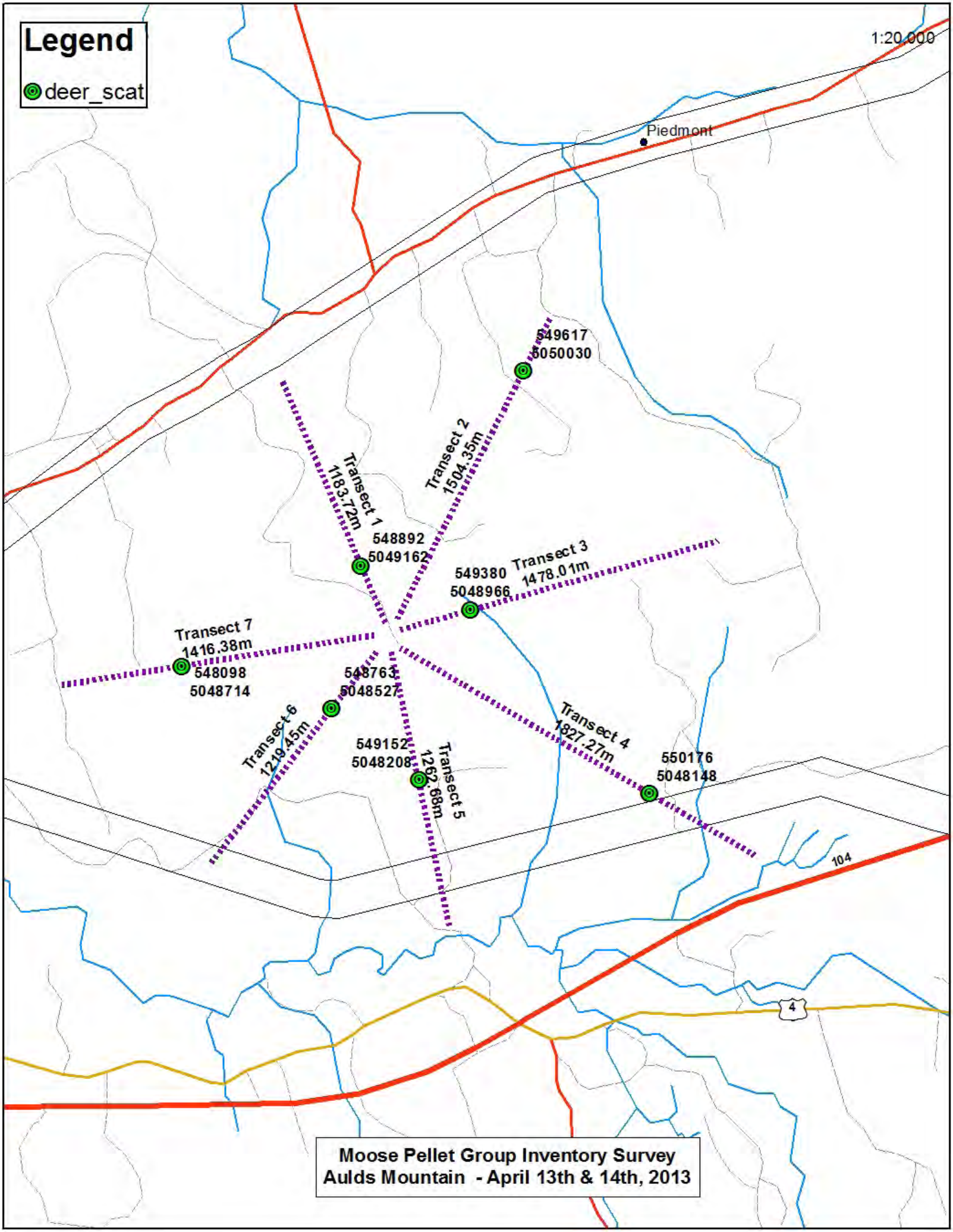
Appendix E:

Mainland Moose Surveys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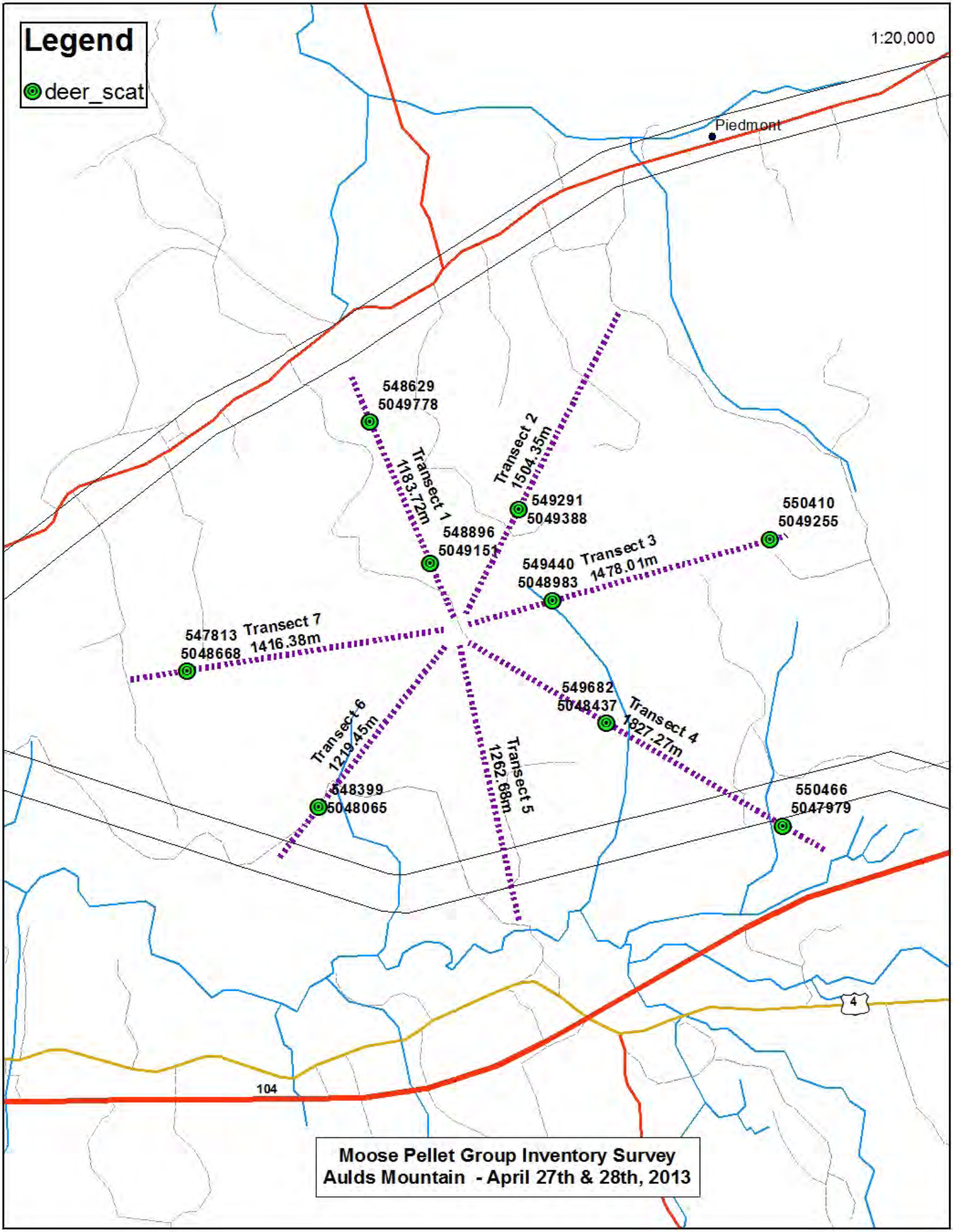
Aulds Mountain - April 13th & 14th, 2013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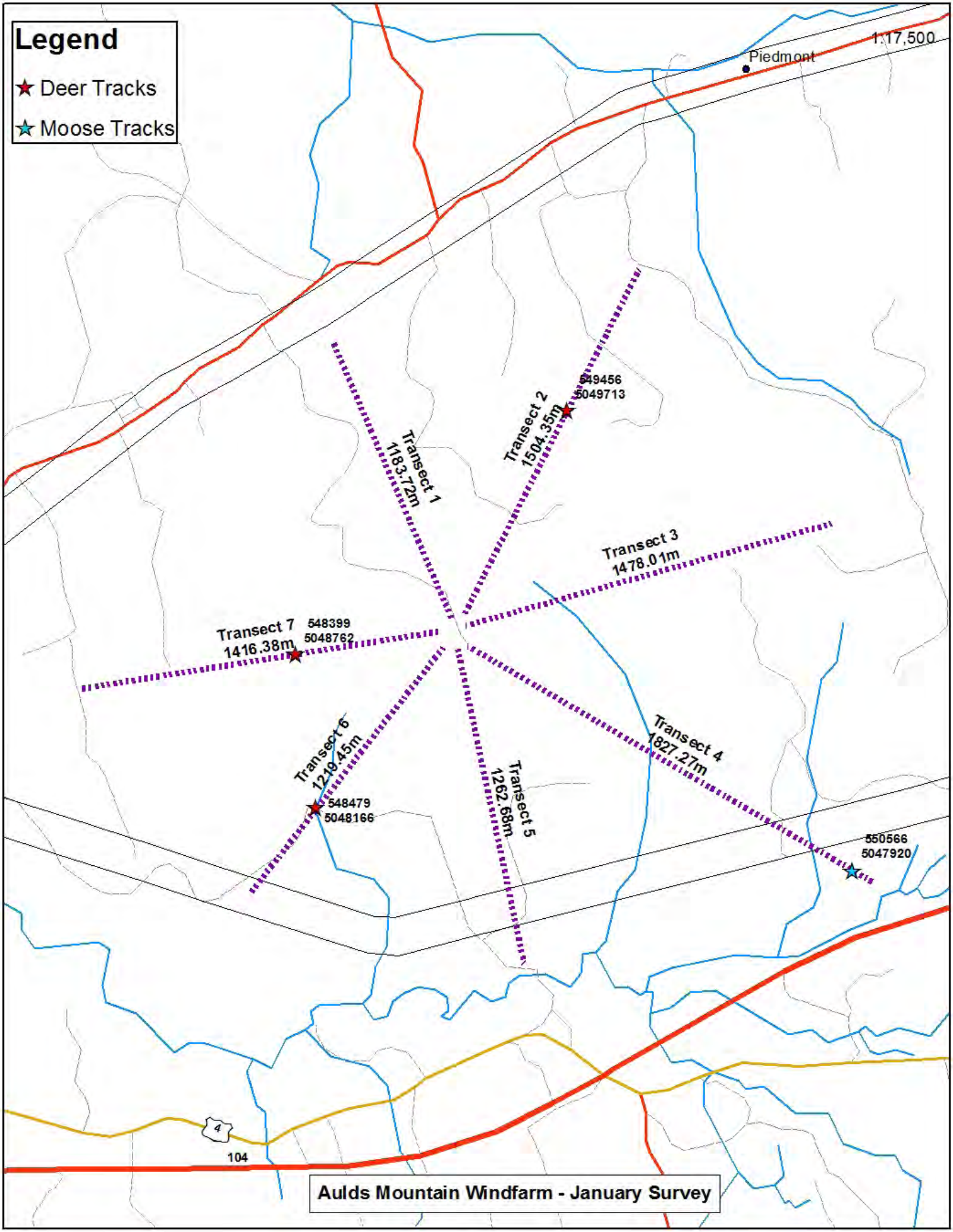
Moose Pellet Group Inventory Survey
Aulds Mountain - April 27th & 28th, 2013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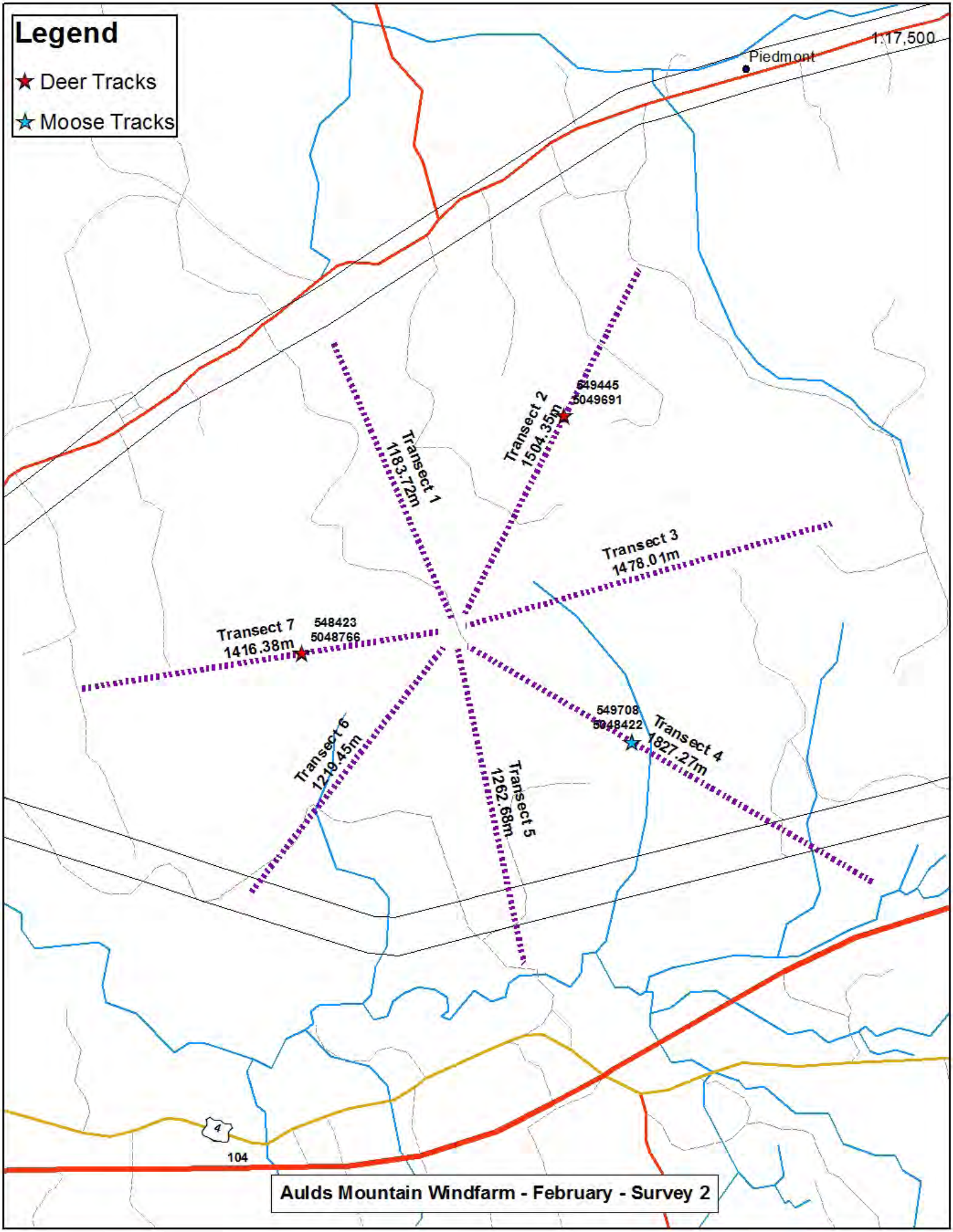
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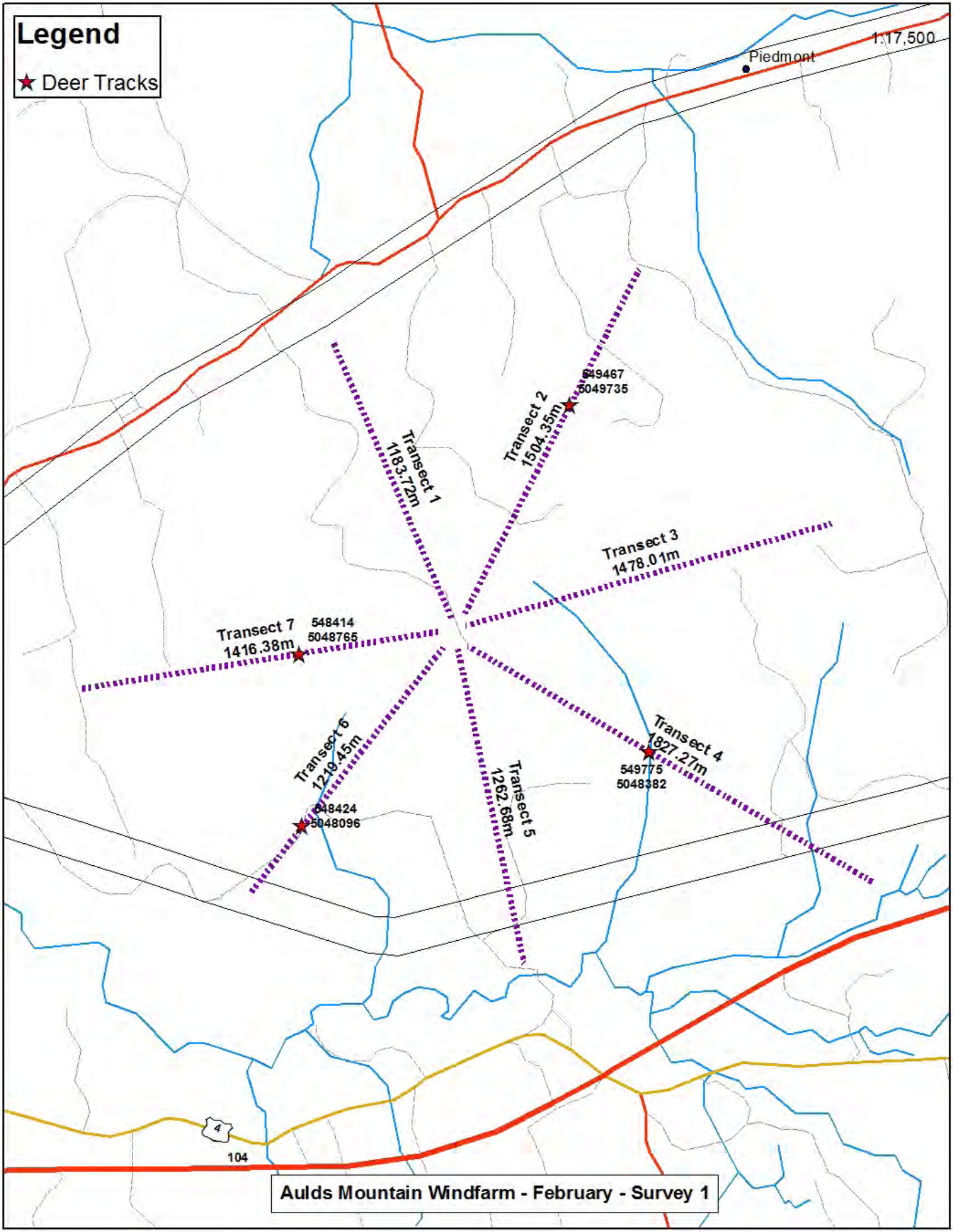
Aulds Mountain Windfarm - February - Survey 2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Aulds Mountain Windfarm - February - Survey 1

Appendix F:

Wetlands Assessment

October 11, 2013

Mr. Andy MacCallum
Natural Forces Wind Inc.
1030 – 1791 Barrington Street
Halifax, NS B3J 3L1

Dear Mr. MacCallum

Re: Wetland and Watercourse Assessment
Auld's Mountain, NS

INTRODUCTION

Strum Consulting was retained by Natural Forces Wind Inc. to conduct a wetland and watercourse assessment on the site of a proposed wind energy development at Auld's Mountain, Nova Scotia (the Project). The objective of the assessment was to identify and characterize areas of wetland habitat and watercourses on the Project site in the areas around the proposed locations of turbine infrastructure and along the associated access road (the Assessment Area).

The scope of the assessment involved completing a desktop review to create mapping that would identify the potential for wetland habitat and watercourses. This was followed by a field survey to confirm, flag, and characterize wetland habitat, and to characterize watercourses within the Assessment Area.

SITE DETAILS

The Project site is located in Pictou County near the community of Piedmont NS, approximately 21 km east of the town of New Glasgow (Drawing 1). The Project site consists of un-developed forested land on the western extent of Auld's Mountain approximately 240 m above sea level. A woods road, historically used to access timber resources, extends 160 m from the Piedmont Valley Road to the Project site. Adjacent properties consist of other private woodlots, small agricultural farms, and residential properties.

DESKTOP REVIEW

Data Sources

The following local databases, maps, and background information were reviewed prior to completing the field survey, to identify potential wetlands and watercourses:

- NS Department of Natural Resources (NSDNR) Significant Species and Habitat Database;
- NS Geomatics Centre;
- NSDNR Wet Areas Mapping (WAM);
- Aerial Photography; and
- Topogr aphical Maps.

Results

Information from the data sources was compiled to create digital mapping layers to review the potential for wetland habitat and watercourses at the Assessment Area.

No wetland habitat was identified by the NS Geomatics Centre or the NS Significant Species and Habitats databases within the Assessment Area. The closest wetland habitat (a marsh) is identified by the NS Significant Species and Habitats database approximately 1km west of the Assessment Area boundary, abutting the Piedmont Valley Road (Drawing 2). The WAM database shows potential for wet areas (as indicated by a depth to water table of 0.5m or less) in several areas along the access road at the northern extent of the Assessment Area, as well as an isolated narrow feature in southern portions of the Assessment Area.

The NS Geomatics Centre also identified one mapped watercourse that originates adjacent to Piedmont Valley Road and crosses beneath the existing access road in northern portions of the Assessment Area (Drawing 2).

FIELD SURVEY

The wetland survey was conducted on October 1st and 2nd, 2013.

Methodology

The Assessment Area was walked to assess for potential wetland habitat and the presence of watercourses. Wetland boundaries were delineated based on the methodology set out by the US Corps of Engineers Wetland Delineation Manual (1987). Wetland boundaries were flagged using pink flagging tape marked 'wetland delineation'. The boundaries were documented by recording the position of each flag using the track function on a GPS receiver capable of sub-5m accuracy. Detailed delineation methodologies are attached.

As part of the survey, a general characterization of the wetlands and watercourses identified in the study area was also completed.

Results

Detailed information for wetland and watercourse characteristics is provided in Tables 1 and 2 (attached). Representative photos of the different wetland types are provided in the Photo Log (attached).

The wetland survey resulted in the identification of twelve wetlands and seven watercourses within the Assessment Area (Drawings 3A and 3B). The wetlands on the site are mostly hardwood or mixed wood treed or shrub swamps in sandy/mucky modified soils or organic soils. Wetlands found along the road are treed or shrub swamps located in small topographic basins sourced by watercourses or ephemeral drainage features that are sufficient to maintain wetland hydrology. One wet meadow (Wetland 1) exists at the northern extent of the proposed access road where it meets the Piedmont Valley Road. This wetland comprises poorly drained land located adjacent to an agricultural field, which sources the wetland water via surface runoff.

In southern portions of the Assessment Area, which encompass the proposed turbine locations, several mixed wood treed swamps exist. , Conditions in these wetlands exhibit thin organic soils on a restrictive rock surface. These swamps typically source ephemeral drainage features or watercourses which drain downhill beyond the Assessment Area. One marsh (Wetland 12) exists in the eastern extent of the Assessment Area in a shallow basin. This marsh appears to have formed by the detainment of surface water in rutting associated with historic logging activities.

Several small watercourses (*i.e.*, bank full width less than 2m) were also confirmed at the Project site. Most of these watercourses arise from ephemeral drainage features that are often sourced by wetlands, and become more channelized as they drain downhill.

PROVINCIAL WETLAND REGULATIONS

The Nova Scotia Wetland Alteration Approval process determines the following activities as a wetland alteration:

- filling;
- drainin g;
- flooding; and
- excavating.

Certain exemptions for wetland alteration approval are possible under the Nova Scotia Environment Wetland Conservation Policy. One such exemption includes linear developments that are less than 10 m wide and less than 600 square meters in total area (*e.g.*, forest access roads, secondary roads and driveways) through shrub or wooded swamps that are not classified as "Wetlands of Special Significance".

RECOMMENDATIONS

Based on the completed assessment, Strum provides the following recommendations:

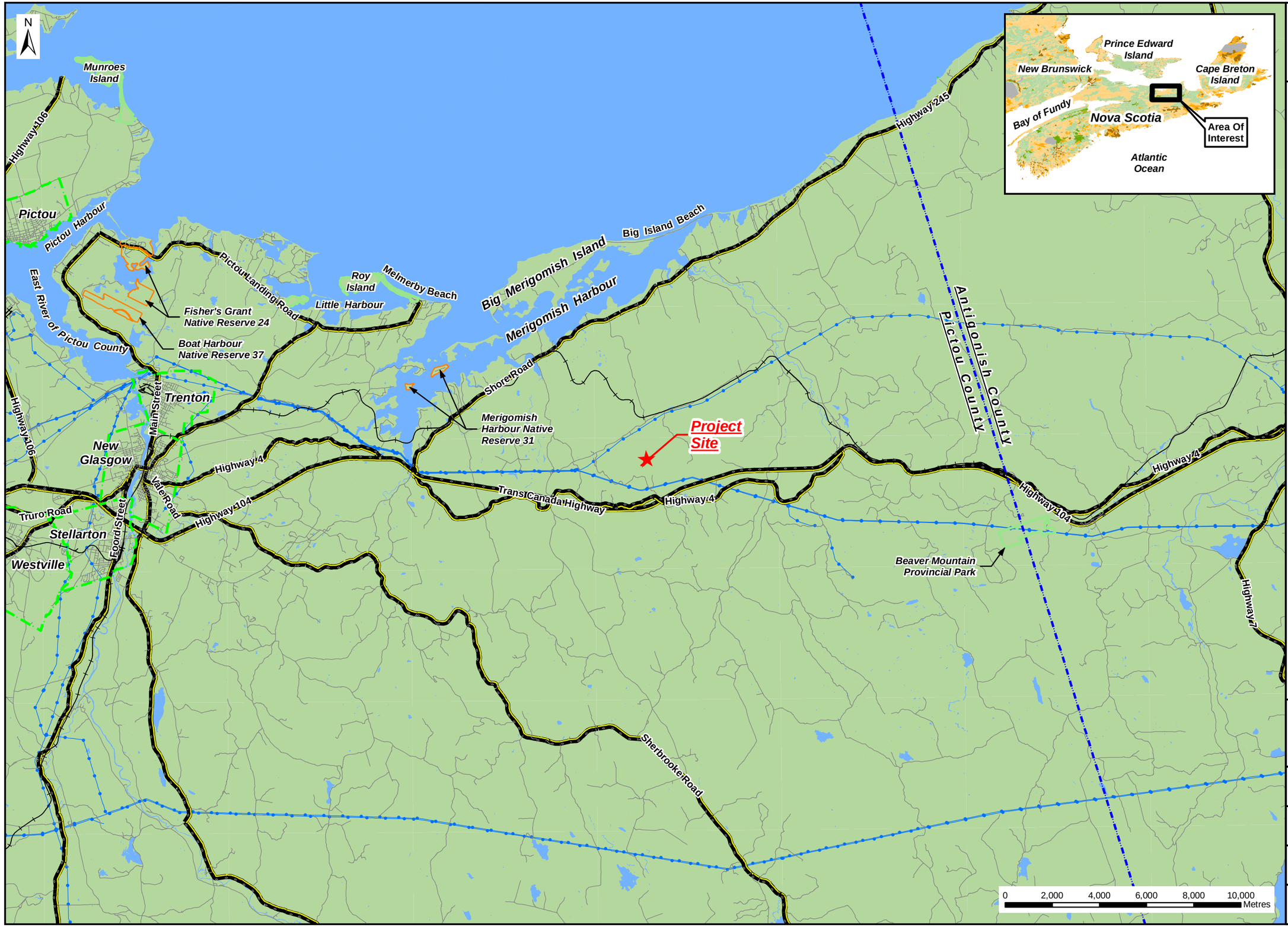
1. Alteration of wetland habitat is subject to provincial permitting requirements. If required, approvals for wetland alteration should be obtained in advance.
2. Alteration of watercourses identified on the property will require provincial permitting and should be obtained in advance.

If you have any questions, please contact us.

Thank you,

Andy Walter, B.Sc.
Environmental Specialist
awalter@strum.com

Carys Burgess, MMM
Senior Environmental Specialist
cburgess@strum.com



Notes:

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

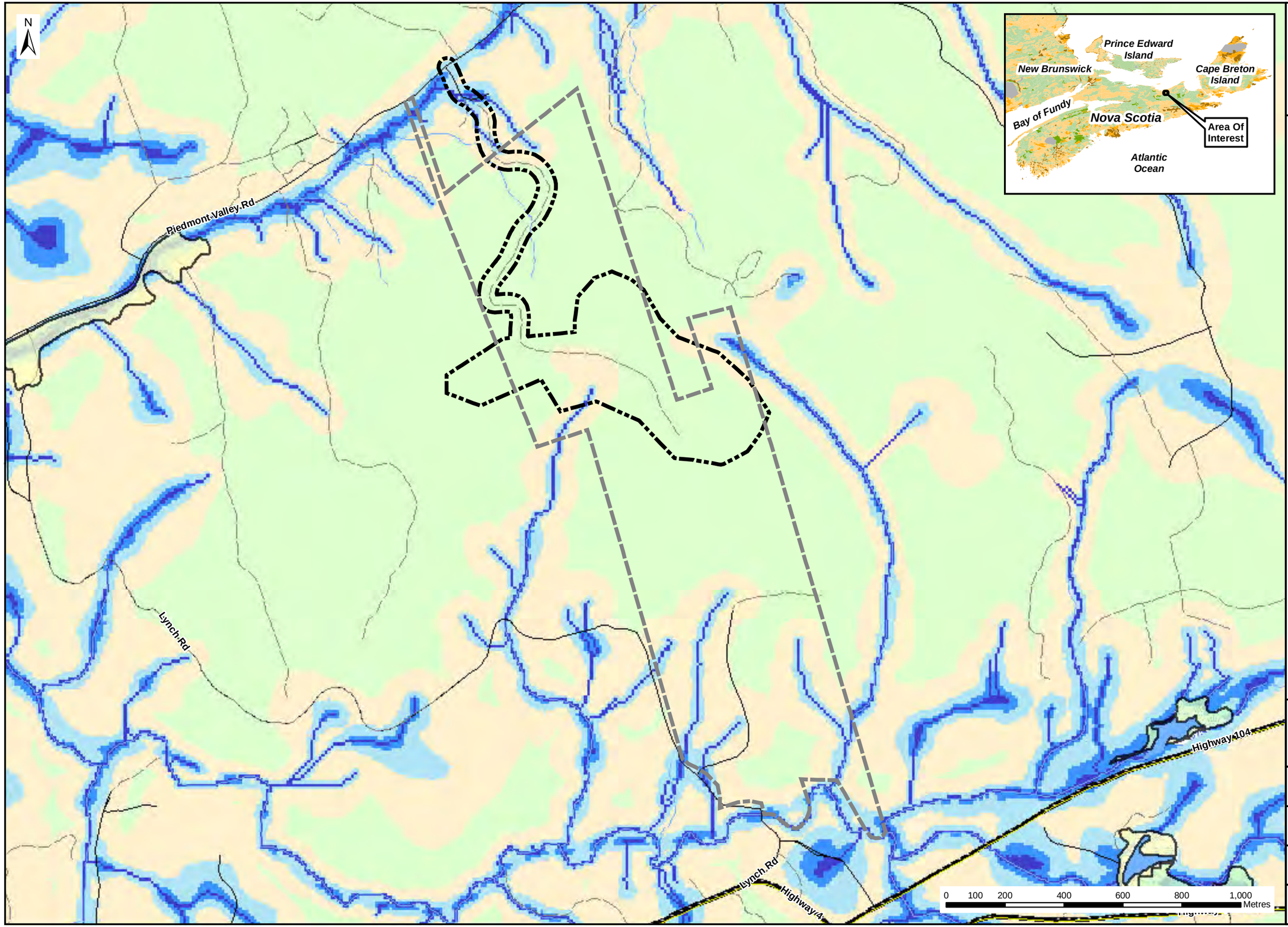
Legend:

- County Boundary
- Municipal Boundary
- Native Reserve
- Provincial Park
- Active Railroad
- Public Roads
- Major Roads and Highways
- Existing Transmission Lines
- Water Bodies

Project Site Location

Strum CONSULTING

Date: October 2013	Project #: 12-4509
Scale: 1:150,000	Drawing #: 1
Drawn By: H. Serhan	
Checked By: S. Dickey	



Notes:

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

Legend:

- Project Site Boundary
- Assessment Area

NS DNR Wetland Inventory

Wetland Type

- Bog or Fen
- Fen
- Marsh
- Salt Marsh
- Swamp
- Major Roads and Highways
- Public Roads
- Access Roads / Trails
- Mapped Stream
- Mapped Indefinite Stream
- Water Bodies
- Mapped Wet Area

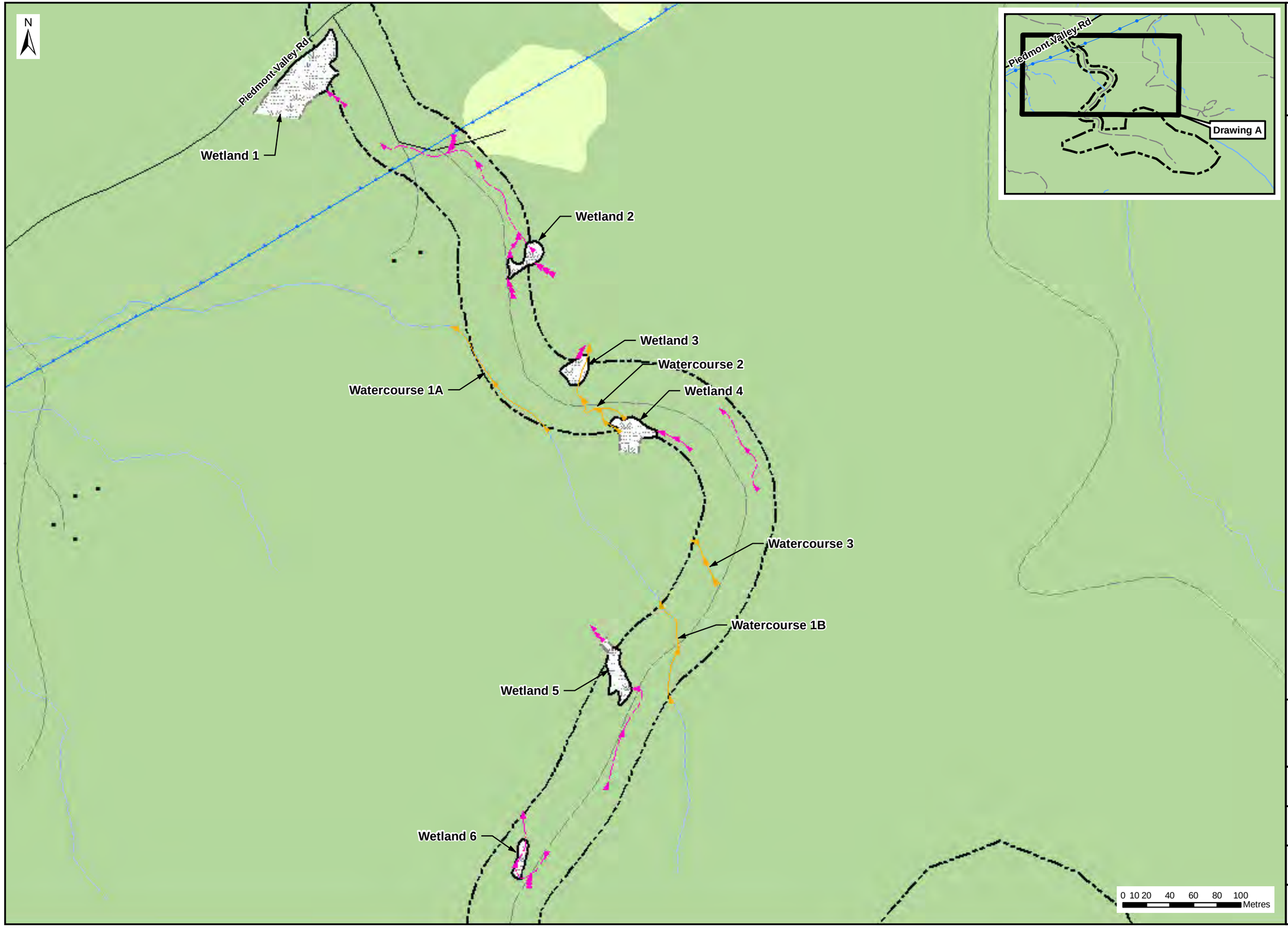
Depth to Water Table (m)

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

Desktop Review Results

Strum Consulting

Date: October 2013	Project #: 12-4509
Scale: 1:12,000	Drawing #: **2**
Drawn By: H. Serhan	
Checked By: S. Dickey	



Notes:

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

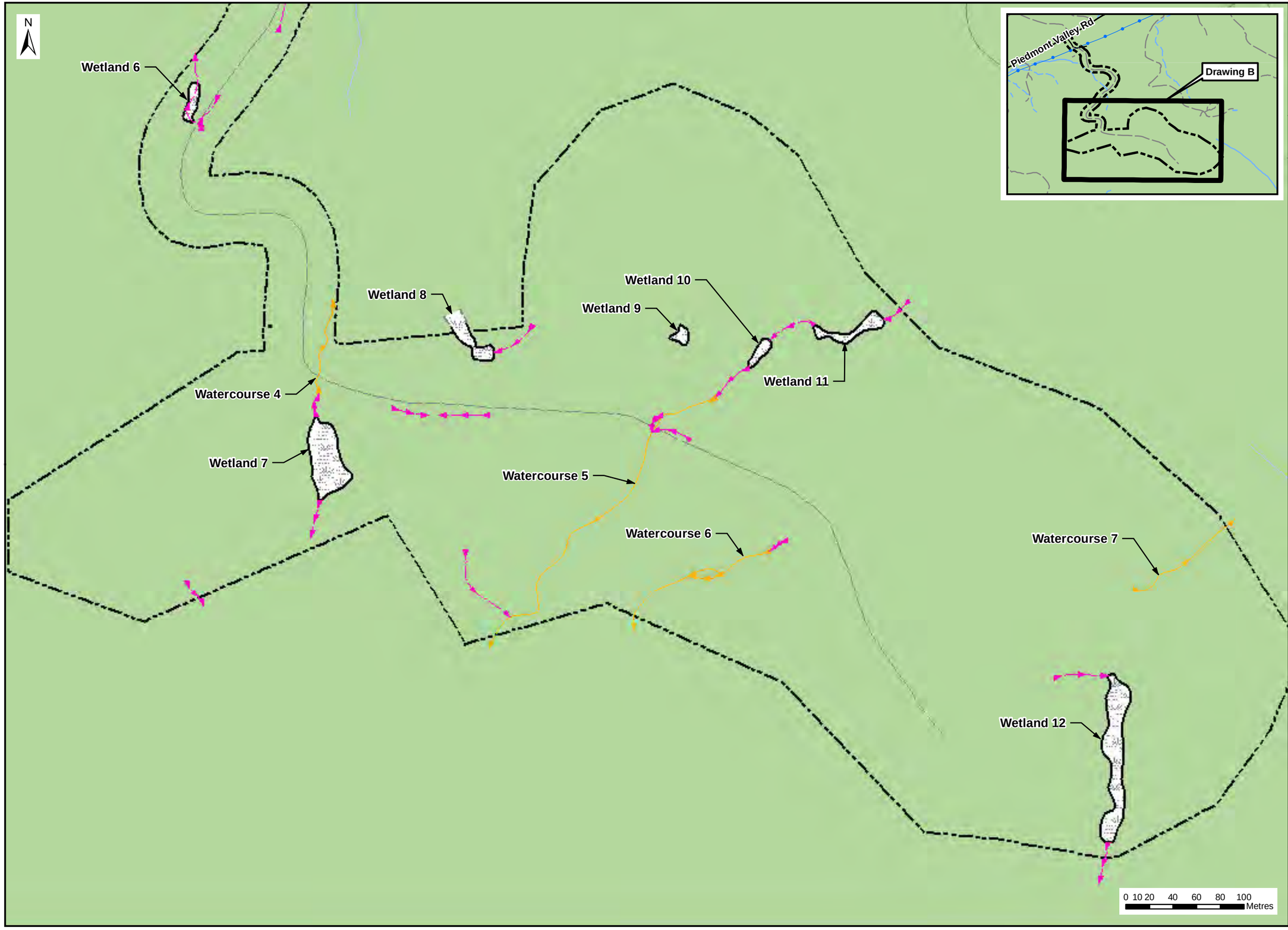
Legend:

- Field Identified Watercourse
- Field Identified Drainage Channel
- Confirmed Wetland Boundary
- Approximate Wetland Boundary
- Field Identified Wetland
- Assessment Area
- Building
- Public Roads
- Access Roads / Trails
- Existing Transmission Lines
- Mapped Stream
- Mapped Indefinite Stream
- Water Bodies
- Cleared Area

Survey Results

Strum CONSULTING

Date: October 2013	Project #: 12-4509
Scale: 1:3000	Drawing #: **3A**
Drawn By: H. Serhan	
Checked By: S. Dickey	



Notes:

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

Legend:

- Field Identified Watercourse
- Field Identified Drainage Channel
- Confirmed Wetland Boundary
- Approximate Wetland Boundary
- Field Identified Wetland
- Assessment Area
- Public Roads
- Access Roads / Trails
- Mapped Stream
- Mapped Indefinite Stream

Survey Results

Strum CONSULTING

Date: October 2013	Project #: 12-4509
Scale: 1:3000	Drawing #: **3B**
Drawn By: H. Serhan	
Checked By: S. Dickey	

Table 1: Wetland Characteristics - Aulds Mountain *Project # 12-4509*

WETLAND ID	WETLAND TYPE	LANDSCAPE POSITION	LANDFORM	WATER FLOW	HYDRIC SOIL INDICATOR	SURFACE/HYDROLOGIC CONDITIONS	WETLAND BOUNDARY	DOMINANT VEGETATION			WATERCOURSE/WATER BODY PRESENT
								Herbs	Shrubs	Trees	
Wetland 1	Wet meadow	Terrene	Basin	Outflow	F21: Red parent material; A4: Hydrogen sulfide odour	1) Saturated at surface 2) Groundwater within 8 cm	Gentle to moderate	sensitive fern; Canada goldenrod;	None	None	None observed.
Wetland 2	Shrub swamp	Terrene	Sloped basin	Throughflow (ephemeral)	S1: Sandy mucky mineral	1) Saturated at surface 2) Intermittent surface water 3) Drainage patterns 4) Sparcley vegetated concave surface	Moderate	creeping buttercup; cinnamon fern; sensitive fern; narrow leaved goldenrod	white ash; yellow birch; white birch	None	Receives drainage from the roadside ditch as well as from the southeast.
Wetland 3	Treed swamp	Terrene	Basin	Throughflow	S1: Sandy mucky mineral	1) Saturated at surface 2) Flowing surface water	Gentle to moderate	sensitive fern; flat-topped aster; bluejoint reedgrass	white birch; witch-hazel	trembling poplar; white birch	Watercourse 2 flows through this wetland.
Wetland 4	Treed swamp	Lotic	Slope	Throughflow (ephemeral)	Organic on rock (A1 - histosol)	1) Saturated at surface; 2) Water-stained leaves	Gentle	flat-topped aster; creeping buttercup; sensitive fern; fringed sedge; wooly rush	speckled alder	white spruce	Drainage input from southeast; drains away to the northwest.
Wetland 5	Shrub swamp	Terrene	Slope	Throughflow (ephemeral)	S1: Sandy mucky mineral; redox concentrations around roots	1) Saturated at surface; 2) Water-stained leaves	Gentle	flat-topped aster; common cinquefoil	speckled alder; white spruce	None	Drainage input via culvert beneath existing road; drainage output to the northwest.
Wetland 6	Treed swamp	Terrene	Slope	Throughflow (ephemeral)	S1: Sandy mucky mineral; redox concentrations around roots	1) Saturated at surface; 2) Water-stained leaves	Gentle	wooly rush; canada rush; flat-topped aster	white spruce; yellow birch; willow species	white spruce; yellow birch	Drainage input via culvert beneath existing road; drainage output to the north.
Wetland 7	Treed swamp	Terrene	Basin	Outflow (ephemeral)	Organic on rock (A1 - histosol)	1) Saturated at surface 2) Standing surface water 3) Groundwater at surface	Gentle	cinnamon fern; three-seeded sedge; evergreen wood fern;	balsam fir; yellow birch; red maple	balsam fir; black spruce; yellow birch; red maple	The wetland is located on high land and drains ephemerally to the south and north. Northern drainage sources water to Watercourse 4.
Wetland 8	Treed swamp	Terrene	Basin	Throughflow (ephemeral)	Organic over depleted mineral (A2- histic epipedon)	1) Saturated at surface; 2) Water-stained leaves	Gentle	cinammon fern; ostrich fern; tussock sedge	white ash; white spruce	red maple; white spruce	Drainage in from southeast, drainage out to northwest.
Wetland 9	Treed swamp	Terrene	Basin	Isolated	Organic over depleted mineral (A2- histic epipedon)	1) Saturated at surface; 2) Water-stained leaves	Gentle to steep	flat-topped aster; cinammon fern; sensitive fern	yellow birch	balsam fir; yellow birch	None observed.
Wetland 10	Treed swamp	Terrene	Basin	Throughflow (ephemeral)	Organic over depleted mineral (A2- histic epipedon); iron-rich layer beneath depleted layer	1) Saturated at surface; 2) Water-stained leaves	Gentle to moderate	cinammon fern; white ash; yellow birch; New York fern	yellow birch; white spruce; balsam fir	white ash; striped maple; red maple	Drainige input from northeast, drainage output to southwest which sources Watercourse 5.
Wetland 11	Treed swamp	Terrene	Basin	Throughflow (ephemeral)	Organic over depleted mineral (A2- histic epipedon); iron-rich layer beneath depleted layer	1) Saturated at surface; 2) Water-stained leaves	Gentle	creeping buttercup; cinammon fern; sensitive fern	balsam fir; eastern hemlock; yellow birch	yellow birch; red maple	Drainage input from northeast, drainage output to southwest.
Wetland 12	Marsh	Terrene	Basin	Throughflow (ephemeral)	Organic over depleted mineral (A2- histosol)	1) Saturated at surface; 2) Standing surface water	Gentle	wooly bullrush; wide-leaved cattain; fringed sedge; flat-topped aster; Canada goldenrod	red spruce	None	Drains to the south. Receives seepage input from a drainage feature to the west.

Table 2: Watercourse Characteristics - Aulds Mountain *Project # 12-4509*

FEATURE ID	WIDTH (m)		DEPTH (cm)		SUBSTRATE	DRAINAGE DIRECTION	OTHER OBSERVATIONS
	Bankfull	Wetted	Bankfull	Wetted			
Watercourse 1A	2	0.75	75	10	cobble, boulders	northwest	Deeply entrenched within a steep ravine; several small waterfalls; significant amount of in-stream woody debris.
Watercourse 1B	1.5	0.5	200	25	cobble, silt	northwest	
Watercourse 2	0.6	0.2	30	5	cobble, silt	northwest	Emerges from drainage outflow from Wetland 4; becomes increasingly entrenched as it extends downslope.
Watercourse 3	2	0.5	50	8	boulders, silt	northwest	Sourced by roadside drainage ditch then drains northwest offsite.
Watercourse 4	1.25	0.45	45	15	cobble, sand, silt	north	Emerges from uphill drainage feature; well defined, stable banks.
Watercourse 5	1.5	0.5	40	20	cobble, silt	southwest	Sourced from drainage exiting Wetlands 10 and 11; becomes entrenched as it drains towards existing road, flows beneath the road via a culvert and southwest offsite; significant amounts of organic material and coarse woody debris in stream.
Watercourse 6	0.75	0.5	25	10	cobble, silt	southwest	Emerges from an uphill drainage feature; poorly channelized, diverges into a braided stream before merging and becoming moderately well channelized. Significant in-stream vegetation in some areas.
Watercourse 7	1	0.5	40	10	cobble, gravel	northeast	Becomes entrenched as it flows downhill.

Photo 1: Wetland 1; a wet meadow.

Photo 2: Wetland 3; a hardwood treed swamp.

Photo 3: Wetland 4; a roadside treed swamp.

Photo 4: Wetland 5; a shrub swamp.

Photo 5: Wetland 8; a mixed wood treed swamp.

Photo 6: Wetland 12; a marsh.

Photo 7: Watercourse 1A.

Photo 8: Typical drainage feature.

Photo 9: Watercourse 5.

Photo 10: Watercourse 7.

Wetlands and Watercourses in Nova Scotia

Wetlands in Nova Scotia are regulated by NSE under Section 105 of the *Environment Act*. Under the Act, wetlands are:

> *Land referred to as a marsh, swamp, fen, or bog that either periodically or permanently has water table at, near, or above the land surface or that is saturated with water, and sustains aquatic processes as indicated by the presence of poorly drained soils, hydrophytic vegetation, and biological activities adapted to wet conditions.*

Watercourses are defined in the *Environment Act* as:

> *Any creek, brook, stream, river, lake, pond, spring, lagoon, or any other natural body of water, and includes all the water in it, and also the bed and the shore (whether there is actually any water in it or not). It also includes all groundwater.*

Watercourses are defined in Halifax Regional Municipality (HRM) land use by-laws as:

> *A lake, river, stream, ocean, or other natural body of water.*

Delineation Methodology

In order for a wetland determination to be made, the following three criteria were assessed the field:

- Presence of hydrophytic (water loving) vegetation;
- Presence of hydrologic conditions that result in periods of flooding, ponding, or saturation during the growing season; and
- Presence of hydric soils (anaerobic conditions in upper part).

Soil pits were completed frequently to confirm the presence/absence of wetland hydrology and hydric soils, as per the methodology below. A general vegetation survey was also completed within the wetlands to confirm hydrophytic vegetation.

<u>Identification of Hydrophytic Vegetation</u>
Hydrophytic vegetation is defined as the sum total of macrophytic plant life that occurs in areas where the frequency and duration of inundation or soil saturation produce permanent or periodically saturated soils of sufficient duration to exert a controlling influence on the plant species present (Environmental Laboratory 1987). Hydrophytic vegetation should be the dominant plant type in wetland habitat (Environmental Laboratory 1987).

Dominant plant species observed in each wetland were classified according to indicator status (probability of occurrence in wetlands), in accordance with the U.S. Fish and Wildlife Service (USFWS) National List of Vascular Plant Species that Occur in Wetlands: NE Region (Region 1) (Reed 1988). Please refer to Table 1 (below) for these classifications. These indicators are used as this region most closely resembles the flora of Nova Scotia and climate regime. Further relevant information was reviewed in Flora of Nova Scotia (Zinck, 1998).

Table 1: Classification of Wetland-Associated Plant Species[1]

Plant Species Classification	Abbreviation[2]	Probability of Occurring in Wetland
Obligate O	BL	>99%
Facultative Wetland	FACW	66-99%
Facultative F	AC	33-66%
Facultative Upland	FACU	1-33%
Upland UP	L	<1%
No indicator status	NI	Insufficient information to determine status
Plants That Are Not Listed (assumed upland species)	NL	Does not occur in wetlands in any region.

[1] Source: Reed 1988

[2] A '+' or '–' symbol can be added to the classification to indicate greater or lesser probability, respectively, of occurrence in a wetland.

If the majority (greater than 50%) of the dominant vegetation at a data point is classified as obligate (OBL), facultative wetland (FACW), or facultative (FAC), then the location of the data point is considered to be dominated by hydrophytic vegetation.

Identification of Hydric Soils

A hydric soil is a soil that has formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (USDA-NRCS 2010). Indicators of the presence of a hydric soil include soil colour (gleyed soils and soils with bright mottles and/or low matrix chroma), aquic or preaquic moisture regime, reducing soil conditions, sulfidic material (odour), soils listed on the hydric soils list, iron and manganese concretions, organic soils (histosols), histic epipedon, high organic content in surface layer in sandy soils, and organic streaking in sandy soils.

Soil pits were excavated to a maximum depth of 40 cm or refusal. The soil in each was then examined for hydric soil indicators. The matrix colour and mottle colour (if present) of the soil were determined using the Munsell Soil Colour Charts.

Determination of Wetland Hydrology

Wetland habitat, by definition, either periodically or permanently, has a water table at, near, or above the land surface or that is saturated with water. To be classified as a wetland, a site should have at least one primary indicator or two secondary indicators of wetland hydrology, as shown in Table 2.

Table 2: Indicators of Wetland Hydrology

Examples of Primary Indicators	Examples of Secondary Indicators
Water marks	Oxidized Root Channels in the Upper 30 cm
Drift Lines	Local Soil Survey Data
Sediment Deposition	Dry season Water Table
Drainage Patterns	Stunted or Stressed Plants
Water-stained leaves	
Visual Observation of Saturated Soils	
Visual Observation of Inundation	

Wetland habitat is assessed for signs of hydrology, via visual observations across the area and through assessment of soil pits.

References

Environmental Laboratory (1987), Corps of Engineers Wetlands Delineation Manual, US Army Corp of Engineers, 1987.

Reed. 1988. National List of Plant Species that Occur in Wetlands: NE Region (Region 1) U.S. Fish and Wildlife Service, Washington, DC.

USDA-NRCS. (United States Department of Agriculture- Natural Resources Conservation Service). 2010. *Field Indicators of Hydric Soils in the United States: A Guide for Identifying and Delineating Hydric Soils*. Version 7.0. 53 pp.

Zinck, M. 1998. *Rolands Flora of Nova Scotia*. Nimbus Publishing, Nova Scotia.

Environmental Laboratory. (1987). "Corps of Engineers wetlands delineation manual," Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. NTIS No. AD A176 912 (Note: Appendix C information is outdated and must be obtained from regional Wetlands offices)

Appendix G:

Vascular Plant Study

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

A vascular plant inventory and plant community assessment of wind turbine sites at Aulds Mountain, Nova Scotia with notes on breeding birds

Photographs from the proposed turbine sites at Aulds Mountain.

July 24, 2012

Conducted by Sean Blaney,
Atlantic Canada Conservation Data Centre

for Natural Forces

METHODS

Sean Blaney conducted 6 hours of fieldwork at the site on June 18, 2013. Fieldwork was on foot and focused on covering the development footprint (proposed roadways and turbine sites - Figure 1) and surrounding areas, but also covering the linear portions of the project footprint in two passes and covering the turbine sites by meanders around the central point. I recorded the areas covered in the field with a GPS unit set to record position approximately every 15 seconds while moving (the "more often" track recording setting on a Garmin GPS 76Cx unit). I compiled a full vascular plant list and I recorded notes on the community type and species composition of each proposed turbine site.

Definitions for S-ranks and for Nova Scotia General Status ranks (the primary ranks by which species' significance is determined by Nova Scotia Department of Natural Resources), are given in Appendix 1.

Results and Discussion

I. Site Coverage

Over the 6 hours I spent on the site, I walked 11.5 km, covering the two proposed turbine sites and surrounding areas, the existing road corridor likely to be used for access to the turbine sites and additional areas within the leased properties. I accessed the site from the south and the coverage values above include about one hour and 3.5 km covered along a southern access road outside the proposed development footprint but on the margin of a leased property. GPS tracks of areas covered are mapped in Figure 1. Fieldwork results should represent a rather complete picture of the vascular flora and plant communities on the site as well as providing a good indication of which areas have the most significant natural heritage value. Additional fieldwork would undoubtedly add more plant species to the site's list, but there is low potential for undocumented provincially rare species within the turbine footprint areas based on the habitats present (primarily forest regenerating on old field, and disturbed deciduous forest) and the strong focus on covering those areas.

II. Species Information

I recorded 225 vascular plant species (173 native, 52 exotic). The full species list is given in Table 1. Only one taxon is potentially of conservation concern based on General Status Ranks or S-ranks. I found one small patch of a polypody fern (*Polypodium* sp.) species that exhibited some characteristics of Appalachian Polypody (*Polypodium appalachianum*, S3? – Undetermined). The fronds of this fern had the relatively pointed pinnae tips of Appalachian Polypody but lacked that species' typical broadly triangular overall frond shape (mapped in Figure 2). They were infertile and could not be determined to species with certainty. They might represent a hybrid Appalachian x Common Polypody (*P. appalachianum* x *virgininianum*) or a slightly atypical

Appalachian Polypody. For management purposes I recommend they be treated as Appalachian Polypody. The small colony was present at 45.59439°N, 62.37273°W, 110 m southeast of proposed turbine one (Figure 2). This is likely outside the development footprint under the proposed layout.

Although inventory of breeding birds was not the focus of my efforts, I recorded 28 bird species during incidental bird observations (Table 2), which included two species of conservation significance. I recorded singing Eastern Wood-Pewee (*Contopus virens*, S3 – Sensitive, COSEWIC Threatened and Vulnerable under the Nova Scotia Species at Risk Act) in deciduous forest suitable for nesting at two locations. The first (not mapped) was at 45.58149°N, 62.37116°W, 1100 m south of proposed turbine two and well outside the project development footprint. The second was at 45.59578°N, 62.37322°W, 120 m northeast of proposed turbine one (mapped in Figure 2) where the bird was in fairly mature deciduous forest along the margin of the clearcut in which turbine construction is proposed.

The other bird species of conservation significance was a Yellow-bellied Flycatcher (*Empidonax flaviventris*, S3 – Sensitive), singing in moist mixed forest suitable for nesting at 45.59436°N, 62.37096°W, 240 m east-southeast of proposed turbine one and outside of the properties leased for turbine construction (mapped in Figure 2).

II. Significant Plant Communities and Wetlands

The natural heritage value of the project footprint area is limited due to past agricultural use and extensive recent disturbance from forestry and meteorological tower construction. A relatively small portion of the potential project footprint is in mature forest (areas mapped west and south of turbine one in Figure 2 and perhaps some other patches not covered in the field). Brief descriptions of the plant community types of each proposed turbine site are given in Table 3 and photographs of each proposed turbine site are given in Figures 3 and 4. The project footprint area, especially around turbine two, is largely regenerated from old field, including both natural woody regeneration with a mix of native and exotic herbs at various stages of canopy closure and spruce plantation around 20 years old which is quite dense with little understorey. The remainder of the project area is mostly heavily cut-over Sugar Maple-dominated hardwood forest. The locations where new roads would be constructed between the main access road and proposed turbine sites were not available at the time of survey so the extent to which they would affect the limited remaining areas of mature forest within the area of potential construction is unclear. Avoidance of the small areas of remaining mature deciduous forest in constructing new roads would reduce impacts on the site's natural heritage values.

The largest and most significant area of mature forest is mapped in Figure 2 between waypoints 121 and 126 and appears to be well outside the area directly affected by project construction. This forest includes areas with relatively rich soil [as indicated

by the presence of species such as Hairy Sweet Cicely (*Osmorhiza claytonii*), Zig-zag Goldenrod (*Solidago flexicaulis*), Ostrich Fern (*Matteuccia struthiopteris*) and Silvery Glade Fern (*Deparia acrostichoides*) among the herbaceous flora and substantial amounts of White Ash (*Fraxinus americana*) and Ironwood (*Ostrya virginiana*) among the tree cover]. Significant groundwater seepage in this area feeds a small stream.

I noted several small wet areas (not all of which are necessarily large enough to be covered under provincial wetland regulations), as indicated in Figure 3. The area between waypoints 120 and 130 is an open herbaceous and shrub wetland community occupying a 140 m by 10 m to 30 m linear depression, which is within about 20 m of the proposed site of turbine two. It is illustrated in Figure 4. The area around waypoint 144 is a small seepy stream in young deciduous forest which might be affected by access road construction to turbine one. The other two wetland areas are likely well outside the project footprint. The area between 122 and 125 is a fairly rich seepage wetland along the upper reaches of a small stream within fairly rich deciduous and mixed forest and would appear to be well outside the project footprint. The area around waypoint 132 is a small forested seepage wetland about 50 m by 10 m.

Table 1. Vascular plants recorded in the study area, 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. "Abund." refers to a generalized assessment of the abundance of the species within the project area. "r" = rare, "u" = uncommon, "f" = fairly common, "c" = common. Abundance estimates followed by an asterisk "*" indicate species that were seen only in the saltmarsh to the east of the project footprint.

Family	English Name	*Species*	S-rank	General Status	ID Notes
Equisetaceae	Field Horsetail	*Equisetum arvense*	S5	Secure	
Equisetaceae	Woodland Horsetail	*Equisetum sylvaticum*	S5	Secure	
Osmundaceae	Cinnamon Fern	*Osmunda cinnamomea*	S5	Secure	
Osmundaceae	Interrupted Fern	*Osmunda claytoniana*	S5	Secure	
Osmundaceae	Interrupted Fern	*Osmunda claytoniana*	S5	Secure	
Polypodiaceae	Appalachian Polypody or hybrid	*Polypodium appalachianum*	S3?	Undetermined	ID uncertain - infertile but strongly pointed pinnae on some fronds, though not as broad-based frond shape as would be expected in good P. appalachianum
Dennstaedtiaceae	Eastern Hay-Scented Fern	*Dennstaedtia punctilobula*	S5	Secure	
Dennstaedtiaceae	Bracken Fern	*Pteridium aquilinum var. latiusculum*	S5	Secure	
Thelypteridaceae	Northern Beech Fern	*Phegopteris connectilis*	S5	Secure	
Thelypteridaceae	New York Fern	*Thelypteris noveboracensis*	S5	Secure	

Family	English Name	*Species*	S-rank	General Status	ID Notes
Dryopteridaceae	Lady Fern	*Athyrium filix-femina ssp. angustum*	S5	Secure	
Dryopteridaceae	Silvery Spleenwort	*Deparia acrostichoides*	S4	Secure	
Dryopteridaceae	Mountain Wood-Fern	*Dryopteris campyloptera*	S5	Secure	
Dryopteridaceae	Crested Shield-Fern	*Dryopteris cristata*	S5	Secure	
Dryopteridaceae	Evergreen Woodfern	*Dryopteris intermedia*	S5	Secure	
Dryopteridaceae	Northern Oak Fern	*Gymnocarpium dryopteris*	S5	Secure	
Dryopteridaceae	Ostrich Fern	*Matteuccia struthiopteris*	S5	Secure	
Dryopteridaceae	Sensitive Fern	*Onoclea sensibilis*	S5	Secure	
Dryopteridaceae	Christmas Fern	*Polystichum acrostichoides*	S5	Secure	
Pinaceae	Balsam Fir	*Abies balsamea*	S5	Secure	
Pinaceae	White Spruce	*Picea glauca*	S5	Secure	
Pinaceae	Red Spruce	*Picea rubens*	S5	Secure	
Pinaceae	Eastern White Pine	*Pinus strobus*	S5	Secure	
Pinaceae	Eastern Hemlock	*Tsuga canadensis*	S5	Secure	
Ranunculaceae	baneberry sp.	*Actaea sp.*		[native, non-rare]	
Ranunculaceae	Tall Butter-Cup	*Ranunculus acris*	SNA	Exotic	
Ranunculaceae	Creeping Butter-Cup	*Ranunculus repens*	SNA	Exotic	
Fagaceae	American Beech	*Fagus grandifolia*	S5	Secure	
Betulaceae	Speckled Alder	*Alnus incana ssp. rugosa*	S5	Secure	
Betulaceae	Green Alder	*Alnus viridis ssp. crispa*	S5	Secure	
Betulaceae	Yellow Birch	*Betula alleghaniensis*	S5	Secure	
Betulaceae	Heart-Leaved Paper Birch	*Betula papyrifera var. papyrifera*	S5	Secure	
Betulaceae	Gray Birch	*Betula populifolia*	S5	Secure	
Betulaceae	Beaked Hazelnut	*Corylus cornuta*	S5	Secure	
Betulaceae	Eastern Hop-Hornbeam	*Ostrya virginiana*	S4S5	Secure	
Caryophyllaceae	Common Mouse-ear Chickweed	*Cerastium fontanum ssp. vulgare*	SNA	Exotic	
Caryophyllaceae	Grove Sandwort	*Moehringia lateriflora*	S5	Secure	
Caryophyllaceae	Procumbent Pearlwort	*Sagina procumbens*	S5	Exotic	
Caryophyllaceae	Little Starwort	*Stellaria graminea*	SNA	Exotic	
Polygonaceae	Fringed Black Bindweed	*Polygonum cilinode*	S5	Secure	
Polygonaceae	Marshpepper Smartweed	*Polygonum hydropiper*	SNA	Exotic	
Polygonaceae	Arrow-Leaved Tearthumb	*Polygonum sagittatum*	S5	Secure	
Polygonaceae	Sheep Sorrel	*Rumex acetosella*	SNA	Exotic	
Polygonaceae	Curly Dock	*Rumex crispus*	SNA	Exotic	
Clusiaceae	A St. John's-Wort	*Hypericum perforatum*	SNA	Exotic	
Clusiaceae	Marsh St. John's-Wort	*Triadenum fraseri*	S5	Secure	
Violaceae	Marsh Blue Violet	*Viola cucullata*	S5	Secure	
Violaceae	Labrador Violet	*Viola labradorica*	S4S5	Secure	

Family	English Name	*Species*	S-rank	General Status	ID Notes
Violaceae	Smooth White Violet	*Viola macloskeyi ssp. pallens*	S5	Secure	
Violaceae	Woolly Blue Violet	*Viola sororia*	S5	Secure	
Salicaceae	Large-Tooth Aspen	*Populus grandidentata*	S5	Secure	
Salicaceae	Quaking Aspen	*Populus tremuloides*	S5	Secure	
Salicaceae	Bebb's Willow	*Salix bebbiana*	S5	Secure	
Salicaceae	Pussy Willow	*Salix discolor*	S5	Secure	
Salicaceae	Heart-Leaved Willow	*Salix eriocephala*	S5	Secure	
Salicaceae	Prairie Willow	*Salix humilis*	S5	Secure	
Salicaceae	Balsam Willow	*Salix pyrifolia*	S5	Secure	
Brassicaceae	Two-Leaf Toothwort	*Cardamine diphylla*	S4S5	Secure	
Brassicaceae	Dame's Rocket	*Hesperis matronalis*	SNA	Exotic	
Ericaceae	Creeping Snowberry	*Gaultheria hispidula*	S5	Secure	
Ericaceae	Late Lowbush Blueberry	*Vaccinium angustifolium*	S5	Secure	
Primulaceae	Northern Starflower	*Trientalis borealis*	S5	Secure	
Grossulariaceae	Skunk Currant	*Ribes glandulosum*	S5	Secure	
Grossulariaceae	Smooth Gooseberry	*Ribes hirtellum*	S5	Secure	
Grossulariaceae	Bristly Black Currant	*Ribes lacustre*	S5	Secure	
Rosaceae	Woodland Agrimony	*Agrimonia striata*	S5	Secure	
Rosaceae	serviceberry sp.	*Amelanchier sp.*		[native, non-rare]	
Rosaceae	Virginia Strawberry	*Fragaria virginiana*	S5	Secure	
Rosaceae	Yellow Avens	*Geum aleppicum*	S5	Secure	ID to sp. probable only
Rosaceae	Purple Avens	*Geum rivale*	S5	Secure	
Rosaceae	Common Apple	*Malus pumila*	SNA	Exotic	
Rosaceae	Old-Field Cinquefoil	*Potentilla simplex*	S5	Secure	
Rosaceae	Fire Cherry	*Prunus pensylvanica*	S5	Secure	
Rosaceae	Wild Black Cherry	*Prunus serotina*	S5	Secure	
Rosaceae	Choke Cherry	*Prunus virginiana*	S5	Secure	
Rosaceae	Carolina Rose	*Rosa carolina*	S4S5	Secure	
Rosaceae	Virginia Rose	*Rosa virginiana*	S5	Secure	
Rosaceae	Allegheny Blackberry	*Rubus allegheniensis*	S5	Secure	
Rosaceae	Smooth Blackberry	*Rubus canadensis*	S5	Secure	
Rosaceae	Bristly Dewberry	*Rubus hispidus*	S5	Secure	ID refers to the sp. in the broad sense – plants grading toward vermontanus
Rosaceae	American Red Raspberry	*Rubus idaeus ssp. strigosus*	S5	Secure	
Rosaceae	Dwarf Red Raspberry	*Rubus pubescens*	S5	Secure	
Rosaceae	American Mountain-Ash	*Sorbus americana*	S5	Secure	
Rosaceae	Northern Meadow-Sweet	*Spiraea alba var. latifolia*	S5	Secure	
Rosaceae	Hardhack Spiraea	*Spiraea tomentosa*	S5	Secure	

Family	English Name	*Species*	S-rank	General Status	ID Notes
Fabaceae	Birds-Foot Trefoil	*Lotus corniculatus*	SNA	Exotic	
Fabaceae	Black Medic	*Medicago lupulina*	SNA	Exotic	
Fabaceae	Low Hop Clover	*Trifolium campestre*	SNA	Exotic	
Fabaceae	Alsike Clover	*Trifolium hybridum*	SNA	Exotic	
Fabaceae	Red Clover	*Trifolium pratense*	SNA	Exotic	
Fabaceae	White Clover	*Trifolium repens*	SNA	Exotic	
Fabaceae	Tufted Vetch	*Vicia cracca*	SNA	Exotic	
Onagraceae	Fireweed	*Chamerion angustifolium*	S5	Secure	
Onagraceae	Small Enchanter's Nightshade	*Circaea alpina*	S5	Secure	
Onagraceae	Hairy Willow-Herb	*Epilobium ciliatum*	S5	Secure	
Onagraceae	Linear-Leaved Willow-Herb	*Epilobium leptophyllum*	S5	Secure	
Onagraceae	evening-primrose sp.	*Oenothera parviflora/biennis*	#N/A	#N/A	
Onagraceae	Small Sundrops	*Oenothera perennis*	S5	Secure	
Cornaceae	Alternate-Leaf Dogwood	*Cornus alternifolia*	S5	Secure	
Cornaceae	Dwarf Dogwood	*Cornus canadensis*	S5	Secure	
Cornaceae	Silky Dogwood	*Cornus sericea*	S5	Secure	
Aquifoliaceae	Black Holly	*Ilex verticillata*	S5	Secure	
Aceraceae	Striped Maple	*Acer pensylvanicum*	S5	Secure	
Aceraceae	Norway Maple	*Acer platanoides*	SNA	Exotic	
Aceraceae	Red Maple	*Acer rubrum*	S5	Secure	
Aceraceae	Sugar Maple	*Acer saccharum*	S5	Secure	
Aceraceae	Mountain Maple	*Acer spicatum*	S5	Secure	
Anacardiaceae	Staghorn Sumac	*Rhus typhina*	S5	Secure	
Oxalidaceae	White Wood-Sorrel	*Oxalis montana*	S5	Secure	
Oxalidaceae	Upright Yellow Wood-Sorrel	*Oxalis stricta*	S5	Secure	
Araliaceae	Wild Sarsaparilla	*Aralia nudicaulis*	S5	Secure	
Apiaceae	Spotted Water-Hemlock	*Cicuta maculata*	S5	Secure	
Apiaceae	Wild Carrot	*Daucus carota*	SNA	Exotic	
Convolvulaceae	Hedge Bindweed	*Calystegia sepium*	S5	Secure	
Boraginaceae	Small Forget-Me-Not	*Myosotis laxa*	S5	Secure	
Lamiaceae	Brittle-Stem Hempnettle	*Galeopsis tetrahit*	SNA	Exotic	
Lamiaceae	Ground Ivy	*Glechoma hederacea*	SNA	Exotic	
Lamiaceae	Northern Bugleweed	*Lycopus uniflorus*	S5	Secure	
Lamiaceae	Self-Heal	*Prunella vulgaris*	S5	Secure	
Plantaginaceae	English Plantain	*Plantago lanceolata*	SNA	Exotic	
Plantaginaceae	Nipple-Seed Plantain	*Plantago major*	SNA	Exotic	
Oleaceae	White Ash	*Fraxinus americana*	S5	Secure	
Scrophulariaceae	White Turtlehead	*Chelone glabra*	S5	Secure	
Scrophulariaceae	eyebright sp.	*Euphrasia sp.*	#N/A	#N/A	
Scrophulariaceae	Little Yellow-Rattle	*Rhinanthus minor*	S5	Secure	
Scrophulariaceae	American Speedwell	*Veronica americana*	S5	Secure	
Scrophulariaceae	Gypsy-Weed	*Veronica officinalis*	S5	Exotic	

Family	English Name	*Species*	S-rank	General Status	ID Notes
Scrophulariaceae	Thyme-Leaved Speedwell	*Veronica serpyllifolia ssp. serpyllifolia*	SNA	Exotic	
Rubiaceae	Great Hedge Bedstraw	*Galium mollugo*	SNA	Exotic	
Rubiaceae	Marsh Bedstraw	*Galium palustre*	S5	Secure	
Rubiaceae	Small Bedstraw	*Galium trifidum*	S5	Secure	ID to sp. probable, not confirmed
Rubiaceae	Sweet-Scent Bedstraw	*Galium triflorum*	S5	Secure	
Rubiaceae	Partridge-Berry	*Mitchella repens*	S5	Secure	
Caprifoliaceae	Northern Bush-Honeysuckle	*Diervilla lonicera*	S5	Secure	
Caprifoliaceae	Twinflower	*Linnaea borealis ssp. americana*	S5	Secure	
Caprifoliaceae	American Fly-Honeysuckle	*Lonicera canadensis*	S5	Secure	
Caprifoliaceae	Red Elderberry	*Sambucus racemosa*	S5	Secure	
Asteraceae	Common Yarrow	*Achillea millefolium*	S5	Secure	
Asteraceae	Pearly Everlasting	*Anaphalis margaritacea*	S5	Secure	
Asteraceae	Lesser Burdock	*Arctium minus*	SNA	Exotic	ID to sp. probable, not confirmed
Asteraceae	Parasol White-Top	*Doellingeria umbellata*	S5	Secure	
Asteraceae	Daisy Fleabane	*Erigeron strigosus*	S5	Secure	
Asteraceae	Common Boneset	*Eupatorium perfoliatum*	S5	Secure	
Asteraceae	Flat-Top Fragrant-Golden-Rod	*Euthamia graminifolia*	S5	Secure	
Asteraceae	Orange Hawkweed	*Hieracium aurantiacum*	SNA	Exotic	
Asteraceae	Canada Hawkweed	*Hieracium canadense*	S5	Secure	
Asteraceae	Common Hawkweed	*Hieracium lachenalii*	SNA	Exotic	
Asteraceae	Mouseear	*Hieracium pilosella*	SNA	Exotic	
Asteraceae	Tall Blue Lettuce	*Lactuca biennis*	S5	Secure	
Asteraceae	Autumn Hawkbit	*Leontodon autumnalis*	SNA	Exotic	
Asteraceae	Oxeye Daisy	*Leucanthemum vulgare*	SNA	Exotic	
Asteraceae	Pineapple-Weed Chamomile	*Matricaria discoidea*	SNA	Exotic	
Asteraceae	Whorled Aster	*Oclemena acuminata*	S5	Secure	
Asteraceae	Robbins Squaw-Weed	*Packera schweinitziana*	S4	Secure	
Asteraceae	Black-Eyed Susan	*Rudbeckia hirta var. pulcherrima*	SNA	Exotic	
Asteraceae	Tansy Ragwort	*Senecio jacobaea*	SNA	Exotic	
Asteraceae	White Goldenrod	*Solidago bicolor*	S5	Secure	
Asteraceae	Canada Goldenrod	*Solidago canadensis*	S5	Secure	
Asteraceae	Broad-Leaved Goldenrod	*Solidago flexicaulis*	S5	Secure	
Asteraceae	Smooth Goldenrod	*Solidago gigantea*	S5	Secure	
Asteraceae	Early Goldenrod	*Solidago juncea*	S5	Secure	
Asteraceae	Downy Goldenrod	*Solidago puberula*	S5	Secure	
Asteraceae	Rough-Leaf Goldenrod	*Solidago rugosa*	S5	Secure	

Family	English Name	*Species*	S-rank	General Status	ID Notes
Asteraceae	Heart-Leaf Aster	*Symphyotrichum cordifolium*	S5	Secure	
Asteraceae	Farewell-Summer	*Symphyotrichum lateriflorum*	S5	Secure	
Asteraceae	New Belgium American-Aster	*Symphyotrichum novi-belgii*	S5	Secure	
Asteraceae	Swamp Aster	*Symphyotrichum puniceum*	S5	Secure	
Asteraceae	Common Dandelion	*Taraxacum officinale*	SNA	Exotic	
Asteraceae	Meadow Goat's-Beard	*Tragopogon pratensis*	SNA	Exotic	
Asteraceae	Colt's Foot	*Tussilago farfara*	SNA	Exotic	
Juncaceae	Soft Rush	*Juncus effusus*	S5	Secure	
Juncaceae	Slender Rush	*Juncus tenuis*	S5	Secure	
Juncaceae	Common Woodrush	*Luzula multiflora*	S5	Secure	
Cyperaceae	Emmons Sedge	*Carex albicans var. emmonsii*	S2	Secure	
Cyperaceae	Black Sedge	*Carex arctata*	S5	Secure	
Cyperaceae	Brownish Sedge	*Carex brunnescens ssp. sphaerostachya*	S5	Secure	
Cyperaceae	Hoary Sedge	*Carex canescens*	S5	Secure	
Cyperaceae	Fibrous-Root Sedge	*Carex communis*	S5	Secure	
Cyperaceae	White-Edge Sedge	*Carex debilis var. rudgei*	S5	Secure	
Cyperaceae	Little Prickly Sedge	*Carex echinata*	S5	Secure	
Cyperaceae	Yellow Sedge	*Carex flava*	S5	Secure	
Cyperaceae	Graceful Sedge	*Carex gracillima*	S5	Secure	
Cyperaceae	A Sedge	*Carex gynandra*	S5	Secure	
Cyperaceae	Bladder Sedge	*Carex intumescens*	S5	Secure	
Cyperaceae	Bristly-Stalk Sedge	*Carex leptalea*	S5	Secure	
Cyperaceae	Finely-Nerved Sedge	*Carex leptonervia*	S5	Secure	
Cyperaceae	Black Sedge	*Carex nigra*	S4S5	Secure	
Cyperaceae	New England Sedge	*Carex novae-angliae*	S5	Secure	
Cyperaceae	Pale Sedge	*Carex pallescens*	S5	Secure	
Cyperaceae	Longstalk Sedge	*Carex pedunculata*	S5	Secure	
Cyperaceae	Rough Sedge	*Carex scabrata*	S5	Secure	
Cyperaceae	Pointed Broom Sedge	*Carex scoparia*	S5	Secure	ID to sp. probable, not confirmed
Cyperaceae	Stalk-Grain Sedge	*Carex stipata*	S5	Secure	
Cyperaceae	Twisted Sedge	*Carex torta*	S5	Secure	
Cyperaceae	Three-Seed Sedge	*Carex trisperma var. trisperma*	S5	Secure	
Cyperaceae	Cottongrass Bulrush	*Scirpus cyperinus*	S5	Secure	ID refers to the sp. in the broad sense (incl. *S. atrocinctus*)
Cyperaceae	Bulrush	*Scirpus hattorianus*	S4	Secure	
Cyperaceae	Small-Fruit Bulrush	*Scirpus microcarpus*	S5	Secure	
Poaceae	Colonial Bentgrass	*Agrostis capillaris*	SNA	Exotic	
Poaceae	Meadow Foxtail	*Alopecurus pratensis*	SNA	Exotic	
Poaceae	Sweet Vernal Grass	*Anthoxanthum odoratum*	SNA	Exotic	

Family	English Name	*Species*	S-rank	General Status	ID Notes
Poaceae	Awnless Brome	*Bromus inermis*	SNA	Exotic	
Poaceae	Rye Brome	*Bromus secalinus*	SNA	Exotic	ID uncertain vs. other exotic annual *Bromus* spp.
Poaceae	Blue-Joint Reedgrass	*Calamagrostis canadensis*	S5	Secure	
Poaceae	Slender Wood Reedgrass	*Cinna latifolia*	S5	Secure	
Poaceae	Orchard Grass	*Dactylis glomerata*	SNA	Exotic	
Poaceae	Flattened Oatgrass	*Danthonia compressa*	S1	Secure	
Poaceae	Poverty Oat-Grass	*Danthonia spicata*	S5	Secure	
Poaceae	Panic Grass	*Dichanthelium acuminatum*	S5	Secure	
Poaceae	Northern Witchgrass	*Dichanthelium boreale*	S5	Secure	
Poaceae	Hair Fescue	*Festuca filiformis*	SNA	Exotic	
Poaceae	Spreading Fescue	*Festuca heteromalla*	SNA	Exotic	
Poaceae	Fowl Manna-Grass	*Glyceria striata*	S5	Secure	
Poaceae	Tall Rye Grass	*Lolium arundinaceum*	SNA	Exotic	or possibly *L. pratensis*
Poaceae	Meadow Timothy	*Phleum pratense*	SNA	Exotic	
Poaceae	Annual Bluegrass	*Poa annua*	SNA	Exotic	
Poaceae	Canada Bluegrass	*Poa compressa*	SNA	Exotic	
Poaceae	Fowl Bluegrass	*Poa palustris*	S5	Secure	
Poaceae	Kentucky Bluegrass	*Poa pratensis*	S5	Secure	
Poaceae	Drooping Bluegrass	*Poa saltuensis*	S4S5	Secure	
Typhaceae	Broad-Leaf Cattail	*Typha latifolia*	S5	Secure	
Liliaceae	Wild Lily-of-The-Valley	*Maianthemum canadense*	S5	Secure	
Liliaceae	Downy Solomon's-Seal	*Polygonatum pubescens*	S5	Secure	
Iridaceae	Strict Blue-Eyed-Grass	*Sisyrinchium montanum*	S5	Secure	
Orchidaceae	Pink Lady's-Slipper	*Cypripedium acaule*	S5	Secure	
Orchidaceae	Small Purple-Fringe Orchis	*Platanthera psycodes*	S4	Secure	

Table 2. Bird species observed incidentally during plant fieldwork, with breeding evidence. S = singing male in suitable habitat, H = adult observed in suitable habitat.

Common Name	Species	S-rank	General Status	Breeding Evidence
Hairy Woodpecker	*Picoides villosus*	S5	Secure	H
Northern Flicker	*Colaptes auratus*	S5B	Secure	H
Eastern Wood-Pewee	*Contopus virens*	S3S4B	Sensitive	S
Yellow-bellied Flycatcher	*Empidonax flaviventris*	S3S4B	Sensitive	S
Alder Flycatcher	*Empidonax alnorum*	S5B	Secure	S
Least Flycatcher	*Empidonax minimus*	S4B	Secure	S
Hermit Thrush	*Catharus guttatus*	S5B	Secure	S
American Robin	*Turdus migratorius*	S5B	Secure	S
Cedar Waxwing	*Bombycilla cedrorum*	S5B	Secure	H
Blue-headed Vireo	*Vireo solitarius*	S5B	Secure	S
Red-eyed Vireo	*Vireo olivaceus*	S5B	Secure	S
Northern Parula	*Parula americana*	S5B	Secure	S
Chestnut-sided Warbler	*Dendroica pensylvanica*	S5B	Secure	S
Magnolia Warbler	*Dendroica magnolia*	S5B	Secure	S
Yellow-rumped Warbler	*Dendroica coronata*	S5B	Secure	H
Black-throated Green Warbler	*Dendroica virens*	S4S5B	Secure	S
Blackburnian Warbler	*Dendroica fusca*	S4B	Secure	S
Black-and-white Warbler	*Mniotilta varia*	S4S5B	Secure	S
American Redstart	*Setophaga ruticilla*	S5B	Secure	S
Ovenbird	*Seiurus aurocapilla*	S5B	Secure	S
Mourning Warbler	*Oporornis philadelphia*	S4B	Secure	S
Common Yellowthroat	*Geothlypis trichas*	S5B	Secure	S
Chipping Sparrow	*Spizella passerina*	S4S5B	Secure	S
Song Sparrow	*Melospiza melodia*	S5B	Secure	H
White-throated Sparrow	*Zonotrichia albicollis*	S5B	Secure	S
Purple Finch	*Carpodacus purpureus*	S4S5	Secure	S
Evening Grosbeak	*Coccothraustes vespertinus*	S4B,S5N	Secure	H

Table 3. Plant community descriptions of proposed turbine locations (as mapped in Figure 1). Photographs of turbine locations are given in Figures to 5.

Location	Community Description
Turbine 1	*White Spruce plantation over old field.* 20 year old white spruce (70%) - balsam fir (20%) - (gray birch - red maple - white ash - 10%); 60% tree cover overall (patchy); limited shrub cover. Herb dominants: Danthonia spicata; Pteridium aquilinum; Solidago rugosa; Hieracium spp.
Turbine 2	*Deciduous forest clearcut at edge of remnant 80 year old stand (sugar maple 100%, a few dead white ash*); 80-90% shrub/sapling cover - *Rubus idaeus* ssp*. strigosus; White Ash; Sugar Maple.* Herbaceous dominants: *Dryopteris campyloptera; Carex brunnescens* ssp*. sphaerostachya; Carex gynandra; Carex debilis* var*. rudgei; Doellingeria umbellata; Dennstaedtia punctilobula*

Figure 1. Track taken in the field as recorded by GPS (blue line), with proposed turbine locations. Aerial photograpy from Google Earth.

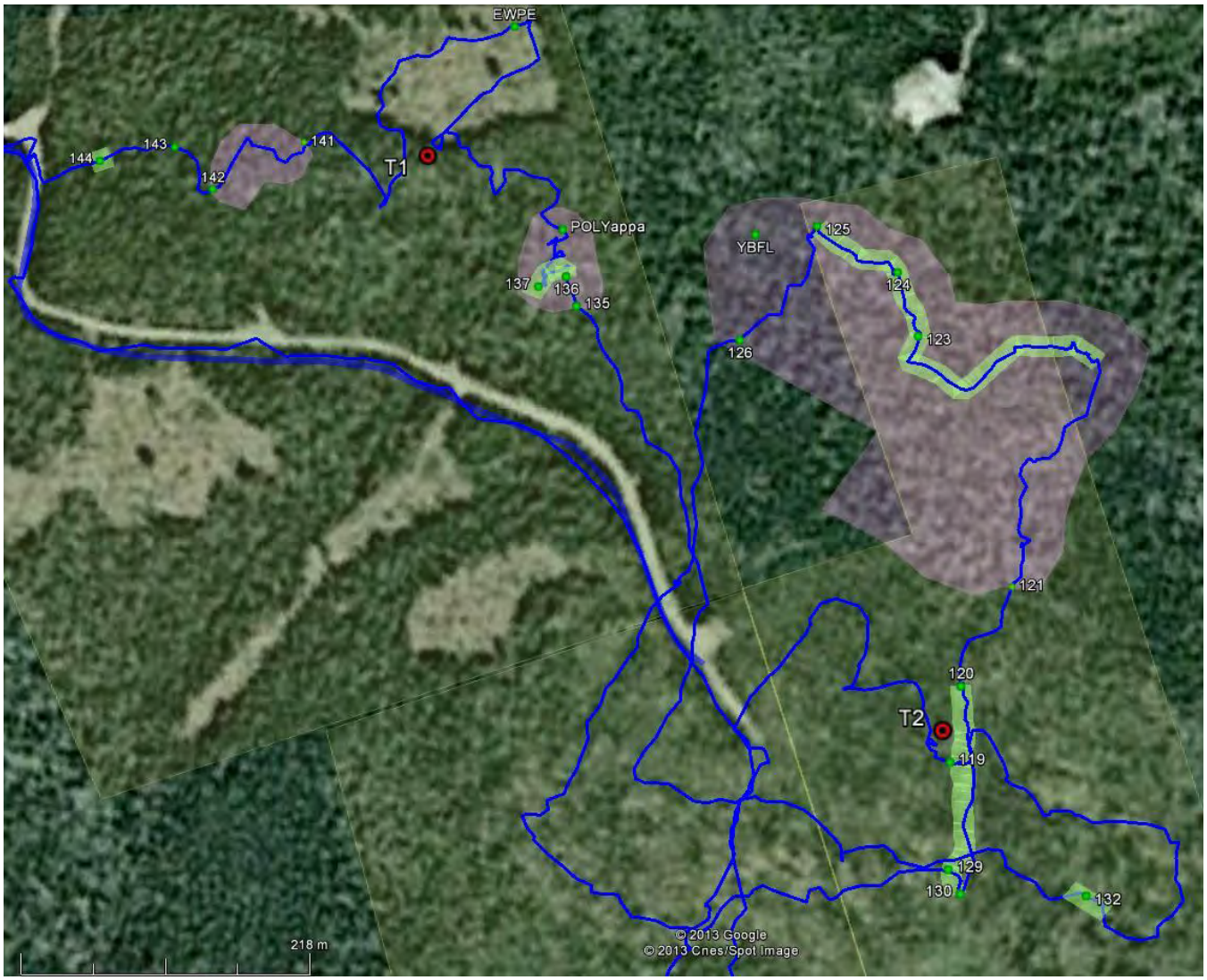


Figure 2. Significant species (EWPE = Eastern Wood Pewee, YBFL = Yellow-bellied Flycatcher) and noteworthy community locations at the Aulds Mountain site. Pale shading represents leased property boundaries. Wetland (green shading) and mature forest (pink shading) were not mapped in the field but boundaries of these community types were noted. Therefore shaded areas do not represent the full extent of these community types and absence of wetland and mature forest can only be inferred in areas along the track covered in the field (blue line). Significant communities and wetlands are described in the text, with reference to the waypoint numbers mapped.

Figure 3. Proposed turbine site 1.

Figure 4. Proposed turbine site 2.

Figure 5. Linear wetland just south of proposed turbine site 2.

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 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.

S 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.

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

S 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 200*report, exotic species have been purposefully excluded from all other categories.
- *Accidental*: species occurring infrequently and unpredictably outside their usual range

Appendix H:

Noise Impact Assessment

Aulds Mountain Wind Farm
Noise Impact Assessment Report
October 2013

Natural Forces Wind Inc.
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Report Information

Client	Natural Forces Wind Inc.
Client Contact	Amy Pellerin
Report Name	Aulds Mountain Wind Farm Noise Impact Assessment
Created By	Amy Pellerin
Signature	

** The WindPRO v2.8, Decibel Module Calculation Results for Enercon E-92 2.3 MW @ 98m Hub Height. To review General Specification for the Enercon E-92 2.3 MW please contact:

Amy Pellerin, Development Engineer
Natural Forces Wind Inc.
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1. Introduction

Natural Forces Wind Inc. has undertaken a noise impact assessment for the proposed Aulds Mountain Wind Farm site to assess the impact of the wind farm's sound emissions on the surrounding points of immission. Details outlining the project, immission receptors, prediction methodology and assumptions made for the assessment are included herein, with WindPRO modelling results supplied in the annexes. The Land Use By-law for the Municipality of Pictou County does not state any restrictions pertaining to sound pressure levels relating to wind turbines activities. Therefore, the Ontario *Noise Guidelines for Wind Farms* will be used during this assessment as a guideline regarding acceptable noise emission from the proposed Aulds Mountain Wind Farm.

The noise analysis was conducted using the ISO 9613-2: Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation model within the Decibel module of the software package, WindPRO version 2.8.

2. General Description of Project Site and Surrounds

The proposed Aulds Mountain Wind Farm consists of a maximum of 2 wind turbine generators located in the Municipality of Pictou County, Nova Scotia. Currently, Enercon E-92 2.3 MW wind turbines are being considered for the project and therefore were used to calculate predicted sound pressure levels, however if the turbine type was to change, a new noise assessment would be conducted.

The project site is situated approximately 6 kilometers south east of Merigomish and adjacent to the Piedmont Valley Road. Land around the proposed project area is zoned as a General Development Zone and so, will not require re-zoning. A map of the site is included in Annex A.

The predominant noise sources in the area are from road traffic along Piedmont Valley Road, the Trans-Canada Highway 104 and Highway 4.

3. Noise Guidelines for Wind Farm

3.1. Provincial and Municipal Noise Guidelines

As previously mentioned, the Land Use By-law for the Municipality of Pictou County does not include any restrictions concerning acceptable sound pressure levels being emitted from wind turbines.

The province of Nova Scotia does not have any guidelines or written restrictions for acceptable sound pressure levels, but adheres to the guidelines outlined in Ontario's *Noise Guidelines for Wind Farms*.

3.2. Ontario Provincial Noise Guidelines

For the proposed Aulds Mountain Wind Farm, the Ontario *Noise Guidelines for Wind Farms* was used as a general guideline. The guidelines describe receptors in rural environments as Class 3. The sound level limits established for this class of receptors is demonstrated in Table 1 for wind turbines at different wind speeds.

Table 1 - Summary of sound level limits for wind turbines (Ministry of the Environment, 2008).

Wind Speed (m/s) at 10 m height	4	5	6	7	8	9	10
Wind Turbine Sound Level Limits Class 3 Area, dB(A)	40.0	40.0	40.0	43.0	45.0	49.0	51.0

To ensure a conservative assessment of the sound level limits emitted by the proposed Aulds Mountain Wind Farm, a general limit of 40 dB(A) was used for all wind speeds ranging between and including 4 and 12 m/s.

The noise assessment used the height above grade at the centre of the receptors of 4.5 m as proposed by the guideline for single and two story dwellings.

4. Description of Receptors

The 71 points of reception taken into consideration for this noise impact assessment are residential buildings and/or seasonal camps located within 2,000 metres (m) of the project land. The receptors are located at dwellings along Piedmont Valley Road and Highway 4. Details of receptor locations and distances to nearest wind turbine are below in Table 2. The point of reception ID letter correspond with the WindPRO generated map included in Annex B.

Table 2 - Description of receptors.

Point of Reception ID Letter	Location (UTM Zone 20, NAD 83)		Distance from Receptor to	
	Easting	Northing	Wind turbine 1	Wind turbine 2
A	548,191	5,046,842	2458	2104
B	549,470	5,047,384	1956	1455
C	548,952	5,047,164	2064	1609
D	548,658	5,046,958	2270	1851
E	549,574	5,050,920	1864	2217
F	550,369	5,047,049	2679	2181
G	547,730	5,049,519	1113	1501
H	550,244	5,050,999	2287	2537
I	547,657	5,049,541	1189	1575
J	548,531	5,046,840	2399	1995
K	549,014	5,047,124	2110	1647
L	547,719	5,049,698	1184	1606
M	549,877	5,050,924	2012	2313
N	549,212	5,047,208	2056	1573
O	548,418	5,046,857	2397	2010
P	549,693	5,047,001	2394	1890
Q	550,858	5,047,141	2925	2448
R	547,617	5,046,912	2598	2336
S	548,382	5,046,890	2370	1989
T	548,958	5,050,538	1324	1769
U	549,277	5,047,177	2100	1613
V	547,138	5,046,896	2861	2664
W	550,053	5,051,008	2179	2459
X	548,662	5,046,569	2658	2233
Y	550,284	5,051,082	2377	2629
Z	547,241	5,047,018	2702	2505
AA	548,046	5,046,892	2451	2122
AB	547,553	5,049,636	1316	1713
AC	548,644	5,046,524	2704	2280
AD	549,806	5,047,119	2331	1825
AE	549,074	5,047,312	1931	1460
AF	549,905	5,051,116	2190	2502

Point of Reception ID Letter	Location (UTM Zone 20, NAD 83)		Distance from Receptor to	
	Easting	Northing	Wind turbine 1	Wind turbine 2
AG	550,021	5,047,024	2514	2008
AH	549,992	5,047,101	2432	1927
AI	546,755	5,048,938	2068	2282
AJ	548,276	5,050,153	1069	1575
AK	549,834	5,050,893	1963	2269
AL	549,640	5,046,824	2541	2040
AM	547,762	5,049,508	1079	1468
AN	549,210	5,047,276	1989	1506
AO	550,388	5,047,252	2529	2037
AP	547,777	5,046,898	2541	2254
AQ	547,848	5,046,870	2539	2239
AR	547,960	5,046,874	2496	2178
AS	549,048	5,050,592	1391	1821
AT	547,741	5,049,543	1109	1503
AU	547,813	5,049,385	1003	1364
AV	547,845	5,049,378	970	1332
AW	547,876	5,046,912	2490	2189
AX	549,267	5,050,625	1477	1869
AY	548,063	5,049,636	847	1298
AZ	548,828	5,047,202	2021	1582
BA	548,151	5,046,945	2369	2027
BB	551,477	5,046,917	3531	3069
BC	548,899	5,046,990	2235	1786
BD	550,247	5,047,130	2543	2042
BE	548,345	5,049,845	772	1274
BF	548,144	5,046,870	2443	2098
BG	546,771	5,048,966	2048	2268
BH	546,960	5,049,282	1844	2133
BI	547,758	5,049,878	1233	1687
BJ	547,494	5,049,611	1365	1752
BK	547,398	5,049,436	1421	1763
BL	549,175	5,050,587	1414	1822
BM	550,339	5,051,031	2372	2611
BN	547,103	5,047,078	2737	2566
BO	547,420	5,046,923	2684	2452
BP	548,673	5,047,093	2134	1716
BQ	549,349	5,047,188	2107	1615
BR	549,632	5,047,012	2361	1859
BS	550,567	5,047,151	2721	2232

5. Description of Sources

5.1. Turbine Locations

A map of the project area with the proposed wind turbine layout is illustrated in Annex A. There are no existing or proposed wind farms within 5 kilometers of the project, thus it is unlikely any cumulative noise effects will occur. UTM coordinates of the turbines are given below in Table 3. Wind turbine ID numbers included in Table 3 correspond with the labels to the WindPRO generated map included Annex B.

Table 3 - Coordinates of proposed turbine locations.

Wind Turbine ID Number	Proposed Wind Turbine Location (UTM Zone 20, NAD 83)	
	Easting	Northing
1	548,803	5,049,223
2	549,031	5,048,771

5.2. Turbine Types

The model of wind turbines being considered for the proposed wind farm is the Enercon E-92 2.3 MW.

This model utilizes horizontal axis, upwind, 3-bladed, and a microprocessor pitch control system. Table 4 below outlines their main characteristics.

Table 4 - Enercon E-92 2.3 MW turbine characteristics. (Enercon, 2012)

Generator Type	Rotor Diameter (m)	Hub Height (m)	Rated Output (MW)
E-92 2.3	92	98	2.3

5.3. Power Curve Data

The power curve for the E-92 2.3 MW wind turbines at Noise Mode 0 and with an air density of 1.225 kg/m³ is shown below in Figure 1.

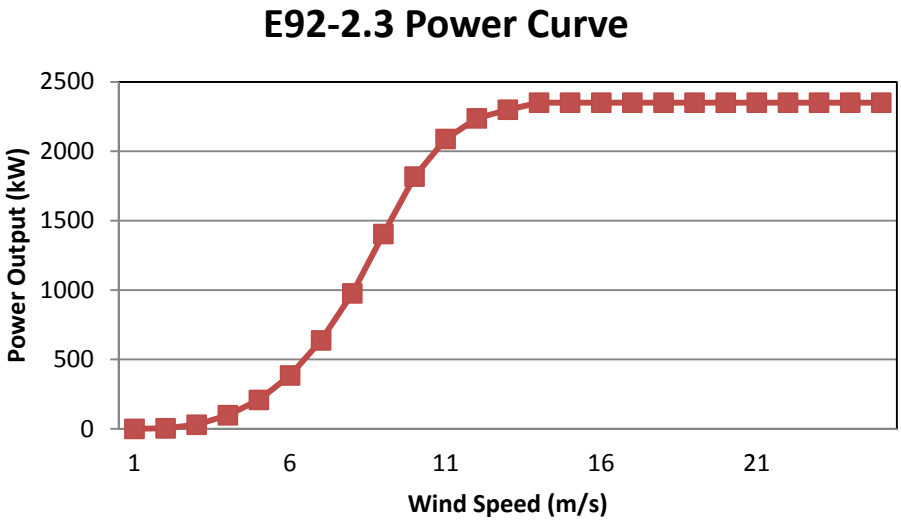

Figure 1 – Power curve for the Enercon E-92 2.3. (Enercon, 2012)

6. Wind Turbine Noise Emission Rating

The noise emission data for the Enercon E-92 2.3 wind turbines, shown in Table 5 below, was provided by Enercon Canada (2012). The Sound Pressure Levels (SPL) were measured to IEC 61400-11 standards, which stipulate measurements at a height of 10m above ground level (a.g.l.) with an air density of 1.225 kg/m^{3}that is taken to be representative of the project area. Where data is shown as 'N/A', WindPRO has extrapolated octave band data to generate appropriate SPL values in order to complete the calculation. These source noise levels are incorporated in the prediction calculations referenced in Section 7.

Table 5 - Enercon E-92 2.3 MW noise emission data for 98m hub height.

Wind speed at 10m a.g.l. (m/s)	SPL (LWA) (dB(A) re 10^{-12} Watts)	Octave Band Centre Frequency (Hz)							
		63	125	250	500	1000	2000	4000	8000
4	97.6	79.2	86.2	89.6	92.2	92.2	89.1	84.3	74.8
5	99.9	81.5	88.5	91.9	94.5	94.3	91.4	86.6	77.1
6	102.2	83.8	90.8	84.2	96.8	96.6	93.7	88.9	79.4
7	103.4	85.0	92.0	95.4	98.0	97.8	94.9	90.1	80.6
8	104.4	86.0	93.0	96.4	99.0	98.8	95.9	91.1	81.6
9	105.0	86.6	93.6	97.0	99.6	99.4	96.5	91.7	82.2
10	105.0	86.6	93.6	97.0	99.6	99.4	96.5	91.7	82.2
11	105.0	86.6	93.6	97.0	99.6	99.4	96.5	91.7	82.2
12	105.0	86.6	93.6	97.0	99.6	99.4	96.5	91.7	82.2

7. Impact Assessment

7.1. Prediction Methodology

The SPL was calculated at each point of reception (listed in Table 2) using the Decibel module of WindPRO v.2.8 which uses the ISO 9613-2 model "Attenuation of sound during propagation outdoors, Part 2: A general method of calculation". The calculations were performed using the Enercon E-92 2.3 MW wind turbine generators with a hub height of 98m. A global ground attenuation of 0.0 was used to represent a 'worst case scenario' that produces results that are unaffected by sound absorption from topographical characteristics such as trees, grass, etc. The WindPRO generated noise contour map for the Enercon E-92 2.3 with a 98m hub height can be found in Annex B.

As another conservative measure, downwind propagation has been assumed to occur simultaneously in all directions and from all wind turbines. Furthermore, no attenuation from topographical shielding (other buildings, barns, trees etc.) has been considered between the turbines and receptors. In reality, noise propagation in an upwind direction would lead to a significant reduction of incident noise levels at receptors located in the upwind direction in relation to the wind turbine.

No correction for special audible characteristics such as clearly audible tones, impulses or modulation of sound levels has been made. These are not common characteristics of modern wind turbine generators in a well designed wind farm. The absence of tonal noise is normally guaranteed by wind turbine manufacturers. Furthermore, impulses and modulation of sound levels from the wind farm under normal conditions would not be of a level to necessitate the application of any penalty.

A full list of parameters assumed for the predictions is provided in Annex B.

7.2. Results of Noise Predictions

The results of the noise prediction model at each point of immission, as summarized in Table 6 below, prove compliance with the Ontario *Noise Guidelines for Wind Farms* and the 40 dB(A) conservative SPL emission limit. The table demonstrates the loudest noise levels for any wind speed modelled between and including 4 to 12 m/s. As the guideline requirements have been exceeded, it was deemed unnecessary to conduct noise monitoring to establish background noise levels.

The receptor with the highest perceived noise immission was receptor BF, which received a maximum worst case emission of 37.6 dB(A) from the Enercon E-92 2.3 MW machine, at a 98m hub heights.

The modelled noise results for a wind speed of 9 m/s, approximately the 'noisiest' operational speed of a Enercon E92 wind turbine is mapped in Annexe B. The receptor ID labels on the contour plot correspond with the WindPRO ID listed in Table 2.

Table 6 - Wind turbine noise impact assessment summary.

Point of Reception ID letter	Distance from Receptor to nearest wind turbine (m)	Max Sound Level from wind farm for all wind speeds dB(A)	Compliance with Ontario Guidelines (Yes/No)	Compliance with 40 dB(A) Noise Level (Yes/No)
A	2104	27.9	Yes	Yes
B	1455	31.5	Yes	Yes
C	1609	30.6	Yes	Yes
D	1851	29.1	Yes	Yes
E	1864	29.2	Yes	Yes
F	2181	27.2	Yes	Yes
G	1113	34.4	Yes	Yes
H	2287	27.1	Yes	Yes
I	1189	33.8	Yes	Yes
J	1995	28.4	Yes	Yes
K	1647	30.3	Yes	Yes
L	1184	33.8	Yes	Yes
M	2012	28.5	Yes	Yes
N	1573	30.8	Yes	Yes
O	2010	28.3	Yes	Yes
P	1890	28.8	Yes	Yes
Q	2448	25.9	Yes	Yes
R	2336	26.8	Yes	Yes
S	1989	28.4	Yes	Yes
T	1324	32.6	Yes	Yes
U	1613	30.5	Yes	Yes
V	2664	25.4	Yes	Yes
W	2179	27.6	Yes	Yes
X	2233	27.1	Yes	Yes
Y	2377	26.6	Yes	Yes
Z	2505	26.1	Yes	Yes
AA	2122	27.8	Yes	Yes
AB	1316	32.8	Yes	Yes
AC	2280	26.8	Yes	Yes
AD	1825	29.1	Yes	Yes
AE	1460	31.6	Yes	Yes
AF	2190	27.5	Yes	Yes
AG	2008	28.1	Yes	Yes
AH	1927	28.5	Yes	Yes
AI	2068	28.3	Yes	Yes
AJ	1069	34.6	Yes	Yes
AK	1963	28.7	Yes	Yes
AL	2040	27.9	Yes	Yes

Point of Reception ID letter	Distance from Receptor to nearest wind turbine (m)	Max Sound Level from wind farm for all wind speeds dB(A)	Compliance with Ontario Guidelines (Yes/No)	Compliance with 40 dB(A) Noise Level (Yes/No)
AM	1079	34.7	Yes	Yes
AN	1506	31.2	Yes	Yes
AO	2037	28	Yes	Yes
AP	2254	27.2	Yes	Yes
AQ	2239	27.3	Yes	Yes
AR	2178	27.5	Yes	Yes
AS	1391	32.1	Yes	Yes
AT	1109	34.5	Yes	Yes
AU	1003	35.5	Yes	Yes
AV	970	35.8	Yes	Yes
AW	2189	27.5	Yes	Yes
AX	1477	31.6	Yes	Yes
AY	847	36.9	Yes	Yes
AZ	1582	30.8	Yes	Yes
BA	2027	28.3	Yes	Yes
BB	3069	23.3	Yes	Yes
BC	1786	29.5	Yes	Yes
BD	2042	27.9	Yes	Yes
BE	772	37.6	Yes	Yes
BF	2098	27.9	Yes	Yes
BG	2048	28.4	Yes	Yes
BH	1844	29.4	Yes	Yes
BI	1233	33.3	Yes	Yes
BJ	1365	32.4	Yes	Yes
BK	1421	32.1	Yes	Yes
BL	1414	32	Yes	Yes
BM	2372	26.7	Yes	Yes
BN	2566	25.9	Yes	Yes
BO	2452	26.3	Yes	Yes
BP	1716	30	Yes	Yes
BQ	1615	30.5	Yes	Yes
BR	1859	28.9	Yes	Yes
BS	2232	26.9	Yes	Yes

8. Conclusions and Recommendations

Natural Forces Wind Inc. has completed a thorough assessment to evaluate the noise impact of the proposed Aulds Mountain Wind Farm at residential locations within 2 kilometers of a proposed wind turbine. Based on the parameters used to run the WindPRO noise prediction model, it has been shown that the predicted sound pressure levels emitted by any of the proposed wind turbine generators are less than 40 dB(A), thus demonstrating compliance with the Ontario *Noise Guidelines for Wind Farms*. As a result of this study, no noise mitigation strategies are recommended.

9. References

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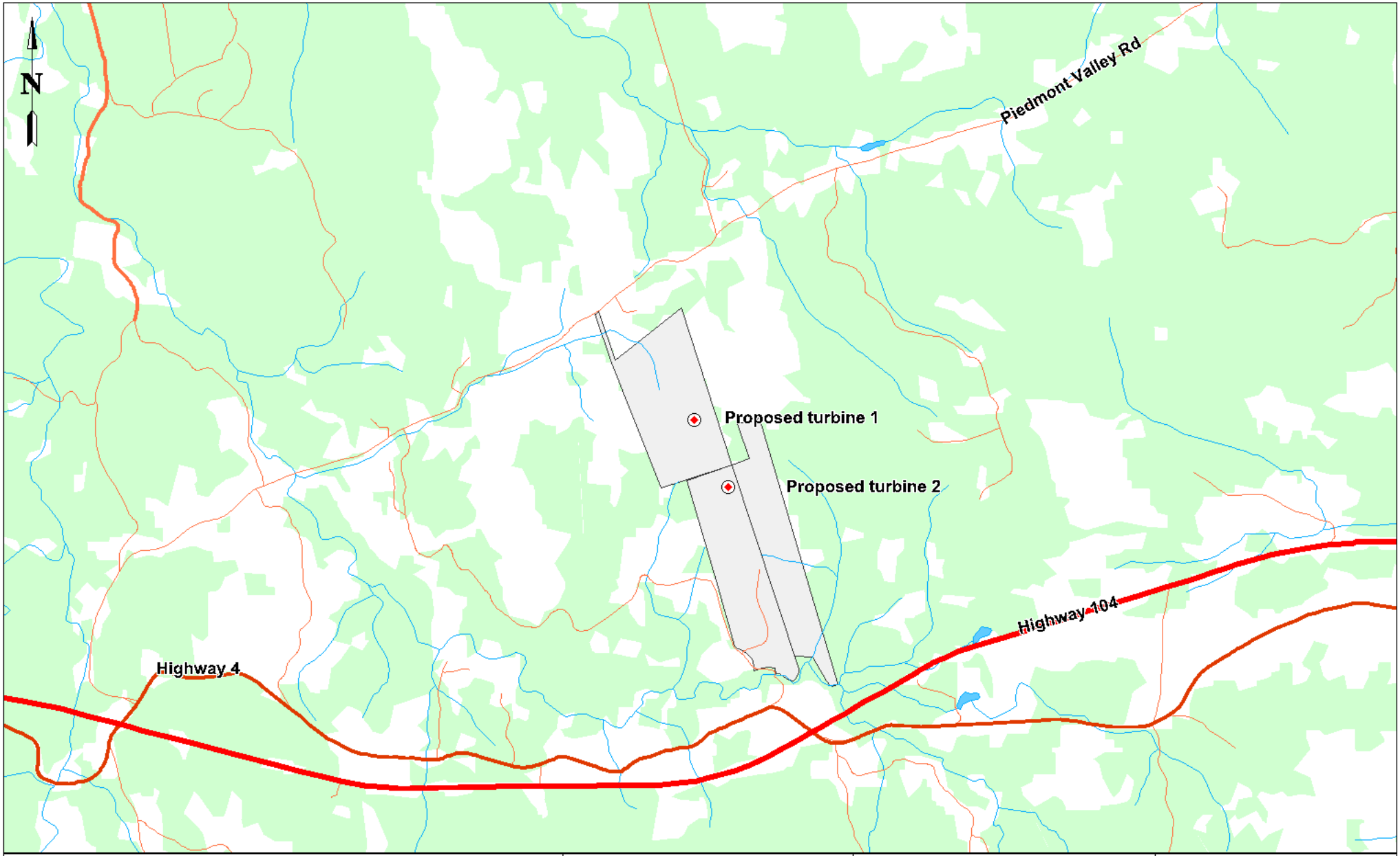
ANNEX A

Site Layout Map



LEGEND

- Project land
- Proposed turbines
- Highway
- Arterial & minor road
- Watercourse

SCALE

0 0.5 1
kilometres

1:35,000

KEY MAP

PROJECT
Aulds Mountain Wind Farm

FIGURE
Annex A

TITLE
Site Layout

DATE
October 9th 2013

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Halifax, NS B3J 3N4
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ANNEX B

WindPRO v2.8, Decibel Module Calculation Results

Enercon E-92 2.3 MW @ 98m Hub Height

Project:
Auld's Mountain Wind Farm

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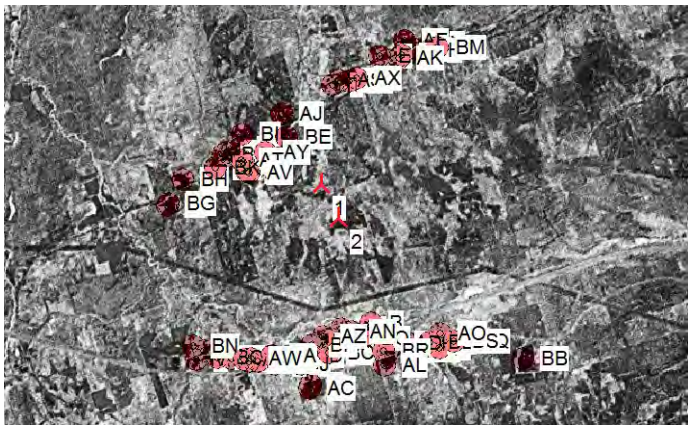
Calculated:
09/10/2013 3:52 PM/2.8.579

DECIBEL - Main Result

Calculation: Aulds Mountain - Final Noise Impact Assessment

Noise calculation model:
ISO 9613-2 General
Wind speed:
4.0 m/s - 12.0 m/s, step 1.0 m/s
Ground attenuation:
None
Meteorological coefficient, C0:
0.0 dB
Type of demand in calculation:
1: WTG noise is compared to demand (DK, DE, SE, NL etc.)
Noise values in calculation:
All noise values are mean values (Lwa) (Normal)
Pure tones:
Pure and Impulse tone penalty are added to WTG source noise
Height above ground level, when no value in NSA object:
4.5 m Don't allow override of model height with height from NSA object
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0.0 dB(A)



Scale 1:100,000
New WTG
Noise sensitive area

WTGs

	UTM (north)-NAD83 (US+CA) Zone: 20				WTG type						Noise data						
	East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Creator	Name	First wind speed	LwaRef	Last wind speed	LwaRef	Pure tones
			[m]					[kW]	[m]	[m]			[m/s]	[dB(A)]	[m/s]	[dB(A)]	
1	548,803	5,049,223	233.8	ENERCON E-92 2,3 MW 2300 ...	Yes	ENERCON	E-92 2,3 MW-2,300	2,300	92.0	98.0	EMD	Level 0 - calculated - Op.Mode I - 03/2012	4.0	97.6	12.0	105.0	0 dB g
2	549,031	5,048,771	230.0	ENERCON E-92 2,3 MW 2300 ...	Yes	ENERCON	E-92 2,3 MW-2,300	2,300	92.0	98.0	EMD	Level 0 - calculated - Op.Mode I - 03/2012	4.0	97.6	12.0	105.0	0 dB g

h) Generic octave distribution used
g) Data calculated from data for other wind speed (uncertain)

Calculation Results

Sound Level

Noise sensitive area		UTM (north)-NAD83 (US+CA) Zone: 20			Demands			Sound Level	Demands fulfilled ?		
No.	Name	East	North	Z	Imission height	Max Noise	Distance	Max From WTGs	Noise	Distance	All
				[m]	[m]	[dB(A)]	[m]	[dB(A)]			
A	Noise sensitive point: User defined (98)	548,191	5,046,842	106.2	4.5	40.0	600	27.9	Yes	Yes	Yes
B	Noise sensitive point: User defined (99)	549,470	5,047,384	87.4	4.5	40.0	600	31.5	Yes	Yes	Yes
C	Noise sensitive point: User defined (100)	548,952	5,047,164	93.9	4.5	40.0	600	30.6	Yes	Yes	Yes
D	Noise sensitive point: User defined (101)	548,658	5,046,958	100.0	4.5	40.0	600	29.1	Yes	Yes	Yes
E	Noise sensitive point: User defined (102)	549,574	5,050,920	80.0	4.5	40.0	600	29.2	Yes	Yes	Yes
F	Noise sensitive point: User defined (103)	550,369	5,047,049	100.0	4.5	40.0	600	27.2	Yes	Yes	Yes
G	Noise sensitive point: User defined (104)	547,730	5,049,519	70.0	4.5	40.0	600	34.4	Yes	Yes	Yes
H	Noise sensitive point: User defined (105)	550,244	5,050,999	94.3	4.5	40.0	600	27.1	Yes	Yes	Yes
I	Noise sensitive point: User defined (106)	547,657	5,049,541	70.0	4.5	40.0	600	33.8	Yes	Yes	Yes
J	Noise sensitive point: User defined (107)	548,531	5,046,840	109.9	4.5	40.0	600	28.4	Yes	Yes	Yes
K	Noise sensitive point: User defined (108)	549,014	5,047,124	95.8	4.5	40.0	600	30.3	Yes	Yes	Yes
L	Noise sensitive point: User defined (109)	547,719	5,049,698	70.9	4.5	40.0	600	33.8	Yes	Yes	Yes
M	Noise sensitive point: User defined (110)	549,877	5,050,924	84.5	4.5	40.0	600	28.5	Yes	Yes	Yes
N	Noise sensitive point: User defined (111)	549,212	5,047,208	93.1	4.5	40.0	600	30.8	Yes	Yes	Yes
O	Noise sensitive point: User defined (112)	548,418	5,046,857	107.4	4.5	40.0	600	28.3	Yes	Yes	Yes
P	Noise sensitive point: User defined (113)	549,693	5,047,001	94.0	4.5	40.0	600	28.8	Yes	Yes	Yes
Q	Noise sensitive point: User defined (114)	550,858	5,047,141	110.4	4.5	40.0	600	25.9	Yes	Yes	Yes
R	Noise sensitive point: User defined (115)	547,617	5,046,912	95.2	4.5	40.0	600	26.8	Yes	Yes	Yes
S	Noise sensitive point: User defined (116)	548,382	5,046,890	104.3	4.5	40.0	600	28.4	Yes	Yes	Yes
T	Noise sensitive point: User defined (117)	548,958	5,050,538	80.0	4.5	40.0	600	32.6	Yes	Yes	Yes
U	Noise sensitive point: User defined (118)	549,277	5,047,177	98.7	4.5	40.0	600	30.5	Yes	Yes	Yes
V	Noise sensitive point: User defined (119)	547,138	5,046,896	79.8	4.5	40.0	600	25.4	Yes	Yes	Yes
W	Noise sensitive point: User defined (120)	550,053	5,051,008	86.3	4.5	40.0	600	27.6	Yes	Yes	Yes

To be continued on next page...

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DECIBEL - Main Result

Calculation: Aulds Mountain - Final Noise Impact Assessment

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Noise sensitive area		UTM (north)-NAD83 (US+CA) Zone: 20				Demands		Sound Level	Demands fulfilled ?		
No.	Name	East	North	Z	Imission height	Max Noise	Distance	Max From WTGs	Noise	Distance	All
				[m]	[m]	[dB(A)]	[m]	[dB(A)]			
X	Noise sensitive point: User defined (121)	548,662	5,046,569	127.2	4.5	40.0	600	27.1	Yes	Yes	Yes
Y	Noise sensitive point: User defined (122)	550,284	5,051,082	90.0	4.5	40.0	600	26.6	Yes	Yes	Yes
Z	Noise sensitive point: User defined (123)	547,241	5,047,018	84.9	4.5	40.0	600	26.1	Yes	Yes	Yes
AA	Noise sensitive point: User defined (124)	548,046	5,046,892	104.6	4.5	40.0	600	27.8	Yes	Yes	Yes
AB	Noise sensitive point: User defined (125)	547,553	5,049,636	70.0	4.5	40.0	600	32.8	Yes	Yes	Yes
AC	Noise sensitive point: User defined (126)	548,644	5,046,524	129.3	4.5	40.0	600	26.8	Yes	Yes	Yes
AD	Noise sensitive point: User defined (127)	549,806	5,047,119	90.0	4.5	40.0	600	29.1	Yes	Yes	Yes
AE	Noise sensitive point: User defined (128)	549,074	5,047,312	88.4	4.5	40.0	600	31.6	Yes	Yes	Yes
AF	Noise sensitive point: User defined (129)	549,905	5,051,116	80.7	4.5	40.0	600	27.5	Yes	Yes	Yes
AG	Noise sensitive point: User defined (130)	550,021	5,047,024	90.7	4.5	40.0	600	28.1	Yes	Yes	Yes
AH	Noise sensitive point: User defined (131)	549,992	5,047,101	90.0	4.5	40.0	600	28.5	Yes	Yes	Yes
AI	Noise sensitive point: User defined (132)	546,755	5,048,938	51.9	4.5	40.0	600	28.3	Yes	Yes	Yes
AJ	Noise sensitive point: User defined (133)	548,276	5,050,153	87.7	4.5	40.0	600	34.6	Yes	Yes	Yes
AK	Noise sensitive point: User defined (134)	549,834	5,050,893	85.6	4.5	40.0	600	28.7	Yes	Yes	Yes
AL	Noise sensitive point: User defined (135)	549,640	5,046,824	110.8	4.5	40.0	600	27.9	Yes	Yes	Yes
AM	Noise sensitive point: User defined (136)	547,762	5,049,508	70.0	4.5	40.0	600	34.7	Yes	Yes	Yes
AN	Noise sensitive point: User defined (137)	549,210	5,047,276	90.0	4.5	40.0	600	31.2	Yes	Yes	Yes
AO	Noise sensitive point: User defined (138)	550,388	5,047,252	100.0	4.5	40.0	600	28.0	Yes	Yes	Yes
AP	Noise sensitive point: User defined (139)	547,777	5,046,898	100.0	4.5	40.0	600	27.2	Yes	Yes	Yes
AQ	Noise sensitive point: User defined (140)	547,848	5,046,870	104.3	4.5	40.0	600	27.3	Yes	Yes	Yes
AR	Noise sensitive point: User defined (141)	547,960	5,046,874	106.5	4.5	40.0	600	27.5	Yes	Yes	Yes
AS	Noise sensitive point: User defined (142)	549,048	5,050,592	80.0	4.5	40.0	600	32.1	Yes	Yes	Yes
AT	Noise sensitive point: User defined (143)	547,741	5,049,543	70.0	4.5	40.0	600	34.5	Yes	Yes	Yes
AU	Noise sensitive point: User defined (144)	547,813	5,049,385	84.8	4.5	40.0	600	35.5	Yes	Yes	Yes
AV	Noise sensitive point: User defined (145)	547,845	5,049,378	87.5	4.5	40.0	600	35.8	Yes	Yes	Yes
AW	Noise sensitive point: User defined (146)	547,876	5,046,912	102.8	4.5	40.0	600	27.5	Yes	Yes	Yes
AX	Noise sensitive point: User defined (147)	549,267	5,050,625	81.4	4.5	40.0	600	31.6	Yes	Yes	Yes
AY	Noise sensitive point: User defined (148)	548,063	5,049,636	89.7	4.5	40.0	600	36.9	Yes	Yes	Yes
AZ	Noise sensitive point: User defined (149)	548,828	5,047,202	86.3	4.5	40.0	600	30.8	Yes	Yes	Yes
BA	Noise sensitive point: User defined (150)	548,151	5,046,945	97.9	4.5	40.0	600	28.3	Yes	Yes	Yes
BB	Noise sensitive point: User defined (151)	551,477	5,046,917	140.0	4.5	40.0	600	23.3	Yes	Yes	Yes
BC	Noise sensitive point: User defined (152)	548,899	5,046,990	100.2	4.5	40.0	600	29.5	Yes	Yes	Yes
BD	Noise sensitive point: User defined (153)	550,247	5,047,130	97.3	4.5	40.0	600	27.9	Yes	Yes	Yes
BE	Noise sensitive point: User defined (154)	548,345	5,049,845	92.1	4.5	40.0	600	37.6	Yes	Yes	Yes
BF	Noise sensitive point: User defined (155)	548,144	5,046,870	103.2	4.5	40.0	600	27.9	Yes	Yes	Yes
BG	Noise sensitive point: User defined (156)	546,771	5,048,966	51.4	4.5	40.0	600	28.4	Yes	Yes	Yes
BH	Noise sensitive point: User defined (157)	546,960	5,049,282	50.2	4.5	40.0	600	29.4	Yes	Yes	Yes
BI	Noise sensitive point: User defined (158)	547,758	5,049,878	95.2	4.5	40.0	600	33.3	Yes	Yes	Yes
BJ	Noise sensitive point: User defined (159)	547,494	5,049,611	70.0	4.5	40.0	600	32.4	Yes	Yes	Yes
BK	Noise sensitive point: User defined (160)	547,398	5,049,436	60.0	4.5	40.0	600	32.1	Yes	Yes	Yes
BL	Noise sensitive point: User defined (161)	549,175	5,050,587	80.1	4.5	40.0	600	32.0	Yes	Yes	Yes
BM	Noise sensitive point: User defined (162)	550,339	5,051,031	90.0	4.5	40.0	600	26.7	Yes	Yes	Yes
BN	Noise sensitive point: User defined (163)	547,103	5,047,078	70.0	4.5	40.0	600	25.9	Yes	Yes	Yes
BO	Noise sensitive point: User defined (164)	547,420	5,046,923	91.5	4.5	40.0	600	26.3	Yes	Yes	Yes
BP	Noise sensitive point: User defined (165)	548,673	5,047,093	88.4	4.5	40.0	600	30.0	Yes	Yes	Yes
BQ	Noise sensitive point: User defined (166)	549,349	5,047,188	98.8	4.5	40.0	600	30.5	Yes	Yes	Yes
BR	Noise sensitive point: User defined (167)	549,632	5,047,012	98.3	4.5	40.0	600	28.9	Yes	Yes	Yes
BS	Noise sensitive point: User defined (168)	550,567	5,047,151	104.2	4.5	40.0	600	26.9	Yes	Yes	Yes

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DECIBEL - Main Result

Calculation: Aulds Mountain - Final Noise Impact Assessment

Distances (m)

	WTG	
NSA	1	2
A	2458	2104
B	1956	1455
C	2064	1609
D	2270	1851
E	1864	2217
F	2679	2181
G	1113	1501
H	2287	2537
I	1189	1575
J	2399	1995
K	2110	1647
L	1184	1606
M	2012	2313
N	2056	1573
O	2397	2010
P	2394	1890
Q	2925	2448
R	2598	2336
S	2370	1989
T	1324	1769
U	2100	1613
V	2861	2664
W	2179	2459
X	2658	2233
Y	2377	2629
Z	2702	2505
AA	2451	2122
AB	1316	1713
AC	2704	2280
AD	2331	1825
AE	1931	1460
AF	2190	2502
AG	2514	2008
AH	2432	1927
AI	2068	2282
AJ	1069	1575
AK	1963	2269
AL	2541	2040
AM	1079	1468
AN	1989	1506
AO	2529	2037
AP	2541	2254
AQ	2539	2239
AR	2496	2178
AS	1391	1821
AT	1109	1503
AU	1003	1364
AV	970	1332
AW	2490	2189
AX	1477	1869
AY	847	1298
AZ	2021	1582
BA	2369	2027
BB	3531	3069
BC	2235	1786
BD	2543	2042

To be continued on next page...

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DECIBEL - Main Result

Calculation: Aulds Mountain - Final Noise Impact Assessment

...continued from previous page

	WTG	
NSA	1	2
BE	772	1274
BF	2443	2098
BG	2048	2268
BH	1844	2133
BI	1233	1687
BJ	1365	1752
BK	1421	1763
BL	1414	1822
BM	2372	2611
BN	2737	2566
BO	2684	2452
BP	2134	1716
BQ	2107	1615
BR	2361	1859
BS	2721	2232

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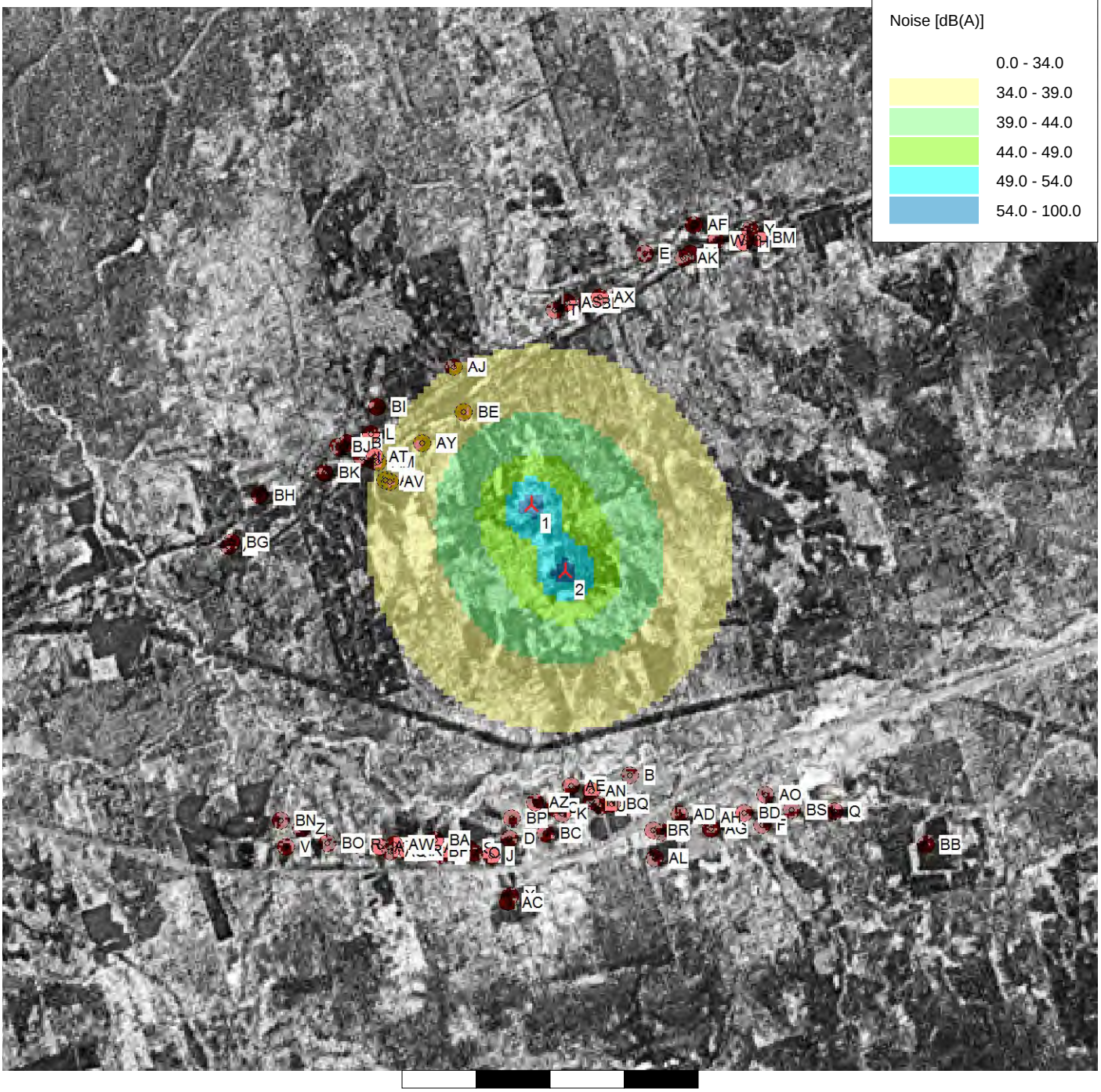
DECIBEL - Map 8.0 m/s

Calculation: Aulds Mountain - Final Noise Impact Assessment



Map: WindPRO map , Print scale 1:40,000, Map center UTM (north)-NAD83 (US+CA) Zone: 20 East: 548,917 North: 5,048,997

New WTG Noise sensitive area

Noise calculation model: ISO 9613-2 General. Wind speed: 8.0 m/s

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Aulds Mountain Wind Farm

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DECIBEL - Assumptions for noise calculation

Calculation: Aulds Mountain - Final Noise Impact Assessment

Noise calculation model:
ISO 9613-2 General
Wind speed:
4.0 m/s - 12.0 m/s, step 1.0 m/s
Ground attenuation:
None
Meteorological coefficient, C0:
0.0 dB
Type of demand in calculation:
1: WTG noise is compared to demand (DK, DE, SE, NL etc.)
Noise values in calculation:
All noise values are mean values (Lwa) (Normal)
Pure tones:
Pure and Impulse tone penalty are added to WTG source noise
Height above ground level, when no value in NSA object:
4.5 m Don't allow override of model height with height from NSA object
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0.0 dB(A)
Octave data required
Air absorption

63 [db/km]	125 [db/km]	250 [db/km]	500 [db/km]	1,000 [db/km]	2,000 [db/km]	4,000 [db/km]	8,000 [db/km]
0.1	0.4	1.0	1.9	3.7	9.7	32.8	117.0

WTG: ENERCON E-92 2,3 MW 2300 92.0 !-!
Noise: Level 0 - calculated - Op.Mode I - 03/2012

Source	Source/Date	Creator	Edited
Manufacturer	16/03/2012	EMD	16/03/2012 5:58 PM

According to manufacturer specification document "SIAS-04-SPL-E-92 OM I 2 3 MW Est Rev1 1-en-eng.pdf" dated 03/2012

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones		Octave data 63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
ExtraPolated	98.0	4.0	97.6	No	Generic data	79.2	86.2	89.6	92.2	92.0	89.1	84.3	74.8
From Windcat	98.0	5.0	99.9	No	Generic data	81.5	88.5	91.9	94.5	94.3	91.4	86.6	77.1
From Windcat	98.0	6.0	102.2	No	Generic data	83.8	90.8	94.2	96.8	96.6	93.7	88.9	79.4
From Windcat	98.0	7.0	103.4	No	Generic data	85.0	92.0	95.4	98.0	97.8	94.9	90.1	80.6
From Windcat	98.0	8.0	104.4	No	Generic data	86.0	93.0	96.4	99.0	98.8	95.9	91.1	81.6
From Windcat	98.0	9.0	105.0	No	Generic data	86.6	93.6	97.0	99.6	99.4	96.5	91.7	82.2
From Windcat	98.0	10.0	105.0	No	Generic data	86.6	93.6	97.0	99.6	99.4	96.5	91.7	82.2
From Windcat	98.0	11.0	105.0	No	Generic data	86.6	93.6	97.0	99.6	99.4	96.5	91.7	82.2
From Windcat	98.0	12.0	105.0	No	Generic data	86.6	93.6	97.0	99.6	99.4	96.5	91.7	82.2

NSA: Noise sensitive point: User defined (98)-A
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (99)-B
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

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DECIBEL - Assumptions for noise calculation

Calculation: Aulds Mountain - Final Noise Impact Assessment

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (100)-C
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (101)-D
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (102)-E
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (103)-F
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (104)-G
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (105)-H
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

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DECIBEL - Assumptions for noise calculation

Calculation: Aulds Mountain - Final Noise Impact Assessment

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (106)-I
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (107)-J
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (108)-K
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (109)-L
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (110)-M
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (111)-N
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

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DECIBEL - Assumptions for noise calculation

Calculation: Aulds Mountain - Final Noise Impact Assessment

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (112)-O
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (113)-P
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (114)-Q
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (115)-R
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (116)-S
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (117)-T
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

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DECIBEL - Assumptions for noise calculation

Calculation: Aulds Mountain - Final Noise Impact Assessment

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (118)-U
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (119)-V
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (120)-W
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (121)-X
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (122)-Y
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (123)-Z
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

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DECIBEL - Assumptions for noise calculation

Calculation: Aulds Mountain - Final Noise Impact Assessment

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (124)-AA
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (125)-AB
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (126)-AC
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (127)-AD
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (128)-AE
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (129)-AF
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

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DECIBEL - Assumptions for noise calculation

Calculation: Aulds Mountain - Final Noise Impact Assessment

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (130)-AG
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (131)-AH
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (132)-AI
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (133)-AJ
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (134)-AK
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (135)-AL
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

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DECIBEL - Assumptions for noise calculation

Calculation: Aulds Mountain - Final Noise Impact Assessment

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (136)-AM
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (137)-AN
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (138)-AO
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (139)-AP
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (140)-AQ
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (141)-AR
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

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DECIBEL - Assumptions for noise calculation

Calculation: Aulds Mountain - Final Noise Impact Assessment

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (142)-AS
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (143)-AT
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (144)-AU
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (145)-AV
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (146)-AW
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (147)-AX
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

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DECIBEL - Assumptions for noise calculation

Calculation: Aulds Mountain - Final Noise Impact Assessment

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (148)-AY
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (149)-AZ
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (150)-BA
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (151)-BB
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (152)-BC
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (153)-BD
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

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DECIBEL - Assumptions for noise calculation

Calculation: Aulds Mountain - Final Noise Impact Assessment

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (154)-BE
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (155)-BF
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (156)-BG
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (157)-BH
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (158)-BI
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (159)-BJ
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

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DECIBEL - Assumptions for noise calculation

Calculation: Aulds Mountain - Final Noise Impact Assessment

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (160)-BK
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (161)-BL
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (162)-BM
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (163)-BN
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (164)-BO
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (165)-BP
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

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DECIBEL - Assumptions for noise calculation

Calculation: Aulds Mountain - Final Noise Impact Assessment

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (166)-BQ
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (167)-BR
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

NSA: Noise sensitive point: User defined (168)-BS
Predefined calculation standard:
Imission height(a.g.l.): Use standard value from calculation model

Noise demand: 40.0 dB(A)
Ambient noise: 0.0 dB(A)
Margin or Allowed additional exposure: 0.0 dB(A)
Sound level always accepted: 0.0 dB(A)
Distance demand: 600

Appendix I:

Shadow Flicker Impact Assessment

Aulds Mountain Wind Farm
Shadow Flicker Assessment Report
October 2013

Natural Forces Wind Inc.
1801 Hollis Street Suite 1205
Halifax, NS B3J 3N4
P +1 (902) 422 9663
F +1 (902) 422 9780

Report Information

Client	Natural Forces Wind Inc.
Client Contact	Amy Pellerin
Report Name	Aulds Mountain Wind Farm Shadow Flicker Assessment
Created By	Amy Pellerin
Signature	

** The WindPRO v2.8, Decibel Module Calculation Results for Enercon E-92 2.3 MW @ 98m Hub Height. To review General Specification for the Enercon E-92 2.3 MW please contact:

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List of Annexes

1. Introduction

Natural Forces Wind Inc. has undertaken a shadow flicker impact assessment for the proposed Aulds Mountain Wind Farm to assess the potential impact of shadow flicker on the surrounding shadow receptors. Details outlining the shadow receptors, prediction methodology and assumptions made for the assessment are included herein, with complete WindPRO results supplied in the annexes. This report also provides background information on shadow flicker.

As there are very few federal, provincial or municipal guidelines or policies for governing or quantifying what is an acceptable amount of shadow flicker at this time, the German standards, *Hinweise zur Ermittlung und Beurteilung der optischen Immissionen von Windenergianlagen*, have been adopted for this study. Often, careful site design in the first instance is recommended, followed by industry accepted mitigation strategies thereafter. This assessment will be used as supporting documentation to demonstrate compliance with these standards. The shadow flicker analysis was conducted using the Shadow module of the software package, WindPRO version 2.8.

2. Background

Flicker is caused by incident light rays on a moving object which then casts an intermittent shadow on a receptor. This intermittent shadow, perceived as a change in light intensity to an observer, as it pertains to wind turbines, is referred to as shadow flicker. Shadow flicker is caused by incident sun rays on the rotor blades as they turn.

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

1. The sun must be shining and not obscured by any cloud cover.
2. The wind turbine must be between the sun and the shadow receptor.
3. The line of sight between the turbine and the shadow receptor must be clear. Light-impermeable obstacles, such as vegetation, buildings, awnings etc., will prevent shadow flicker from occurring at the receptor.
4. The shadow receptor has to be close enough to the turbine to be in the shadow.

3. Policy and Guidelines

As previously stated, there are very few federal, provincial or municipal guidelines or policies for governing or quantifying what is an acceptable amount of shadow flicker. As a result, the German standards have been adopted for this study. The German shadow flicker guidelines provide a means of quantifying acceptable levels of shadow flicker exposure based on the astronomic worst case. Acceptable levels at shadow receptors are:

- no more than 30 hours per year of astronomical maximum shadow (worst case), and
- no more than 30 minutes on the worst day of astronomical maximum shadow (worst case).

The guidelines also stipulate two factors that limit the shadow flicker effect, due to optic conditions in the atmosphere:

1) the angle of the sun over the horizon, which must be at least 3 degrees, and
2) the blade of the WTG must cover at least 20 % of the sun.

Receptors not exposed to more than 30 minutes per day on the worst affected day or a total of 30 hours per year from all surrounding wind turbines are considered unlikely to require technical mitigation.

4. General Description of Project Site and Surrounds

The proposed Aulds Mountain Wind Farm consists of a maximum of 2 wind turbine generators (WTG) located in the Municipality of Pictou County, Nova Scotia. Currently, Enercon E-92 2.3 MW WTG are being considered for the project and therefore were used in this assessment, however if the turbine type was to change, a new shadow flicker assessment would be conducted.

The project site is situated approximately 6 kilometers south east of Merigomish and adjacent to the Piedmont Valley Road. Land around the proposed project area is zoned as a General Development Zone and so, will not require re-zoning. A map of the site is included in Annex A.

5. Description of Receptors

The 71 points of reception taken into consideration for this shadow flicker assessment are residential buildings and/or seasonal homes located within 2 km from the project land. The receptors are located at dwellings generally along Piedmont Valley Road and Highway 4.

Details of receptor locations and distances to nearest WTG are detailed in Table 1. Receptor ID letters included in Table 1correspond with the WindPRO generated maps included in Annex B.

Table 1: Description of receptors.

Point of Reception ID Letter	Location (UTM Zone 20, NAD 83)		Distance from Receptor to	
	Easting	Northing	Wind turbine 1	Wind turbine 2
A	548,191	5,046,842	2458	2104
B	549,470	5,047,384	1956	1455
C	548,952	5,047,164	2064	1609
D	548,658	5,046,958	2270	1851
E	549,574	5,050,920	1864	2217
F	550,369	5,047,049	2679	2181
G	547,730	5,049,519	1113	1501
H	550,244	5,050,999	2287	2537
I	547,657	5,049,541	1189	1575
J	548,531	5,046,840	2399	1995
K	549,014	5,047,124	2110	1647
L	547,719	5,049,698	1184	1606
M	549,877	5,050,924	2012	2313
N	549,212	5,047,208	2056	1573
O	548,418	5,046,857	2397	2010
P	549,693	5,047,001	2394	1890
Q	550,858	5,047,141	2925	2448
R	547,617	5,046,912	2598	2336
S	548,382	5,046,890	2370	1989
T	548,958	5,050,538	1324	1769
U	549,277	5,047,177	2100	1613
V	547,138	5,046,896	2861	2664
W	550,053	5,051,008	2179	2459
X	548,662	5,046,569	2658	2233
Y	550,284	5,051,082	2377	2629
Z	547,241	5,047,018	2702	2505
AA	548,046	5,046,892	2451	2122
AB	547,553	5,049,636	1316	1713
AC	548,644	5,046,524	2704	2280
AD	549,806	5,047,119	2331	1825
AE	549,074	5,047,312	1931	1460
AF	549,905	5,051,116	2190	2502

Point of Reception ID Letter	Location (UTM Zone 20, NAD 83)		Distance from Receptor to	
	Easting	Northing	Wind turbine 1	Wind turbine 2
AG	550,021	5,047,024	2514	2008
AH	549,992	5,047,101	2432	1927
AI	546,755	5,048,938	2068	2282
AJ	548,276	5,050,153	1069	1575
AK	549,834	5,050,893	1963	2269
AL	549,640	5,046,824	2541	2040
AM	547,762	5,049,508	1079	1468
AN	549,210	5,047,276	1989	1506
AO	550,388	5,047,252	2529	2037
AP	547,777	5,046,898	2541	2254
AQ	547,848	5,046,870	2539	2239
AR	547,960	5,046,874	2496	2178
AS	549,048	5,050,592	1391	1821
AT	547,741	5,049,543	1109	1503
AU	547,813	5,049,385	1003	1364
AV	547,845	5,049,378	970	1332
AW	547,876	5,046,912	2490	2189
AX	549,267	5,050,625	1477	1869
AY	548,063	5,049,636	847	1298
AZ	548,828	5,047,202	2021	1582
BA	548,151	5,046,945	2369	2027
BB	551,477	5,046,917	3531	3069
BC	548,899	5,046,990	2235	1786
BD	550,247	5,047,130	2543	2042
BE	548,345	5,049,845	772	1274
BF	548,144	5,046,870	2443	2098
BG	546,771	5,048,966	2048	2268
BH	546,960	5,049,282	1844	2133
BI	547,758	5,049,878	1233	1687
BJ	547,494	5,049,611	1365	1752
BK	547,398	5,049,436	1421	1763
BL	549,175	5,050,587	1414	1822
BM	550,339	5,051,031	2372	2611
BN	547,103	5,047,078	2737	2566
BO	547,420	5,046,923	2684	2452
BP	548,673	5,047,093	2134	1716
BQ	549,349	5,047,188	2107	1615
BR	549,632	5,047,012	2361	1859
BS	550,567	5,047,151	2721	2232

6. Description of Sources

6.1. Turbine Locations

A map of the project area with the proposed WTG layout is illustrated in Annex A. There are no existing or proposed wind farms within 5 kilometers the project, thus it is unlikely any cumulative shadow effects will occur. Coordinates of the wind turbines are given below in Table 2. Turbine ID numbers included in Table 2 with the WindPRO generated figures included Annex B.

Table 2: Coordinates of proposed turbine locations.

Wind Turbine ID Number	Proposed Turbine Location (UTM Zone 20, NAD 83)	
	Easting	Northing
1	548,803	5,049,223
2	549,031	5,048,771

6.2. Turbine Types

The models of WTGs being considered for the proposed wind farm are the Enercon E-92 2.3 MW.

This model utilizes horizontal axis, upwind, 3-bladed, and a microprocessor pitch control system. Table 3 - Enercon E-92 2.3 MW turbine characteristics below outlines their main characteristics.

Table 3 - Enercon E-92 2.3 MW turbine characteristics. (Enercon, 2012)

Generator Type	Rotor Diameter (m)	Hub Height (m)	Swept Area (m^2)	Rated Output (MW)
E-92 2.3	92	98	6648	2.3

7. Impact Assessment

7.1. Prediction Methodology

The shadow flicker impact was calculated at each receptor using the Shadow module of the software package, WindPRO version 2.8. The model simulates the Earth's orbit and rotation, to provide the astronomical maximum shadow, also known as the astronomical worst-case scenario. The astronomical maximum shadow calculation assumes that for every day of the year:

1. The sky is cloudless between sunrise and sunset,
2. The turbines are always in operation, and
3. The wind direction changes throughout the day such that the rotor plane is perpendicular to the incident sun rays at all times.

The position of the sun relative to the wind turbine rotor plane and the resulting shadow is calculated in steps of one minute intervals throughout a complete year. If the rotor plane, assumed to be a solid disk equivalent in size to the swept area shown in Table 3 casts a shadow on a receptor window during one of these intervals, it is registered as one minute of potential shadow impact.

As previously noted, following the German guidelines, the impact of shadow flicker on surrounding receptors is limited by two factors. The first being that the angle of the sun over the horizon must be greater than 3 degrees, due to optic conditions in the atmosphere which cause the shadow to dissipate before it could potentially reach a receptor. The second is that the blade of the wind turbine must cover at least 20% of the incident solar rays in order to have a noticeable effect.

Each receptor was treated as a 'greenhouse' with 3m high windows for 360° of the building. Furthermore, no topographical shielding (other buildings, barns, trees etc.) has been considered between the wind turbines and receptors. This is a worst-case assumption and results in a conservative prediction of the potential shadow flicker impacts.

Table 4 below provides results of the analysis for shadow flicker at each of the 71 receptors used in this assessment.

7.2. Results of Shadow Flicker Predictions

The results of the shadow flicker prediction model at each receptor, as summarized Table 4, prove compliance with the German standards of no more than 30 hours per year of astronomical maximum shadow (worst case), and no more than 30 minutes on the worst day of astronomical maximum shadow (worst case). Furthermore, some receptors within 2,000 km of the closest WTGs will not encounter any shadow flicker impacts.

While all receptors are subject to less than 30hrs/year or 30mins/day, the worst affected receptors are located on Piedmont Valley Road with the highest worst case shadow flicker hours per year being 22:31. Tabulated results for the Enercon E-92 2.3 MW can be found in Table 4, while modelled results representing shadow flicker hours per year are mapped in Annex B.

Table 4: Predicted shadow flicker for E-92 2.3 MW @ 98 m hub height.

Point of Reception ID letter	Shadow flicker		
	Shadow hours per year (hr/year)	Shadow days per year (days/year)	Shadow hours per day (hours/day)
A	0:00	0	0:00
B	0:00	0	0:00
C	0:00	0	0:00
D	0:00	0	0:00
E	0:00	0	0:00
F	0:00	0	0:00
G	10:02	45	0:19
H	0:00	0	0:00
I	9:03	42	0:18
J	0:00	0	0:00
K	0:00	0	0:00
L	10:05	48	0:19
M	0:00	0	0:00
N	0:00	0	0:00
O	0:00	0	0:00
P	0:00	0	0:00
Q	0:00	0	0:00
R	0:00	0	0:00
S	0:00	0	0:00
T	0:00	0	0:00
U	0:00	0	0:00
V	0:00	0	0:00
W	0:00	0	0:00
X	0:00	0	0:00
Y	0:00	0	0:00
Z	0:00	0	0:00
AA	0:00	0	0:00
AB	4:27	21	0:17
AC	0:00	0	0:00
AD	0:00	0	0:00
AE	0:00	0	0:00
AF	0:00	0	0:00
AG	0:00	0	0:00
AH	0:00	0	0:00
AI	0:00	0	0:00
AJ	0:00	0	0:00
AK	0:00	0	0:00
AL	0:00	0	0:00

Point of Reception ID letter	Shadow flicker		
	Shadow hours per year (hr/year)	Shadow days per year (days/year)	Shadow hours per day (hours/day)
AM	10:34	47	0:20
AN	0:00	0	0:00
AO	0:00	0	0:00
AP	0:00	0	0:00
AQ	0:00	0	0:00
AR	0:00	0	0:00
AS	0:00	0	0:00
AT	10:13	45	0:19
AU	12:07	50	0:21
AV	12:47	52	0:22
AW	0:00	0	0:00
AX	0:00	0	0:00
AY	19:04	69	0:25
AZ	0:00	0	0:00
BA	0:00	0	0:00
BB	0:00	0	0:00
BC	0:00	0	0:00
BD	0:00	0	0:00
BE	22:31	62	0:29
BF	0:00	0	0:00
BG	0:00	0	0:00
BH	0:00	0	0:00
BI	6:08	26	0:18
BJ	4:11	20	0:16
BK	3:46	19	0:15
BL	0:00	0	0:00
BM	0:00	0	0:00
BN	0:00	0	0:00
BO	0:00	0	0:00
BP	0:00	0	0:00
BQ	0:00	0	0:00
BR	0:00	0	0:00
BS	0:00	0	0:00

8. Conclusions and Recommendations

Natural Forces Wind Inc. has completed a thorough assessment to evaluate the astronomical worst case shadow flicker impact of the proposed Aulds Mountain Wind Farm at receptor locations within 2,000 m of the project land. Based on the parameters used to run the shadow flicker prediction model via WindPRO, it has been shown that the predicted duration of shadow flicker emitted by the wind turbine generators at all points of reception is less than the German guidelines, adopted for this assessment. As a result of this study, no mitigation strategies are recommended.

9. References

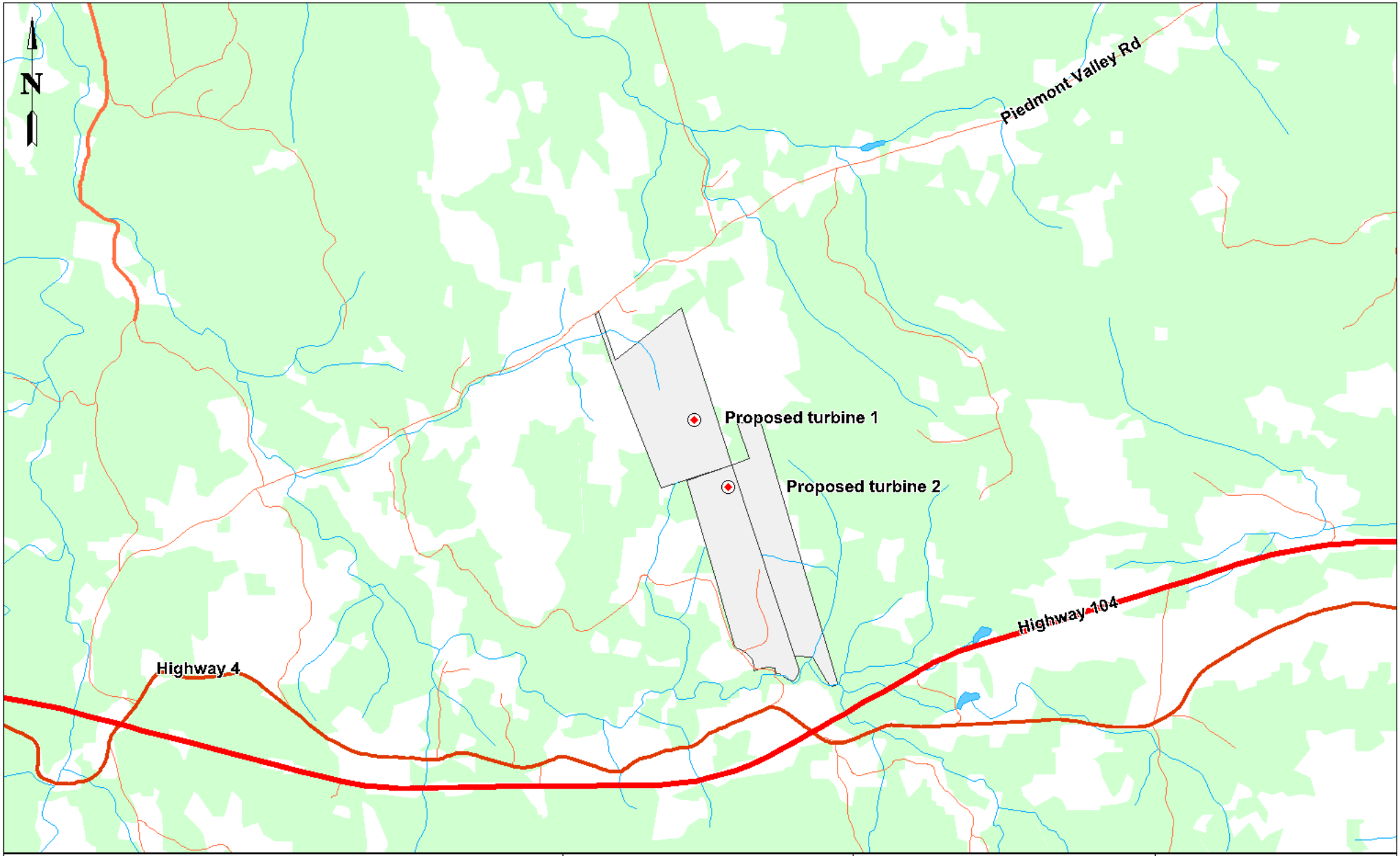
Enercon Canada (2012). *Enercon E-92 2.3 MW Wind Turbine Generator data sheet.*

Nielson, P. (2012). *Windpro 2.8 user guide*. (1st ed.). Denmark: EMD International A/S.

WEA-Schattenwurf-Hinweise (2002). *Hinweise zur Ermittlung und Beurteilung der optischen Immissionen von Windenergianlagen (Notes on the identification and assessment of the optical pollutions of Wind Turbines).* WindPRO

ANNEX A

Site Layout Map



LEGEND

- Project land
- Proposed turbines
- Highway
- Arterial & minor road
- Watercourse

SCALE

0 0.5 1
kilometres

1:35,000

KEY MAP

PROJECT
Aulds Mountain Wind Farm

FIGURE
Annex A

TITLE
Site Layout

DATE
October 9th 2013

naturalforces
1205-1801 Hollis Street
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ANNEX B

WindPRO v2.8, Shadow Module Calculation Results

E92-2.3 MW @ 98m Hub Height

Project:
Aulds Mountain Wind Farm

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Amy / apellerin@naturalforces.ca
Calculated:
09/10/2013 4:03 PM/2.8.579

SHADOW - Main Result

Calculation: Aulds Mountain- Final Shadow Flicker Assessment

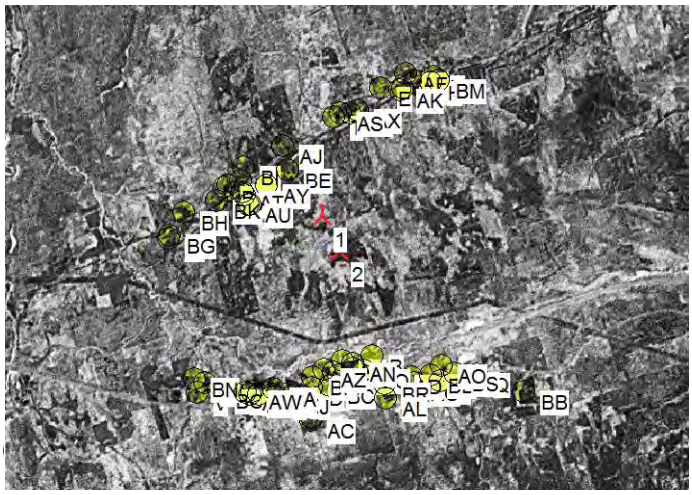
Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

The calculated times are "worst case" given by the following assumptions:
- The sun is shining all the day, from sunrise to sunset
- The rotor plane is always perpendicular to the line from the WTG to the sun
- The WTG is always operating

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Height Contours: CONTOURLINE_ONLINEDATA_0.wpo
Obstacles used in calculation
Eye height: 1.5 m
Grid resolution: 10.0 m



Scale 1:100,000

New WTG Shadow receptor

WTGs

	UTM (north)-NAD83 (US+CA) Zone: 20				WTG type						Shadow data	
	East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
1	548,803	5,049,223	233.8	ENERCON E-92 2,3 MW 2300 92....	Yes	ENERCON	E-92 2,3 MW-2,300	2,300	92.0	98.0	1,639	16.0
2	549,031	5,048,771	230.0	ENERCON E-92 2,3 MW 2300 92....	Yes	ENERCON	E-92 2,3 MW-2,300	2,300	92.0	98.0	1,639	16.0

Shadow receptor-Input

	UTM (north)-NAD83 (US+CA) Zone: 20								
No.	East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
			[m]	[m]	[m]	[m]	[°]	[°]	
A	548,191	5,046,842	106.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
B	549,470	5,047,384	87.4	3.0	3.0	1.0	0.0	90.0	"Green house mode"
C	548,952	5,047,164	93.9	3.0	3.0	1.0	0.0	90.0	"Green house mode"
D	548,658	5,046,958	100.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
E	549,574	5,050,920	80.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
F	550,369	5,047,049	100.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
G	547,730	5,049,519	70.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
H	550,244	5,050,999	94.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
I	547,657	5,049,541	70.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
J	548,531	5,046,840	109.9	3.0	3.0	1.0	0.0	90.0	"Green house mode"
K	549,014	5,047,124	95.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
L	547,719	5,049,698	70.9	3.0	3.0	1.0	0.0	90.0	"Green house mode"
M	549,877	5,050,924	84.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
N	549,212	5,047,208	93.1	3.0	3.0	1.0	0.0	90.0	"Green house mode"
O	548,418	5,046,857	107.4	3.0	3.0	1.0	0.0	90.0	"Green house mode"
P	549,693	5,047,001	94.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
Q	550,858	5,047,141	110.4	3.0	3.0	1.0	0.0	90.0	"Green house mode"
R	547,617	5,046,912	95.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
S	548,382	5,046,890	104.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
T	548,958	5,050,538	80.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
U	549,277	5,047,177	98.7	3.0	3.0	1.0	0.0	90.0	"Green house mode"
V	547,138	5,046,896	79.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"

To be continued on next page...

Project:
Aulds Mountain Wind Farm

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Calculated:
09/10/2013 4:03 PM/2.8.579

SHADOW - Main Result

Calculation: Aulds Mountain- Final Shadow Flicker Assessment

...continued from previous page

UTM (north)-NAD83 (US+CA) Zone: 20

No.	East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
			[m]	[m]	[m]	[m]	[°]	[°]	
W	550,053	5,051,008	86.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
X	548,662	5,046,569	127.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
Y	550,284	5,051,082	90.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
Z	547,241	5,047,018	84.9	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AA	548,046	5,046,892	104.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AB	547,553	5,049,636	70.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AC	548,644	5,046,524	129.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AD	549,806	5,047,119	90.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AE	549,074	5,047,312	88.4	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AF	549,905	5,051,116	80.7	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AG	550,021	5,047,024	90.7	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AH	549,992	5,047,101	90.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AI	546,755	5,048,938	51.9	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AJ	548,276	5,050,153	87.7	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AK	549,834	5,050,893	85.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AL	549,640	5,046,824	110.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AM	547,762	5,049,508	70.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AN	549,210	5,047,276	90.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AO	550,388	5,047,252	100.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AP	547,777	5,046,898	100.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AQ	547,848	5,046,870	104.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AR	547,960	5,046,874	106.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AS	549,048	5,050,592	80.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AT	547,741	5,049,543	70.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AU	547,813	5,049,385	84.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AV	547,845	5,049,378	87.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AW	547,876	5,046,912	102.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AX	549,267	5,050,625	81.4	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AY	548,063	5,049,636	89.7	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AZ	548,828	5,047,202	86.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BA	548,151	5,046,945	97.9	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BB	551,477	5,046,917	140.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BC	548,899	5,046,990	100.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BD	550,247	5,047,130	97.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BE	548,345	5,049,845	92.1	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BF	548,144	5,046,870	103.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BG	546,771	5,048,966	51.4	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BH	546,960	5,049,282	50.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BI	547,758	5,049,878	95.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BJ	547,494	5,049,611	70.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BK	547,398	5,049,436	60.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BL	549,175	5,050,587	80.1	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BM	550,339	5,051,031	90.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BN	547,103	5,047,078	70.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BO	547,420	5,046,923	91.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BP	548,673	5,047,093	88.4	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BQ	549,349	5,047,188	98.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BR	549,632	5,047,012	98.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BS	550,567	5,047,151	104.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"

Project:
Aulds Mountain Wind Farm

Licensed user:
Natural Forces Wind Inc
1791 Barrington Street Suite 1030
CA-HALIFAX, Nova Scotia B3J 3L1

Amy / apellerin@naturalforces.ca

Calculated:
09/10/2013 4:03 PM/2.8.579

SHADOW - Main Result

Calculation: Aulds Mountain- Final Shadow Flicker Assessment

Calculation Results

Shadow receptor

No.	Shadow, worst case: Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
A	0:00	0	0:00
B	0:00	0	0:00
C	0:00	0	0:00
D	0:00	0	0:00
E	0:00	0	0:00
F	0:00	0	0:00
G	10:02	45	0:19
H	0:00	0	0:00
I	9:03	42	0:18
J	0:00	0	0:00
K	0:00	0	0:00
L	10:05	48	0:19
M	0:00	0	0:00
N	0:00	0	0:00
O	0:00	0	0:00
P	0:00	0	0:00
Q	0:00	0	0:00
R	0:00	0	0:00
S	0:00	0	0:00
T	0:00	0	0:00
U	0:00	0	0:00
V	0:00	0	0:00
W	0:00	0	0:00
X	0:00	0	0:00
Y	0:00	0	0:00
Z	0:00	0	0:00
AA	0:00	0	0:00
AB	4:27	21	0:17
AC	0:00	0	0:00
AD	0:00	0	0:00
AE	0:00	0	0:00
AF	0:00	0	0:00
AG	0:00	0	0:00
AH	0:00	0	0:00
AI	0:00	0	0:00
AJ	0:00	0	0:00
AK	0:00	0	0:00
AL	0:00	0	0:00
AM	10:34	47	0:20
AN	0:00	0	0:00
AO	0:00	0	0:00
AP	0:00	0	0:00
AQ	0:00	0	0:00
AR	0:00	0	0:00
AS	0:00	0	0:00
AT	10:13	45	0:19
AU	12:07	50	0:21
AV	12:47	52	0:22
AW	0:00	0	0:00
AX	0:00	0	0:00
AY	19:04	69	0:25
AZ	0:00	0	0:00
BA	0:00	0	0:00

To be continued on next page...

Project:
Aulds Mountain Wind Farm

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10/10/2013 1:34 PM / 4
Licensed user:
Natural Forces Wind Inc
1791 Barrington Street Suite 1030
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Amy / apellerin@naturalforces.ca
Calculated:
09/10/2013 4:03 PM/2.8.579

SHADOW - Main Result

Calculation: Aulds Mountain- Final Shadow Flicker Assessment

...continued from previous page

Shadow, worst case

No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
BB	0:00	0	0:00
BC	0:00	0	0:00
BD	0:00	0	0:00
BE	22:31	62	0:29
BF	0:00	0	0:00
BG	0:00	0	0:00
BH	0:00	0	0:00
BI	6:08	26	0:18
BJ	4:11	20	0:16
BK	3:46	19	0:15
BL	0:00	0	0:00
BM	0:00	0	0:00
BN	0:00	0	0:00
BO	0:00	0	0:00
BP	0:00	0	0:00
BQ	0:00	0	0:00
BR	0:00	0	0:00
BS	0:00	0	0:00

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]	Expected [h/year]
1	ENERCON E-92 2,3 MW 2300 92.0 !-! hub: 98.0 m (TOT: 144.0 m) (1)	68:57	
2	ENERCON E-92 2,3 MW 2300 92.0 !-! hub: 98.0 m (TOT: 144.0 m) (2)	23:36	

Project:
Aulds Mountain Wind Farm

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10/10/2013 1:36 PM / 1

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Natural Forces Wind Inc
1791 Barrington Street Suite 1030
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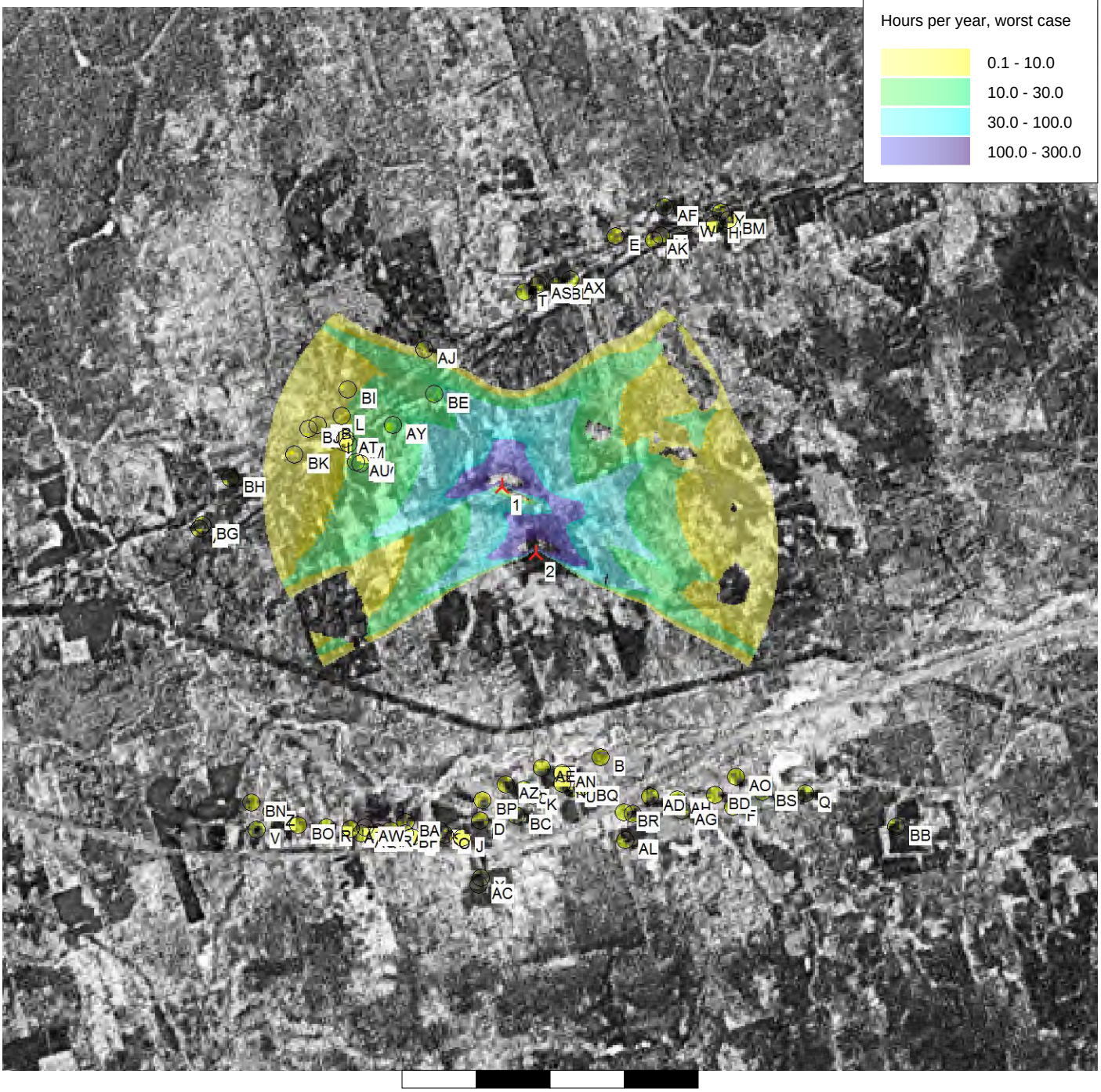
Calculated:
09/10/2013 4:03 PM/2.8.579

SHADOW - Map

Calculation: Aulds Mountain- Final Shadow Flicker Assessment



Map: WindPRO map , Print scale 1:40,000, Map center UTM (north)-NAD83 (US+CA) Zone: 20 East: 549,116 North: 5,048,876

New WTG Shadow receptor

Flicker map level: Height Contours: CONTOURLINE_ONLINEDATA_0.wpo (1)

Appendix J:

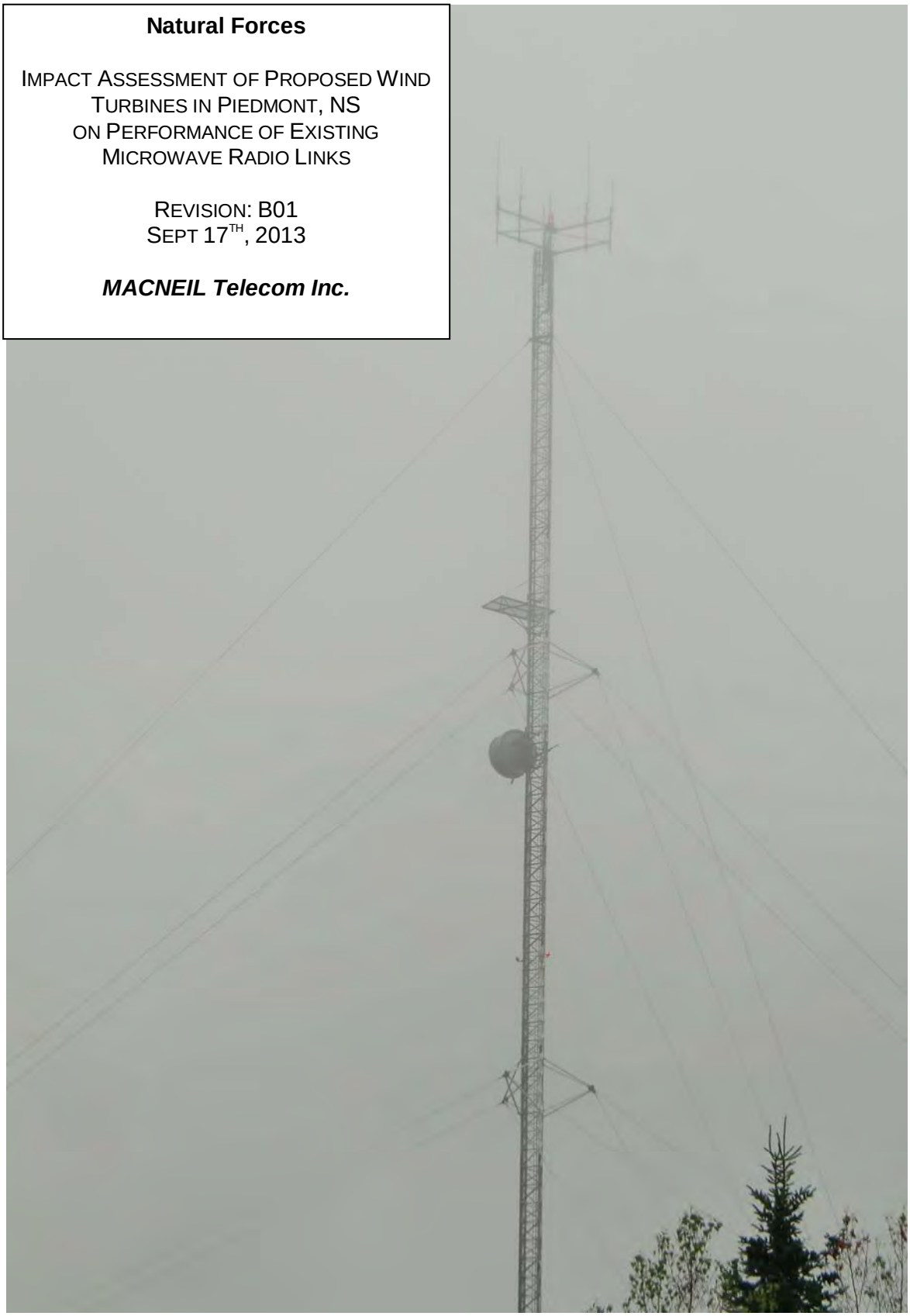
EMI Study

Natural Forces

IMPACT ASSESSMENT OF PROPOSED WIND TURBINES IN PIEDMONT, NS ON PERFORMANCE OF EXISTING MICROWAVE RADIO LINKS

REVISION: B01
SEPT 17TH, 2013

MACNEIL Telecom Inc.



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LIST OF FIGURES

PURPOSE OF REPORT:

Natural Forces is proposing to construct 2 wind turbines in the Piedmont Valley, NS area. As part of the design phase of the project, MacNeil Telecom Inc. was contacted to examine the impact the proposed wind turbines may have on the performance of existing radio communication systems that exist in the area.

ANALYSIS METHODOLOGY:

1. Identify proposed location and size of wind turbines.
2. Obtain data for licensed radio systems within 35km of the wind farm from the radio spectrum licensing authority, Industry Canada (IC) – TAFL database.
3. Plot applicable radio links on a map to show their proximity wrt to the turbines.
4. Review the Industry Canada data records/map to produce a "short list" of radio systems that could potentially be impacted by the turbines.
5. Perform a site visit to verify the location of applicable radio towers and to verify the existence of the antennas identified on the "short list".
6. Tabulate a "verified inventory" of existing radio links that may be of concern and update maps with field verified data.
7. Calculate the recommended required clearance between the radio links of concern and the wind turbine = Fresnel zone and turbine radius.
8. Calculate the expected achievable clearance based on field verified radio site coordinates and specified turbine locations.
9. Assess the results and identify potential issues.
10. If required, recommend what steps can be taken to minimize the impact the turbines will have on existing radio links. The first approach will to work with Natural Forces to consider the possibility of relocating those wind turbines that infringe on existing radio links.

LIMITATIONS OF INDUSTRY CANADA DATA:

The data contained in the Industry Canada database, like any database is subject to certain limitations:

1. **Accuracy of Data**
   System parameters such as site locations (latitudes and longitudes), antenna heights and radio operating parameters are provided by the licensee (or their representative) and are sometimes prone to error. Other system parameters such as the operating frequencies assigned by Industry Canada are much less likely to suffer from serious errors. For the purpose of this particular report, the accuracy of physical parameters of the radio systems (i.e. site locations, elevations, antenna heights, etc.) are of highest importance, making it necessary to confirm the parameters by means of field survey.

2. **Extent of Data**
   The report considers only systems data included in the Industry Canada database as of September 15th, 2013.

3. **Licensed Radio Systems**
   The Industry Canada database only includes radio systems that require a license from Industry Canada to operate. Non-licensed radio systems (e.g. certain spread-spectrum radios) are not captured in the database and therefore cannot be identified.

4. **Status of Systems**
   It is assumed that all systems identified on the Industry Canada database are still in service (provided the antennas associated with that system was found to still exist during the field survey).

LIMITATIONS OF ANALYSIS:

1. **Point-to-point Radio Links**
   The report considers point-to-point (PTP) radio links employing narrow beamwidth (e.g parabolic) antennas operating above 900MHz. It does not consider lower frequency systems (i.e. below 900MHz) employing wide beam antennas (e.g. omni-direction or yagi antennas) as the performance of such systems is not expected to be significantly impacted by the proposed structures. Typically, lower frequency systems operating in the VHF and UHF band for example are much less susceptible to diffraction loss resulting from obstructions beyond the immediate proximity of its antennas. The dimensions and shape of the proposed wind turbines (i.e. tower and blades) are considered relatively narrow wrt the wavelength of such lower frequency systems and would therefore only be of concern (to cause significant performance degradation) if positioned in very close proximity to the antenna itself. The performance of cellular type radio systems operating in the 1900/2100 MHz bands that use sectorial antennas and operate in the near vicinity of the wind turbines are also examined.

2. **Accuracy of Field Measurements**
   Location and ground elevations of towers were measured using Magellan Explorist 310 GPS receiver. The expected accuracy of this unit is in the neighborhood of +/- 5m horizontal.

3. **Accuracy of Customer Data**
   The accuracy of the location of the proposed wind turbines is unknown.

INPUTS:

The location of the proposed wind turbines have been identified as:

Turbine 1	45°35'41.44"N	62°22'26.32"W
Turbine 2	45°35'28.58"N	62°22'9.66"W

Initial indications are the proposed turbines will have a rotor radius of 46m (92m diameter).

FINDINGS:

Table A in Appendix A outlines the active licensed non-protected PTP radio links operating in the vicinity (within 35km) of the proposed wind turbines as of Sept 15th, 2013. This data was sourced from Industry Canada's TAFL. This information is shown visually on a map in **Figure 1**. **Figure 2** shows a close up view of the area around the turbines and the links operating nearby.

An existing radio site on the same mountain as the turbine farm is of the most concern and the focus of the study can be narrowed down to a two active microwave link operating in the area. Both radio links in question are operated by Rogers Communications and links Rogers' Piedmont Valley radio site and Rogers' Browns Mountain site back to Rogers' McLellans Mountain site (north of New Glasgow).

Figure 1 - Active Licensed Non-Protected PTP Links within 35km radius of Proposed Piedmont Valley Turbines

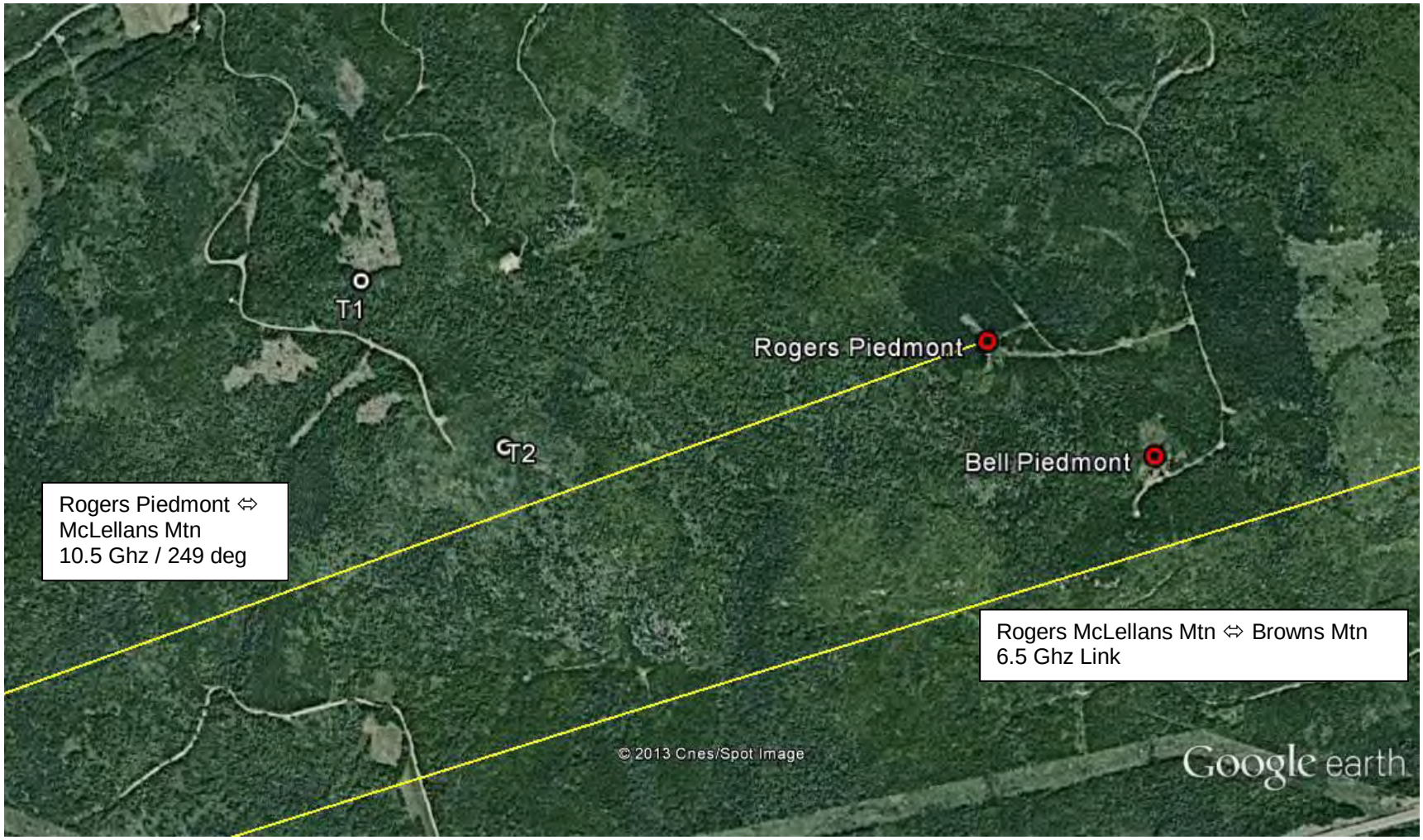


Figure 2 - Rogers' Piedmont Valley Radio Site and Proposed Turbine Locations (T1 and T2)

Figure 3 - Rogers Piedmont Valley Tower

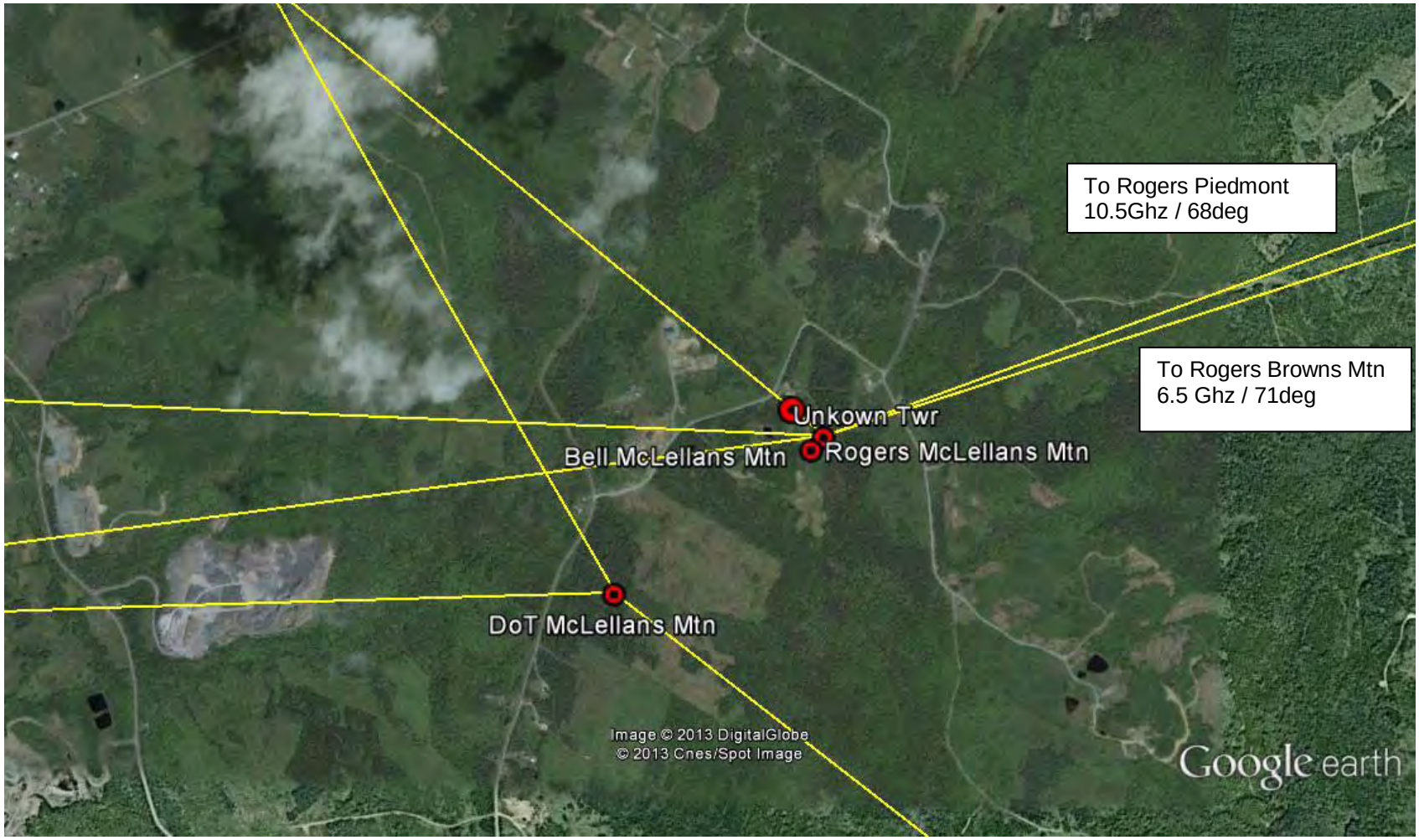
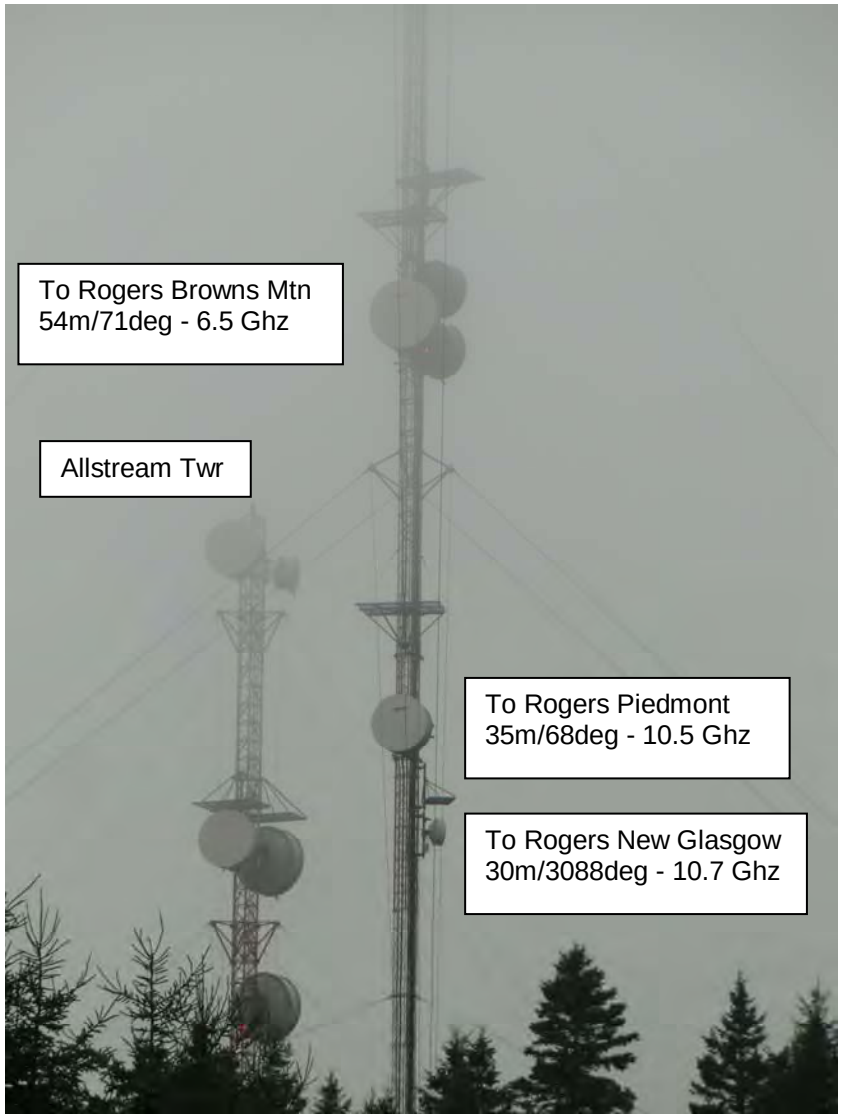
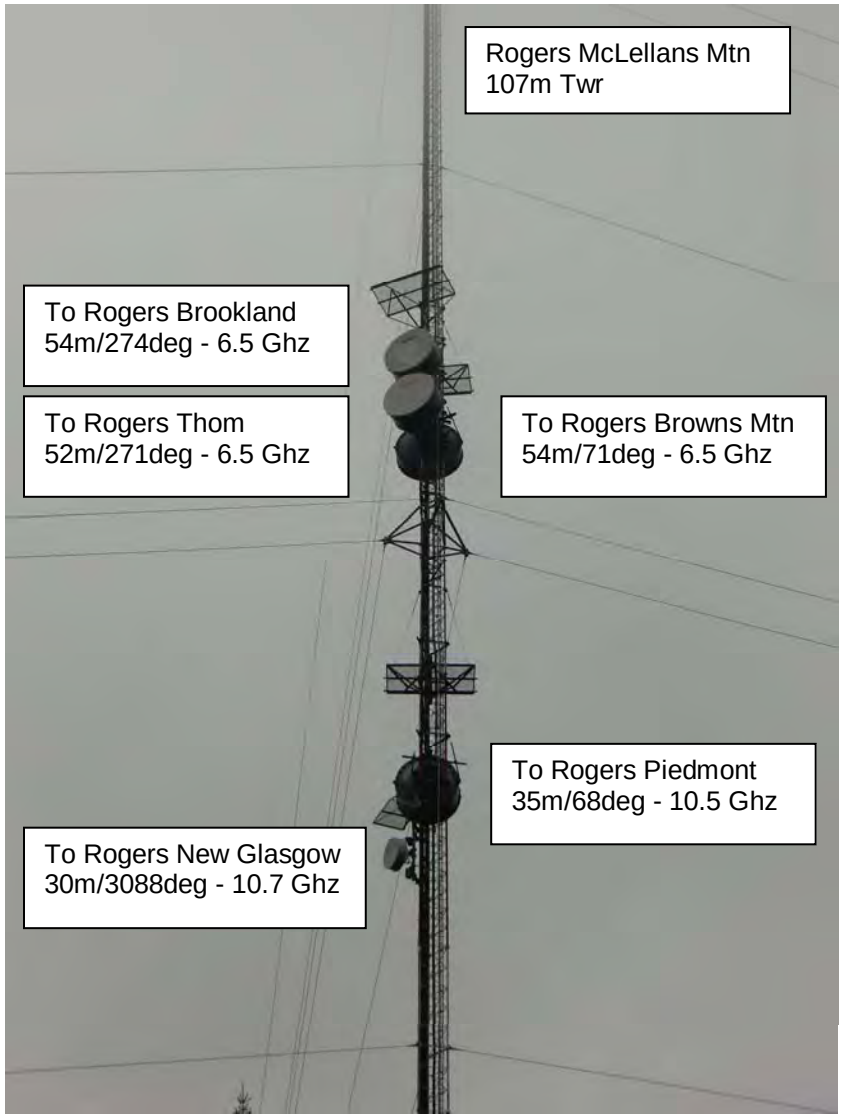


Figure 4 - MacLellans Mountain Radio Sites – Licensed Links To Piedmont Valley (Rogers) and Browns Mtn (Rogers)


To Rogers Browns Mtn
54m/71deg - 6.5 Ghz
Allstream Twr
To Rogers Piedmont
35m/68deg - 10.5 Ghz
To Rogers New Glasgow
30m/3088deg - 10.7 Ghz


Rogers McLellans Mtn
107m Twr
To Rogers Brookland
54m/274deg - 6.5 Ghz
To Rogers Thom
52m/271deg - 6.5 Ghz
To Rogers Browns Mtn
54m/71deg - 6.5 Ghz
To Rogers Piedmont
35m/68deg - 10.5 Ghz
To Rogers New Glasgow
30m/3088deg - 10.7 Ghz

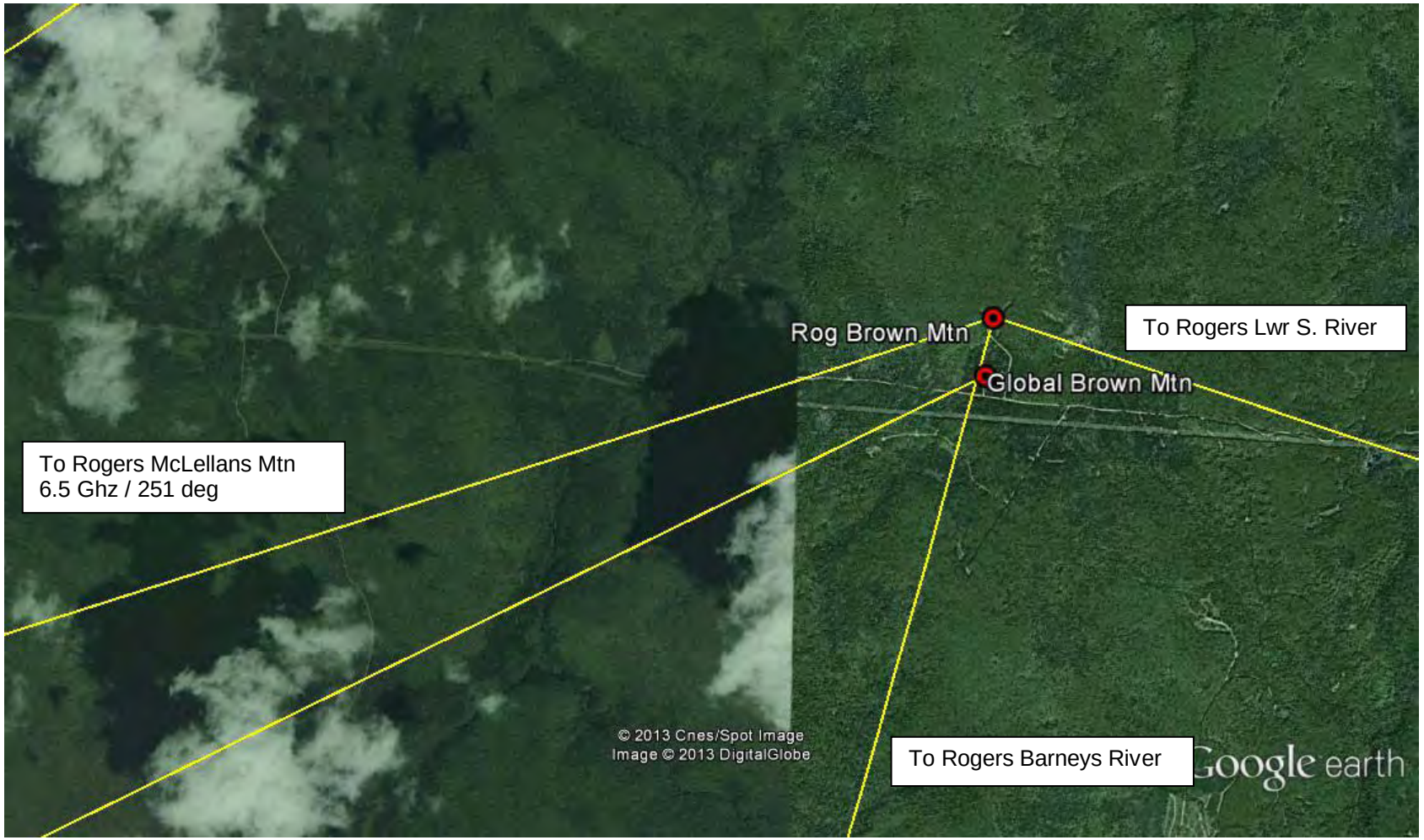


Figure 5 - Rogers Browns Mountain Radio Site

Figure 6 - Rogers Browns Mountain

ANALYSIS:

Two (2) active licensed point-to-point radio links shoot in the proximity of the proposed wind turbines. The PTP links between McLellans Mountain to Piedmont Valley and McLellans Mountain to Browns Mountain are owned by Rogers Communications and operates in the 10.5GHz band and 6.5GHz bands respectively.

TABLE A – MEASURED RADIO SITE DATA

Site	Description	UTM Northing (m)	UTM Easting (m)	Site Elev. (m)
1	Rogers McLellans Mtn	5042770.78	534256.97	176
2	Rogers Piedmont	5049122.22	550354.54	252
3	Rogers Browns Mtn	5054763.17	568155.66	301

The required clearance around a given radio link to avoid diffraction loss is inversely proportional to its frequency (i.e. the higher the frequency, the narrower the clearance - aka the Fresnel zone).

The absolute minimum clearance required for a given radio link to avoid diffraction loss is 60% of the first fresnel zone (0.6 F1) at the obstruction. However to account for limitations of field measurements and inaccuracies of the actual positioning of turbines, we recommend a minimum clearance of 30m + F1.

TABLE B – FRESNEL ZONE CALCULATION

Freq (GHz)	Wave Length (cm)	D (km) Link Length	d1 (km)	F1 (m)	F1 + 30m (m)	Rotor Radius (m)	Recommended Minimum Clearance (m)
10.5	3	17.3	1.2	6m	36m	46m	82m
6.5	5	36	18.2	20.5m	50.5m	46m	97m

TABLE C – SPECIFIED TURBINE LOCATIONS AND CALCULATED OFFSET WRT PIEDMONT RADIO LINK

Site	UTM Northing (m)	UTM Easting (m)	Calculated Offset (m)	Rec. Min Clearance (m)	Difference (m)	Status
T1	5049224.00 m	548827.00 m	655m	82m	+573m	OK
T2	5048830.00 m	549191.00 m	155m	82m	+73m	OK

TABLE D – SPECIFIED TURBINE LOCATIONS AND CALCULATED OFFSET WRT BROWNS MTN RADIO LINK

Site	UTM Northing (m)	UTM Easting (m)	Calculated Offset (m)	Rec. Min Clearance (m)	Difference (m)	Status
T1	5049224.00 m	548827.00 m	1224	97	+1127	OK
T2	5048830.00m	549191.00 m	731	97	+634	OK

Cellular Systems

It is noted that there are no cellular type systems operating on the Rogers' tower at Piedmont Valley. There is 850MHz cellular operating at Bell's tower at Piedmont Valley however its performance is not expected to be negatively impacted by the turbines due to its distance (1.5km) and operating frequency (wl=35cm).

CONCLUSIONS/RECOMMENDATIONS:

Based on the results of our findings, the proposed wind turbines at Piedmont Valley are not expected to cause significant performance degradations on existing radio systems in the area.

Point To Point Systems:
The proposed wind turbines are not expected to significantly impact the performance of licensed PTP radio systems operating in the area.

Fixed Mobile Radio Systems:
Lower frequency fixed systems (below 900MHz) utilizing non-directional antennas (i.e. omni-direction or sector type antennas) that operate close to the turbines are not expected to be negatively impacted with the possible exception being high EMI or local signal scatter that could negatively impacting mobile radio units operating very near the wind turbines.

HSPA/LTE Cellular Systems:
There are no cellular type systems (1900/2100 MHz bands) operating at the closest identified tower (Rogers Piedmont) Mountain. There is 850MHz cellular operating at Bell's tower at Piedmont Valley however it's performance is not expected to be negatively impacted by the turbines due to its distance (1.5km) and operating frequency.

APPENDIX A – TAFL DATA (SEPT 15TH, 2013) – 35KM RADIUS PIEDMONT VALLEY TURBINES

TAFL Data - Active Licensed Unprotected TX - 35km Search About Piedmont Valley, NS - Sept 15/13

Ref#	Tx Freq (MHz)	Rx Freq (MHz)	Status	Latitude (ddmmss)	Longitude (dddmmss)	Station Location	Twr Height AGL (m)	Tx Ant Gain	Tx Ant Az (deg)	Tx Ant Hgt (AGL-m)	Tx Ant BW (deg)	Link Call Sign	Link Licence Number	Link Station Location	Az (deg) wrt Site	Dist (km) wrt Site	Licensee Name	Licence Number	Call Sign
1	931.6125		6	453214	623339	MCLELLANS MOUNTAIN, NOVA S	110	10	0	110	6				248.06	16.07	Rogers Communications Inc. (Paging) Wilson Tam, Mgr. Radio Engineering	4852402	XMQ887
2	931.6875		6	453214	623339	MCLELLANS MOUNTAIN, NOVA S	110	10	0	110	6				248.06	16.07	Rogers Communications Inc. (Paging) Wilson Tam, Mgr. Radio Engineering	4852402	XMQ887
3	931.7375		6	453508	624041	SUTHERLANDS BOG N.S.	69	9	0	69					268.56	24.02	Bell Mobility Inc Attn: Meyang Yunga: PEIN 6026826	3665648	VAC511
4	931.7375		6	453520	620841	JAMES RIVER N.S.	69	9	0	69					90.83	17.49	Bell Mobility Inc Attn: Meyang Yunga: PEIN 6026826	3665646	VAC510
5	931.9375		6	453214	623339	MCLELLANS MOUNTAIN, NOVA S	110	10	0	110	6				248.06	16.07	Rogers Communications Inc. (Paging) Wilson Tam, Mgr. Radio Engineering	4852402	XMQ887
6	932.00526	941.49375	4	454358	620242	MARYVALE NS , (WIND FARM)	18	10	138	18	48	CKS446	5153741	FAIRMONT	57.94	29.71	NOVA SCOTIA POWER CUSTOMER OPERATIONS - RAL	5153742	CKS447
7	932.33125	941.33125	6	453715	623850	TRENTON N.S. (GEN UNIT #6)	70	9.9	240	55	48				278.72	21.86	NOVA SCOTIA POWER CUSTOMER OPERATIONS - RAL	3524863	VAC690
8	932.6	941.6	6	454116	620703	MAPLE RIDGE, NS	56	18.4	241.2	50		CHX245	5102106	GLEN DHU WIND FARM	61.22	22.33	NOVA SCOTIA POWER CUSTOMER OPERATIONS - RAL	819092	XOA238
9	933.8	942.8	6	453200	623353	MCLELLAN'S MOUNTAIN, NS	53	18.4	326.2	45		CHG527	5088518	TRENTON	247.06	16.52	NOVA SCOTIA POWER CUSTOMER OPERATIONS - RAL	5037321	CIJ446
10	934.2	943.2	6	453200	623353	MCLELLAN'S MOUNTAIN, NS	53	26.6	266.3	61		CHG528	5088520	DALHOUSIE MTN SUB	247.06	16.52	NOVA SCOTIA POWER CUSTOMER OPERATIONS - RAL	5037321	CIJ446
11	934.2	943.2	6	454116	620703	MAPLE RIDGE, NS	56	18.4	93.2	28		CIJ444	5037255	FAIRMONT	61.22	22.33	NOVA SCOTIA POWER CUSTOMER OPERATIONS - RAL	819092	XOA238
12	941.33125	932.33125	6	453545	624229	MICHELIN GRANTON SUBSTATION	24	9.9	60	24	48				271.2	26.35	NOVA SCOTIA POWER CUSTOMER OPERATIONS - RAL	5083885	CHA249
13	941.48125	932.48125	4	454056	615846	FAIRMONT NS (DOT & PW SITE)	46	10	318	40	48	CKS447	5153742	MARYVALE	71.44	31.96	NOVA SCOTIA POWER CUSTOMER OPERATIONS - RAL	5153741	CKS446
14	941.6	932.6	6	453847	621323	BARNEY'S RIVER STN, NS (GLEN DHU)	32	18.4	61.1	30		XOA238	819092	MAPLE RIDGE	61.7	12.92	NOVA SCOTIA POWER CUSTOMER OPERATIONS - RAL	5102106	CHX245
15	942.8	933.8	6	453715	623850	TRENTON, NS (GEN UNIT #6)	61	18.4	146.2	61		CIJ446	5037321	MCLELLAN'S MOUNTAIN (DND)	278.72	21.86	NOVA SCOTIA POWER CUSTOMER OPERATIONS - RAL	5088518	CHG527
16	943.2	934.2	6	454056	615843	FAIRMONT, NS (DOT & PW SITE)	46	18.4	273.3	29		XOA238	819092	MAPLE RIDGE	71.47	32.02	NOVA SCOTIA POWER CUSTOMER OPERATIONS - RAL	5037255	CIJ444
17	943.8	934.8	6	454056	615843	FAIRMONT, NS (DOT & PW SITE)	46	26.2	224.3	44		CIJ449	5037253	KILTARLITY	71.47	32.02	NOVA SCOTIA POWER CUSTOMER OPERATIONS - RAL	5037255	CIJ444
18	959.75		6	453706	615953	ANTIGONISH, NS - 85 KIRK ST	18	16.7	337	17	3	CGQ354	5118451	ANTIGONISH, NS - TX SITE	83.95	29.05	ATLANTIC BROADCASTERS LTD. ATTN: GORD CAMERON	5118450	CGQ340
19	1432.25	1481.25	6	454025	624032	PICTOU LANDING, NOVA SCOTIA	8	17	30.7	8		CJP935	112728	PICTOU ISLAND	291.12	25.5	BELL ALIANT REGIONAL COMM. INC. Attn Karen Bradbury- Contract Mgt.	853853	CGF647
20	1481.25	1432.25	6	454846	623325	PICTOU ISLAND, NOVA SCOTIA	15	17	210.8	5		CGF647	853853	PICTOU LANDING	329.46	28.6	BELL ALIANT REGIONAL COMM. INC. Attn Karen Bradbury- Contract Mgt.	112728	CJP935
21	1850	1741.5	6	453200	623353	MACLELLAN MOUNTAIN, NS	67	31.2	272.8	62		XMZ583	937917	NUTTBY	247.06	16.52	NS Dept. of Transportations & PW Public Safety & Field Comm. Office	937916	XMZ584
22	5912.375	5878.875	6	453834	620729	BROWNS MTN, NOVA SCOTIA	122	40.8	107.4	122		VEL430		LOWER SOUTH RIVER, NS	73.2	19.87	ROGERS COMMUNICATIONS PARTNERSHIP ATTN: M VUJOSEVIC, TRANSMISSION ENG	3510732	XKH211
23	6093.45	6345.49	6	454133	624212	PICTOU, NS	122	40.8	228.1	35		CGE983	3405051	BROOKLAND	293.54	28.29	ROGERS COMMUNICATIONS PARTNERSHIP ATTN: M VUJOSEVIC, TRANSMISSION ENG	4935963	VEM431
24	6445	6785	6	453214	623339	MCLELLANS MOUNTAIN, NS	107	44	70.5	54		XKH211	3510732	BROWNS MOUNTAIN, NS	248.06	16.07	ROGERS COMMUNICATIONS PARTNERSHIP ATTN: M VUJOSEVIC, TRANSMISSION ENG	3405053	CGE984
25	6445	6785	6	453214	623339	MCLELLANS MOUNTAIN, NS	107	44	261.1	38		CGG895	4811904	THOM, NS	248.06	16.07	ROGERS COMMUNICATIONS PARTNERSHIP ATTN: M VUJOSEVIC, TRANSMISSION ENG	3405053	CGE984
26	6505	6845	6	453214	623339	MCLELLANS MOUNTAIN, NS	107	44	70.5	54		XKH211	3510732	BROWNS MOUNTAIN, NS	248.06	16.07	ROGERS COMMUNICATIONS PARTNERSHIP ATTN: M VUJOSEVIC, TRANSMISSION ENG	3405053	CGE984
27	6505	6845	6	453214	623339	MCLELLANS MOUNTAIN, NS	107	44	261.1	38		CGG895	4811904	THOM, NS	248.06	16.07	ROGERS COMMUNICATIONS PARTNERSHIP ATTN: M VUJOSEVIC, TRANSMISSION ENG	3405053	CGE984
28	6535	6875	6	453214	623339	MCLELLANS MOUNTAIN, NS	107	42	271	54		CGE983	3405051	BROOKLAND, NS	248.06	16.07	ROGERS COMMUNICATIONS PARTNERSHIP ATTN: M VUJOSEVIC, TRANSMISSION ENG	3405053	CGE984
29	6535	6875	6	453214	623339	MCLELLANS MOUNTAIN, NS	107	43.8	70.7	54		XKH211	3510732	BROWNS MOUNTAIN, NS	248.06	16.07	ROGERS COMMUNICATIONS PARTNERSHIP ATTN: M VUJOSEVIC, TRANSMISSION ENG	3405053	CGE984

Ref#	Tx Freq (MHz)	Rx Freq (MHz)	Status	Latitude (ddmmss)	Longitude (dddmmss)	Station Location	Twr Height AGL (m)	Tx Ant Gain	Tx Ant Az (deg)	Tx Ant Hgt (AGL-m)	Tx Ant BW (deg)	Link Call Sign	Link Licence Number	Link Station Location	Az (deg) wrt Site	Dist (km) wrt Site	Licensee Name	Licence Number	Call Sign
30	6565	6905	6	453214	623339	MCLELLANS MOUNTAIN, NS	107	44	70.5	54		XKH211	3510732	BROWNS MOUNTAIN, NS	248.06	16.07	ROGERS COMMUNICATIONS PARTNERSHIP ATTN: M VUJOSEVIC, TRANSMISSION ENG	3405053	CGE984
31	6565	6905	6	453214	623339	MCLELLANS MOUNTAIN, NS	107	44	261.1	38		CGG895	4811904	THOM, NS	248.06	16.07	ROGERS COMMUNICATIONS PARTNERSHIP ATTN: M VUJOSEVIC, TRANSMISSION ENG	3405053	CGE984
32	6785	6445	6	453834	620729	BROWNS MTN, NOVA SCOTIA	122	45.4	91.8	41		XKH212	3510734	FRANKVILLE, NS	73.2	19.87	ROGERS COMMUNICATIONS PARTNERSHIP ATTN: M VUJOSEVIC, TRANSMISSION ENG	3510732	XKH211
33	6785	6445	6	453834	620729	BROWNS MTN, NOVA SCOTIA	122	45.4	250.8	56		CGE984	3405053	MCLELLANS MOUNTAIN, NS	73.2	19.87	ROGERS COMMUNICATIONS PARTNERSHIP ATTN: M VUJOSEVIC, TRANSMISSION ENG	3510732	XKH211
34	6845	6505	6	453834	620729	BROWNS MTN, NOVA SCOTIA	122	45.4	91.8	41		XKH212	3510734	FRANKVILLE	73.2	19.87	ROGERS COMMUNICATIONS PARTNERSHIP ATTN: M VUJOSEVIC, TRANSMISSION ENG	3510732	XKH211
35	6845	6505	6	453834	620729	BROWNS MTN, NOVA SCOTIA	122	45.4	250.8	56		CGE984	3405053	MCLELLANS MOUNTAIN, NS	73.2	19.87	ROGERS COMMUNICATIONS PARTNERSHIP ATTN: M VUJOSEVIC, TRANSMISSION ENG	3510732	XKH211
36	6875	6535	6	453834	620729	BROWNS MTN, NOVA SCOTIA	122	43.8	251	52		CGE984	3405053	MCLELLANS MOUNTAIN, NS	73.2	19.87	ROGERS COMMUNICATIONS PARTNERSHIP ATTN: M VUJOSEVIC, TRANSMISSION ENG	3510732	XKH211
37	6875	6535	6	453834	620729	BROWNS MTN, NOVA SCOTIA	122	45.4	90.4	40		XKH212	3510734	FRANKVILLE	73.2	19.87	ROGERS COMMUNICATIONS PARTNERSHIP ATTN: M VUJOSEVIC, TRANSMISSION ENG	3510732	XKH211
38	6905	6565	6	453834	620729	BROWNS MTN, NOVA SCOTIA	122	45.4	91.8	41		XKH212	3510734	FRANKVILLE, NS	73.2	19.87	ROGERS COMMUNICATIONS PARTNERSHIP ATTN: M VUJOSEVIC, TRANSMISSION ENG	3510732	XKH211
39	6905	6565	6	453834	620729	BROWNS MTN, NOVA SCOTIA	122	45.4	250.8	56		CGE984	3405053	MCLELLANS MOUNTAIN, NS	73.2	19.87	ROGERS COMMUNICATIONS PARTNERSHIP ATTN: M VUJOSEVIC, TRANSMISSION ENG	3510732	XKH211
40	7208.75	7383.75	6	453626	615953	ANTIGONISH, NS	15	40.5	313.9	15		XOA238	5142394	MAPLE RIDGE	86.38	28.95	NOVA SCOTIA POWER CUSTOMER OPERATIONS - RAL	858358	XMZ558
41	7383.75	7208.75	6	454116	620703	MAPLE RIDGE, NS	56	40.5	133.8	55		XMZ558	858358	ANTINGONISH	61.22	22.33	NOVA SCOTIA POWER CUSTOMER OPERATIONS - RAL	5142394	XOA238
42	7533.75	7683.75	6	453626	615953	ANTIGONISH, NS	15	40.5	313.9	15		XOA238	5142394	MAPLE RIDGE	86.38	28.95	NOVA SCOTIA POWER CUSTOMER OPERATIONS - RAL	858358	XMZ558
43	7683.75	7533.75	6	454116	620703	MAPLE RIDGE, NS	56	40.5	133.8	55		XMZ558	858358	ANTIGONISH	61.22	22.33	NOVA SCOTIA POWER CUSTOMER OPERATIONS - RAL	5142394	XOA238
44	10552.5	10617.5	6	453214	623339	MCLELLANS MOUNTAIN, NS	107	45.9	68.6	35		XMZ289	4725204	PIEDMONT	248.06	16.07	ROGERS COMMUNICATIONS PARTNERSHIP ATTN: M VUJOSEVIC, TRANSMISSION ENG	3405053	CGE984
45	10617.5	10552.5	6	453537	622115	PIEDMONT, NOVA SCOTIA	91	45.9	248.8	60		CGE984	3405053	MCLELLANS MOUNTAIN	78.25	1.21	ROGERS COMMUNICATIONS PARTNERSHIP ATTN: M VUJOSEVIC, TRANSMISSION ENG	4725204	XMZ289
46	10725	11215	6	453214	623339	MCLELLANS MOUNTAIN, NS	107	40.4	308.1	30		CHL355	5110688	NEW GLASGOW (MTS SITE)	248.06	16.07	ROGERS COMMUNICATIONS PARTNERSHIP ATTN: M VUJOSEVIC, TRANSMISSION ENG	3405053	CGE984
47	10735	11225	6	453522	624246	MOUNT WILLIAM, NS (574 MT WILLIAM)	90	43.6	253.5	45		CGE983	3405051	BROOKLAND, NS	269.66	26.72	ROGERS COMMUNICATIONS PARTNERSHIP ATTN: M VUJOSEVIC, TRANSMISSION ENG	5025973	CIO386
48	11215	10725	6	453503	623847	NEW GLASGOW, NS (MTS ALLSTREAM)	30	40.4	128.1	23		CGE984	3405053	MCLELLANS MOUNTAIN, NOVA	267.96	21.57	ROGERS COMMUNICATIONS PARTNERSHIP ATTN: M VUJOSEVIC, TRANSMISSION ENG	5110688	CHL355
49	14471	12171	6	451910	620210	MLV 40 (***), NS	3	46.5	232.6	3	0.8				139.19	39.88	RIGNET (CA), INC.	4860002	VE967
50	14471	12171	6	452015	621934	MLV 64 (***), NS	3	46.5	232.3	3	0.8				173.16	28.43	RIGNET (CA), INC.	4860003	VE968
51	14471	12171	6	452233	622716	MLV 76 (***), NS	3	46.5	232.2	3	0.8				195.48	24.87	RIGNET (CA), INC.	4860004	VE969
52	14471	12171	6	452759	624656	MLV 106 (***), NS	3	46.5	231.8	3	0.8				246.77	35.03	RIGNET (CA), INC.	4860005	VE970
53	14630	15105	6	453834	620729	BROWNS MTN, NOVA SCOTIA	122	42.7	194.8	50		XMZ287	4722187	BARNEY'S RIVER	73.2	19.87	ROGERS COMMUNICATIONS PARTNERSHIP ATTN: M VUJOSEVIC, TRANSMISSION ENG	3510732	XKH211
54	14893.75		6	452854	623347	BROOKVILLE, NOVA SCOTIA	80	46	62.4	80			4837488	BROWNS MOUNTAIN	231.09	19.4	Global Maritimes Division of Shawmedia Inc.	4837486	CZJ419
55	15105	14630	6	453523	620841	BARNEY'S RIVER, NOVA SCOTIA	91	42.7	14.8	41		XKH211	3510732	BROWNS MTN	90.53	17.49	ROGERS COMMUNICATIONS PARTNERSHIP ATTN: M VUJOSEVIC, TRANSMISSION ENG	4722187	XMZ287
56	19007.5	18667.5	6	453708	615938	ANTIGONISH, NS	30	39.2	111	30		VEL430	4900896	LOWER SOUTH RIVER, NS	83.89	29.37	ROGERS COMMUNICATIONS PARTNERSHIP ATTN: M VUJOSEVIC, TRANSMISSION ENG	4956118	CJL736

TAFL Data - Active Licensed Unprotected TX - 35km Search About Piedmont Valley, NS - Sept 15/13

Ref#	Tx Freq (MHz)	Rx Freq (MHz)	Status	Latitude (ddmmss)	Longitude (dddmmss)	Station Location	Twr Height AGL (m)	Tx Ant Gain	Tx Ant Az (deg)	Tx Ant Hgt (AGL-m)	Tx Ant BW (deg)	Link Call Sign	Link Licence Number	Link Station Location	Az (deg) wrt Site	Dist (km) wrt Site	Licensee Name	Licence Number	Call Sign
57		959.75	6	454306	620328	ANTIGONISH, NS - TX SITE	76					CGQ340	5118450	ANTIGONISH, NS - 85 KIRK	59.66	28.04	ATLANTIC BROADCASTERS LTD. ATTN: GORD CAMERON	5118451	CGQ354
58		14893.75	6	453826	620732	BROWNS MOUNTAIN, NOVA SCOTIA	50					CZJ419	4837486	BROOKVILLE	73.84	19.74	Global Maritimes Division of Shawmedia Inc.	4837488	XJO28

Appendix K:

Complaint Resolution Plan

Formal complaints procedure for Natural Forces Wind Inc. Aulds Mountain Wind Farm

Natural Forces Wind Inc. is committed to addressing any public concerns regarding Aulds Mountain Wind Farm in Aulds Mountain in the Municipality of Pictou County. The intention is that this policy can inform the public on the ways that they can communicate their concerns to Natural Forces Wind Inc., and how complaints will be addressed.

1.0 PURPOSE

The purpose of this policy is to ensure all public complaints are dealt with consistently and effectively. Natural Forces Wind Inc. aims to:

- Manage complaints openly, promptly and properly;
- Try to resolve complaints as soon as possible; and
- Learn from complaints and improve our services.

2.0 SCOPE

This policy will address any complaint; written or spoken expression of dissatisfaction.

3.0 PROCEDURE

All complaints of the Aulds Mountain Wind Farm will be directed to the Project Manager, Andy MacCallum:

Andy MacCallum | VP Developments
Natural Forces Wind Inc.
1801 Hollis Street | Suite 1205 | Halifax | NS | B3J 3N4
Tel: +1 902 422 9663 x 214
Fax: +1 902 425 7840
For more information please refer to Natural Forces Wind Inc. website
www.naturalforces.ca

Complainant will be notified upon receipt of the complaint. The Project Manager will investigate complaints within 20 days of receiving the complaint; upon which complainant will be notified of how the concern was or will be addressed.

3.1 Noise

Complaints dealing with noise will be assessed on whether noise monitoring is necessary.

If there are several complaints regarding noise from the Aulds Mountain Wind Farm, then a noise monitoring program may be implemented.

Ways on reducing noise will be discussed with the wind farm operators.

Complainant(s) will be informed of noise mitigation strategies and will be contacted within a year of implemented noise reduction strategies on the success of the noise reduction strategy. This will help address any noise issues that may arise from the Aulds Mountain Wind Farm.

3.2 Construction and Operation

Complaints regarding operation and construction activities will be discussed with workers or contractors involved.

Solutions to the complaints will be established with worker(s) and contractor(s). Complainant will be informed of how issue was addressed.

If complaints persist, then worker(s) and contractor(s) may be dismissed.

4.0 CLOSURE

If the complainant is not satisfied with the initial response, the complaint will be referred to a higher authority within the company to further resolve the issue.

Appendix L:

Stakeholder Consultation

Date	Person Contacted	Band/Organization	Method of Communication	Content
December 4, 2011	Chief Aileen Francis	Pictou Landing First Nation	Letter	Invitation to the First Public Meeting
August 29, 2012	Office Receptionist	Office of Aboriginal Affairs	Phone Call	Engagement effort with the Mi'Kmaq community
July 3, 2013	Beata Dera	Office of Aboriginal Affairs	Phone Call	Discussed scoping for MEKS and their requirement for ComFIT
September 6, 2013	Chief Aileen Francis	Pictou Landing First Nation	Letter	Invitation to the Second Public Meeting
September 9, 2013	Chief Aileen Francis	Pictou Landing First Nation	Phone Call	Invitation to the Second Public Meeting
August 19, 2013	Twila Gaudet, Consultation Liaison Officer	Kwilmu'kw Maw-Klusuaqn Negotiation Office	Letter	Wind Farm Update

Date	Person Contacted	Department / Agency	Method of Communication	Content
		Municipal		
June 28, 2013	Sally Fraser, Councillor	Municipality of Pictou County	Phone call	Introduction to project
July 23, 2013	Van Mcleod	Municipality of Pictou County	Phone call	Discussed development permit
August 14, 2013	Clarrie MacKinnon, Councillor	Municipality of Pictou County	Meeting	Meeting to give update on project and to introduce Community Economic Development Investment Fund.
August 20, 2013	Clarrie MacKinnon, Councillor	Municipality of Pictou County	Letter	Project Update
August 20, 2013	Sally Fraser, Councillor	Municipality of Pictou County	Letter	Project Update
September 6, 2013	Councillors	Municipality of Pictou County	Letter	Invitation to the Second Public Meeting
September 6, 2013	Sally Fraser, Councillor	Municipality of Pictou County	Phone Call	Invitation to Public Meeting
		Provincial		
November 7, 2012	Steve Stanford	Nova Scotia Environment – EA Branch	Meeting	Discussed EA process, forming CLC, health Canada study and EA scoping.
November 27, 2013	Mark Elderkin & Peter MacCullins	Nova Scotia Environment	Meeting	Discussed conducting moose surveys and timing of avian studies
September 18, 2013	Shavonne Meyer	Nova Scotia Department of Natural Resources	Meeting	Discussed turtles/ amphibians, moose, environmental management plan scoping and micro siting with respect to wetlands

Date	Person Contacted	Department / Agency	Method of Communication	Content
Federal				
November 14, 2012	Adin Switzer, AEC Liaison Officer	Government of Canada, National Defence	Email	No interference with DND radar and airport facilities
September 18, 2012	Mario Lavoie, Spectrum Engineering Technician	Government of Canada, Department of National Defence	Email	No interference with radio communications
September 18, 2012	Carolyn Rennie, National Radar Program	Environment Canada, Meteorological Service of Canada	Email	No severe interference with meteorological radar systems
September 18, 2012	Martin Gregoire	Canadian Coast Guard	Email	No interference with radar

Appendix M:

Consultant CV

Christopher M. Milley, M.Sc., MMM

Senior Environmental Consultant, Dartmouth, NS

Years with AMEC: 3
Years Experience: >27

Education

Dalhousie University, 1995 (Masters of Marine Management)

Dalhousie University, 1983 (Master of Science (Oceanography))

Mount Allison University, 1979 (Bachelor of Science)

Training

Negotiation Skills, Conflict Management Group, Cambridge, MA

Meeting Facilitation, Saint Mary's University, 2002

Introduction to MapInfo Professional, Baseline Business Geographics, 1998

Middle Management Orientation Program, Public Service Commission, Ottawa, 1990

Project Management by Activity, Bureau of Management Consultants, Supply and Services Canada, Georgetown, Guyana, 1990

Resource Systems and Economic Development, Institute for Resource and Environmental Studies, Dalhousie University, 1985

Professional Summary

Chris Milley is a resource manager with over 25 years of experience working in cross cultural environments. Mr. Milley has managed resource and environmental management projects in the Caribbean, Central America and with the First Nations in Atlantic Canada. Mr. Milley has liaised actively with regional and national First Nations organizations, international agencies and organisations, such as the Assembly of First Nations, the UNPFII, UN FAO and UNESCO's Intergovernmental Oceanographic Commission, and co-ordinated co-operative support for international development assistance projects. He has been a delegate at the UN Economic and Social Council's Permanent Forum on Indigenous Issues

Mr. Milley specializes in working with Indigenous communities in the design, and implementation of species inventories and community-based resource management activities that promote sustainable social and economic development. Mr. Milley teaches Fisheries Management, and special courses on Indigenous Resource Management in the Faculty of Graduate Studies at Dalhousie University.

Relevant Experience

Environmental Project Management

Mr. Milley brings to this project an intimate familiarity of the local environmental issues of communities in Nova Scotia with a specific emphasis of the relationships between tradition, culture and local environment. Chris has a dept of knowledge and experience working with projects that have a potential impact on local and First Nation communities, particularly in identification of traditional resource use practices, harvesting areas and mapping traditional knowledge. Chris has worked with a number of resource development and management projects and organizations, including: the Eskasoni Fish and Wildlife Commission, the Mi'kmaq Fish and Wildlife Commission, where he served as Executive Director and the Atlantic Policy Congress as a fishery policy analyst, the Acadia Band in SW Nova Scotia as Director of their Fisheries Program, and with the Mi'kmaq Confederacy of PEI as Director of Integrated Resource Management.

Relevant Projects

Traditional Knowledge Study
Designed, implemented and managed a Traditional Ecological Knowledge Study for the Sable Offshore Energy Inc. Natural Gas Liquids (NGL) Pipeline Corridor (Goldboro to Point Tupper).

Fishermen and Scientist Research Society Conference
Coordinated the development and incorporation of the Fishermen and Scientist Research Society, a community-oriented research group involved in fishery research. Also organized an inaugural conference of the FSRS

Coastal Communities Network Workshop
Organized and facilitated a Coastal Communities Network workshop on Community-based Co-management. Also presented an overview of fisheries co-management concepts and principles to conference participants from municipal governments, fishery organization and ENGOs.

Research on traditional management systems
Collaborated in the design and managed First Nation inputs to a collaborative research project with St. FX. This project, Social Research for Sustainable Fisheries, involved inter-community research on customary decision-making systems.

Coastal Traditional Resources Mapping Program – Bras D'or Lakes, Eskasoni First Nation
Managed and implemented a community-based coastal mapping program with the Eskasoni First Nation for the Bras D'or Lakes region of Cape Breton. This project involved organizing field data collection activities, designing information presentations systems (including GIS), and conducting community workshops throughout the Bras D'or Lakes region.

First Nations Renewable Energy Development
Assisted the Mi'kmaq First Nations on Prince Edward Island in the review and development of an alternative energy strategy that build upon available wind technology and ethanol production.

Teaching materials and Course delivery - Integrated Coastal Zone Management: A community perspective
Prepared a text and teaching modules for a short course on Integrated Coastal Zone Management for community organizations in Spain and delivered the course during a spring semester of the University of Las Palmas de Gran Canaria, Spain

Training Needs Assessment
Managed a study to assess the training needs and job/task analysis of the Lennox Island and Abegweit First Nations' fisheries as part of an ongoing DFO funded initiative to determine the long-term and short term training needs that can be effectively addressed through an at-sea mentoring program.

Fisheries Management Program, Prince Edward Island First Nations
Designed and managed a Federal government funded program to enhance the institutional and administrative fisheries management capacity within the PEI First Nations

Study on Environmental Contaminants in the Food Fishery
Designed and managed a small project undertaken with the support of Health Canada to examine the presence of common environmental contaminants, including heavy metals, in the food fishery resources commonly consumed in First Nations Communities in PEI

Davis MacIntyre & Associates

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www.davismacintyre.com

Company Details
Davis MacIntyre & Associates Limited was established in 2009 and previously operated as Davis Archaeological Consultants Limited. We are leaders in the cultural resource management discipline in the Atlantic Region. Our staff has over 50 years of combined experience in the field of archaeology. We provide comprehensive professional services in undertaking archaeological and historical cultural resource assessments for government, public, and private industry. We are committed to excellence and pride ourselves on offering our clients value-added services to meet modern environmental and development standards.
(Source: http://www.davismacintyre.com/)