project will be located.

c. The function of a Citizen Monitoring Committee continued or established pursuant to clause 9.6(a) of this By-law shall be as determined from time to time by Policy.

9.7. Notice of Approval

a. Notice of an approval of a License shall be sent by the Development Officer to those land owners who own land within two (2) kilometres of the boundaries of the approved Wind Power Project, by way of regular mail within five (5) days following the issuance of the License.

10. Enforcement

10.1. Right of Inspection

a. The Development Officer may, for the purpose of ensuring compliance with this By-law and the terms of a License issued pursuant to this By-law, enter in or upon any land or premises at any reasonable time upon reasonable notice.

b. If any individual or organization attempts to interfere or interferes with the Development Officer in the exercise of a power pursuant to this By-law, the Development Officer may apply to a judge of the Supreme Court of Nova Scotia for an order to allow the Development Officer to enter in or upon the premises for the purpose of ensuring compliance with this By-law and the terms of a License issued pursuant to this By-law and for an order restraining the individual or organization from further interference.

10.2. Offence

It shall be an offence to:

a. contravene any provision of this By-law;

b. contravene any condition in a Licence issued or renewed pursuant to this By-law; or

c. fail to comply with any representations contained within an application upon which a Licence was issued or renewed pursuant to this By-law.

10.3. Punishment

a. Any individual or organization who commits an offence pursuant to clause 10.2 of this By-law shall be punishable on summary conviction as follows:

i. for a first offence, by a fine of not less than $1,000 and not more than $5,000 and to imprisonment of not more than two (2) months in default of payment thereof;

ii. for a second offence, by a fine of not less than $2,000 and not more than $10,000 and to imprisonment of not more than two (2) months in default of payment thereof; and

iii. for a third and subsequent offence, by a fine of not less than $5,000 and not more than $20,000 and to imprisonment of not more than two (2) months in default of payment thereof.

10.4. Additional Penalty

a. In addition to any penalty under clause 10.3 of this By-law, in the event of an offence under this By-law, the Development Officer may:

i. suspend a Licence for a period of up to three (3) months for a first conviction, and

ii. revoke a Licence for a second conviction within any three (3) year period.

b. A suspension or revocation shall preclude any individual or organization from

i. in the event of a suspension, receiving a Licence or renewal of a License for the period of the suspension, and

ii. in the event of a revocation, receiving a License or renewal of a License for five (5) years,

in respect of the same Wind Power Project in relation to which the offence was committed.

10.5. Enforcement of Decommission Plan

a. At the end of the operational life of a Wind Power Project or part thereof, occurring either at the choice of the Owner and/or Operator or for any other reason contemplated in this By-law, and upon a finding by the Development Officer that the Decommission Plan has not been carried out in a way satisfactory to the Development Officer, the Development Officer may:

i. give notice to the Owner and/or Operator advising them of any steps necessary to complete the Decommission Plan and directing the Owner and/or Operator to take such steps to complete Decommissioning of the Wind Power Project within a reasonable period of time and at the Owner and/or Operator's expense;

ii. if the Owner and/or Operator does not abide by direction of the Development Officer within a reasonable period of time after notice is given pursuant to clause 10.5(a)(i) of this By-law, carry out any steps the Development Officer had deemed necessary to complete Decommission of the Wind Power Project on behalf of the Owner and/or Operator. All costs incurred in the course of such Decommissioning undertaken by the Development Officer shall be the responsibility of the Owner and/or Operator and shall be immediately payable by the Owner and/or Operator to the Development Officer upon demand.

b. This Section shall operate in addition to the provisions contained on clause 10.3 of this By-law.

10.6. Appeals

a. Any applicant whose application for a Licence or renewal of a License has been refused may, within thirty (30) days from the date of the Development Officer's decision, file an appeal to Council or to a Committee designated by Council from time to time by Policy, in writing and in such form as is approved from time to time by Council by Policy.

b. Any individual or organization whose License has been suspended or revoked may, within thirty (30) days from the date of the Development Officer's decision, file an appeal to Council or to a Committee designated by Council from time to time by Policy, in writing and in such form as is approved from time to time by Council by Policy.

c. Council or the Committee designated by Council from time to time by Policy shall hear an appeal commenced pursuant to clauses 10.6(a) or 10.6(b) at a hearing held within a reasonable period of time after the filing of the appeal and Council may dismiss the appeal, allow the appeal and reverse the decision under appeal, or vary the decision under appeal.

d. The filing of an appeal pursuant this clauses 10.6(a) and 10.6(b) does not vary, suspend or stay the decision of the Development Officer, and decision of the Development Officer shall remain in full force and effect unless and until it is reversed or varied by Council or the Committee designated by Council.

e. The right of appeal provided by clauses 10.6(a) and 10.6(b) shall expire thirty (30) days after the date of the Development Officer's decision.

f. All other decisions made by the Development Officer pursuant to this By-law shall be final.

11. Transition

11.1. Any application for a License or renewal of a License submitted prior to the date of the coming into force of this By-law, and which is undecided as of the coming into force of this By-law, shall be deemed to be a new application for a License or renewal of a License submitted as of the date of the coming into force of this By-law, and shall be decided in accordance with this By-law.

12. Severability

12.1 Each and every of the foregoing clauses of this By-law is severable and that if any provision of this By-law should for any reason be declared invalid by any court, it is the intention and desire of the Council of the Municipality that each and every of the then remaining provisions hereof should remain in full force and effect.

THIS IS TO CERTIFY, that By-law # 56, Wind Turbine Development By-law, was duly approved at a duly called meeting of the Municipal Council of the Municipality of the County of Colchester, duly convened and held on the 30th day of October, A.D., 2013.

GIVEN under the hand of the Municipal Clerk and under the corporate seal of said Municipality this 6th day of November, A.D., 2013.

_____

Ramesh Ummat
Municipal Clerk

I, Ramesh Ummat, Municipal Clerk of the Municipality of the County of Colchester, do hereby certify that the adjacent Notice of Approval is a true copy of the Notice of Approval of Chapter 56 – Wind Turbine Development By-law, duly advertised in the Wednesday, November 6, 2013 issue of the Truro Daily News.

Given under the hand of the Municipal Clerk and under the corporate seal of said Municipality this 6th day of November, 2013.

_____

Municipal Clerk

The Municipality of Colchester
Notice of Approval
Wind Turbine Development By-law

TAKE NOTICE that on Wednesday, October 30, 2013, the Council of the Municipality of the County of Colchester approved amendments to Chapter 56 - Wind Turbine Development By-law.

The amendments to the By-law, effective immediately, increase the minimum setback requirement for large scale wind turbines, in combination with meeting an established maximum sound pressure level to determine location. Enhanced public consultation and communication requirements are also in place.

Copies of the By-law are available from the Community Development Office, 1 Church Street, Truro, or through the County's website at www.colchester.ca

Dated November 6, 2013

Ramesh Ummat
Chief Administrative Officer

Appendix L

COMFIT Approval and Certification

NOVA SCOTIA
Energy
Office of the Minister

Suite 400, 5151 George Street, PO Box 2664, Halifax, Nova Scotia, Canada B3J 3P7 • Telephone 902 424-7793 Fax 902 424-3265 • www.gov.ns.ca/energy

July 31, 2012

Reuben Burge
796 Dan Fraser Rd
Pictou, NS
B0K 2A0

Dear Affinity Renewables:

Re: Community Feed-In Tariff Approval

On behalf of the Nova Scotia Department of Energy, I am pleased to present you with your Community Feed-In Tariff (COMFIT) approval for two 1.6 MW wind turbines (for a total of 3.2 MW) in Greenfield, Nova Scotia. (Project Number 183). Attached to this letter is a certificate indicating your approval.

In order to maintain your COMFIT approval, you must comply with:

(1) The specifications of the proposed project as outlined in your COMFIT application and any supplemental information provided; any alterations to your proposal (e.g., technology type, ownership structure, specifications, etc.) requires prior approval by the Department. Alterations must be submitted in writing for approval.

(2) The Electricity Act and the Renewable Electricity Regulations. Amongst other things, section 34 of the Renewable Energy Regulations requires you to submit a report to the Department of Energy within 30 days of your project's connection to the distribution grid, failure to do so may result in revocation of your COMFIT approval.

As a condition of your approval, you must comply with any conditions set by Nova Scotia Power Incorporated.

As a further condition of approval, you must complete:

- Community Consultation: A minimum of two public information sessions must be held prior to commencing construction of the project. Results of the information sessions must be submitted to the Department of Energy, outlining any community concerns with the proposed project.

- Project Time Line and Milestones: As per S. 30 of the *Renewable Electricity Act and Regulations,* a detailed project schedule including timelines and key milestones must be submitted to the Department of Energy within 60 days of approval. You will be required to report on the progress of the project, in accordance with your submission.

- Environmental Assessment.

- Wind Energy Mapping: The Department of Energy and Department of Natural Resources are endeavoring to map wind development within the province. All approved projects are required to submit the appropriate geographic information system data, and work collaboratively to address any recommendations emerging from an assessment of the cumulative impact of wind energy in the province. More information is provided in the guidance note.

These conditions are not an exhaustive list of the permits and approvals needed for your project. COMFIT approval does not supersede any additional regulations, permits or approval required by other government authorities as your project unfolds. Projects must still comply with all other conditions and milestones as set by government entities and Nova Scotia Power Inc. Failure to meet additional requirements may result in revocation of your COMFIT approval, even though they may not be an explicit condition at this time.

A COMFIT guidance note is attached with information pertaining to the implementation of your project. The guidance note is not a condition of approval, but information that may be useful to you as you implement your project. As per Directive 004: Annual Progress reports, the Department looks forward to receiving your annual reports on how COMFIT proceeds have assisted in meeting community sustainability goals.

Please note that you are also required to submit a report to the Department of Energy within 30 days of your project's connection to the distribution grid as identified in Section 34 of the Renewable Electricity Regulations. Failure to do so may result in revocation of your COMFIT approval.

If you have any questions about your approval, or if we can be of further assistance to you, please call COMFIT Clerk at (902) 424-5293 and a representative will be happy to assist you.

Yours sincerely,

Charlie Parker
Minister

Enclosure

№. Project 183

Community Feed-In Tariff Approval

This certifies that *Affinity Renewables* has received Community Feed-In Tariff Approval by the Nova Scotia Department of Energy for a 3.2 MW large wind project in Greenfield, Nova Scotia. Approval may be revoked should a project not meet the requirements of the Community Feed-In Tariff program or deviate from details specified in its Community Feed-In Tariff application.

NOVA SCOTIA
Department of Energy

Charlie Parker
Minister

№. Project 183

Community Feed-In Tariff Approval

This certifies that *Affinity Renewables* has received Community Feed-In Tariff Approval by the Nova Scotia Department of Energy for a 3.2 MW large wind project in Greenfield, Nova Scotia. Approval may be revoked should a project not meet the requirements of the Community Feed-In Tariff program or deviate from details specified in its Community Feed-In Tariff application.

NOVA SCOTIA
Department of Energy

Charlie Parker
Minister