

APPENDIX SUPPLEMENTS

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AS 1: Application for Aeronautical Lighting

Aeronautical Lighting Plan - Proposed Dalhousie Mountain Wind Farm

Turbine ID	Proposed Lit	Latitude ¹ (N)			Longitude ¹ (W)			Ground Elevation ²	Nacelle Elevation ³	Maximum. Elevation ⁴
		Degrees	Minutes	Seconds	Degrees	Minutes	Seconds	(m asl) ⁵	(m asl) ⁵	(m asl) ⁵
P1-1	Yes	45	35	25	62	58	3	305	385	423
P1-10	Yes	45	35	8	62	56	47	305	385	424
P1-11	Yes	45	34	13	62	57	43	330	410	449
P1-13		45	33	55	62	57	36	326	406	444
P1-15	Yes	45	34	50	62	56	24	292	372	410
P1-16		45	34	12	62	58	7	330	410	448
P1-17		45	34	33	62	56	52	291	371	409
P1-18		45	34	0	62	56	52	306	386	424
P1-19		45	34	26	62	58	8	325	405	443
P1-20	Yes	45	33	38	62	57	28	300	380	419
P1-21		45	34	41	62	58	12	321	401	439
P1-22		45	34	59	62	57	1	288	368	406
P1-24		45	34	58	62	56	38	300	380	419
P1-25	Yes	45	35	36	62	57	46	325	405	444
P1-26		45	34	21	62	57	20	318	398	437
P1-27	Yes	45	35	30	62	57	21	299	379	418
P1-28		45	32	50	62	58	31	300	380	418
P1-3		45	33	52	62	57	4	307	387	425
P1-34		45	34	21	62	58	50	319	399	438
P1-36	Yes	45	33	35	62	59	18	288	368	406
P1-37	Yes	45	34	11	62	59	6	306	386	424
P1-39	Yes	45	34	7	63	0	10	292	372	411
P1-4	Yes	45	32	35	62	58	41	300	380	419
P1-40	Yes	45	34	12	62	59	52	300	380	419
P1-41		45	34	1	62	59	43	315	395	433
P1-42		45	33	56	62	59	19	308	388	426
P1-43	Yes	45	35	0	62	58	31	286	366	404
P1-45	Yes	45	34	32	62	58	33	310	390	429
P1-46	Yes	45	33	8	62	58	38	286	366	404
P1-5		45	33	24	62	59	5	292	372	411
P1-6		45	34	44	62	57	31	290	370	409
P1-7	Yes	45	34	11	62	56	42	295	375	414
P1-8		45	34	14	62	56	59	316	396	434
P1-9		45	35	10	62	58	14	300	380	419



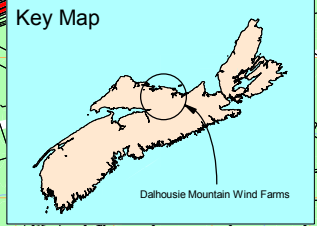
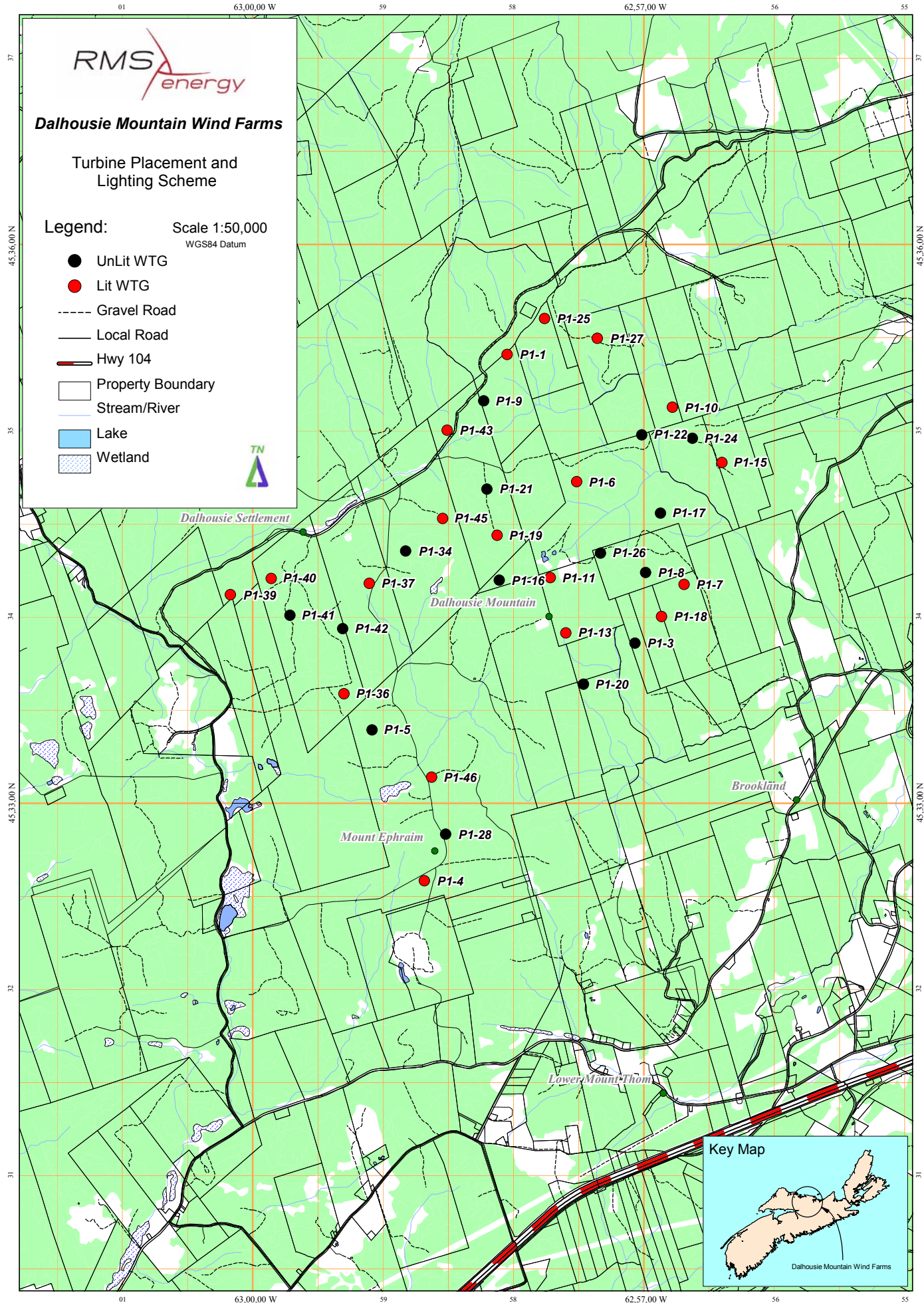
Dalhousie Mountain Wind Farms

Turbine Placement and Lighting Scheme

Legend:

- UnLit WTG
- Lit WTG
- - - - Gravel Road
- Local Road
- Hwy 104
- Property Boundary
- Stream/River
- Lake
- Wetland

Scale 1:50,000
WGS84 Datum



**AS 2: Dalhousie Mountain Wind Farms: Archaeological Resource Impact
Assessment**



DALHOUSIE MOUNTAIN WIND FARMS: ARCHAEOLOGICAL RESOURCE IMPACT ASSESSMENT

Heritage Research Permit A2008NS29



May 2008

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**DALHOUSIE MOUNTAIN WIND FARMS:
ARCHAEOLOGICAL RESOURCE IMPACT ASSESSMENT**

**Heritage Research Permit A2008NS29
Category C**

Davis Archaeological Consultants Limited

Principal Investigator: April D. MacIntyre
Report Compiled by: Donna Matheson-LeFort, Heather MacLeod-Leslie, &
April D. MacIntyre

Cover: The John MacKenzie house, looking toward the southwest corner.

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EXECUTIVE SUMMARY

An archaeological resource impact assessment of the proposed Dalhousie Mountain Wind Farm development in Pictou County was conducted by Davis Archaeological Consultants Limited. Davis Archaeological Consultants Limited conducted a desktop study in 2007 and a field reconnaissance in 2008. The 2007 study revealed that the general area had been impacted by historical settlement, most heavily in the nineteenth century. The conclusion from the assessment was that the likelihood of encountering Mi'kmaq archaeological resources is low on the mountaintops within the study area, though moderate to high potential exists in the intervening valley. High potential exists for archaeological resources related to the nineteenth century Scottish settlement, which was confirmed by the field reconnaissance in 2008. However no historic resources were encountered directly within the impact areas and, therefore, no active mitigation is recommended at this time.

1.0 INTRODUCTION

In May 2007, Davis Archaeological Consultants (DAC) Limited was contracted by RMSEnergy Ltd. to conduct an archaeological resource impact assessment of the proposed Dalhousie Mountain Wind Farms project in Pictou County. This assessment included a phase I archaeological desktop study of the development area which was conducted in July 2007 under Heritage Research Permit A2007NS40, as well as a phase II archaeological reconnaissance of the development area in April 2008 under Heritage Research Permit A2008NS29. A report was completed and submitted to the Nova Scotia Department of Tourism, Culture and Heritage (NSDTCH) for the first phase of the assessment in 2007. The results of the first phase of the assessment indicated that the study area was of high potential for historic period archaeological resources related to late eighteenth and nineteenth century occupation of the area. It was determined through desktop predictive modeling that the area was also of moderate potential for First Nations resources. Subsequently, a phase II archaeological reconnaissance of the development area was recommended.

This report details the results of the archaeological reconnaissance which was conducted between 28 April and 22 May 2008 and conforms to the standards required by the NSDTCH Heritage Division under the Special Places program.

2.0 DEVELOPMENT AREA

The Dalhousie Mountain Wind Farms development area is located north of Mount Thom in the Cobequid Hills of Pictou County. For the purposes of the archaeological assessment, the study area is defined as those areas which will be directly impacted by construction of the turbines, necessary access roads, and associated substation. Thirty-six turbines have been proposed, although two of those turbines (P1-17 and P1-20) will not likely be constructed and, due to time constraints, were not surveyed during this assessment. Expected impact for the turbine pads will include excavation of a 17 metre radius around the base of the turbine, to a depth of two metres. Lay down and parking areas will be along existing or proposed road ways. Access roads will be approximately 5 to 8 metres wide and will include upgrading of existing roads as well as construction of new roads.

The development area is located over a convergence of three Nova Scotia Theme Regions: 1. Pictou Rivers (natural region #582a), 2. Cobequid Hills (#311) and 3. Dissected Margins (sub unit # 320a: Waughs River). In the Pictou Rivers Region the forests consist of White Spruce and Balsam Fir (re-growth). In the Cobequid Hills unit the land previously cleared by early settlers has also reverted to forest, comprised of Red and Black spruce, Balsam Fir, as well as Maple, Birch and Beech. Forests in the Dissected Margins theme region are mixed with hardwood stands. Evidence of logging (skidder trails) and secondary forest growth can be seen in numerous locations throughout the study area.

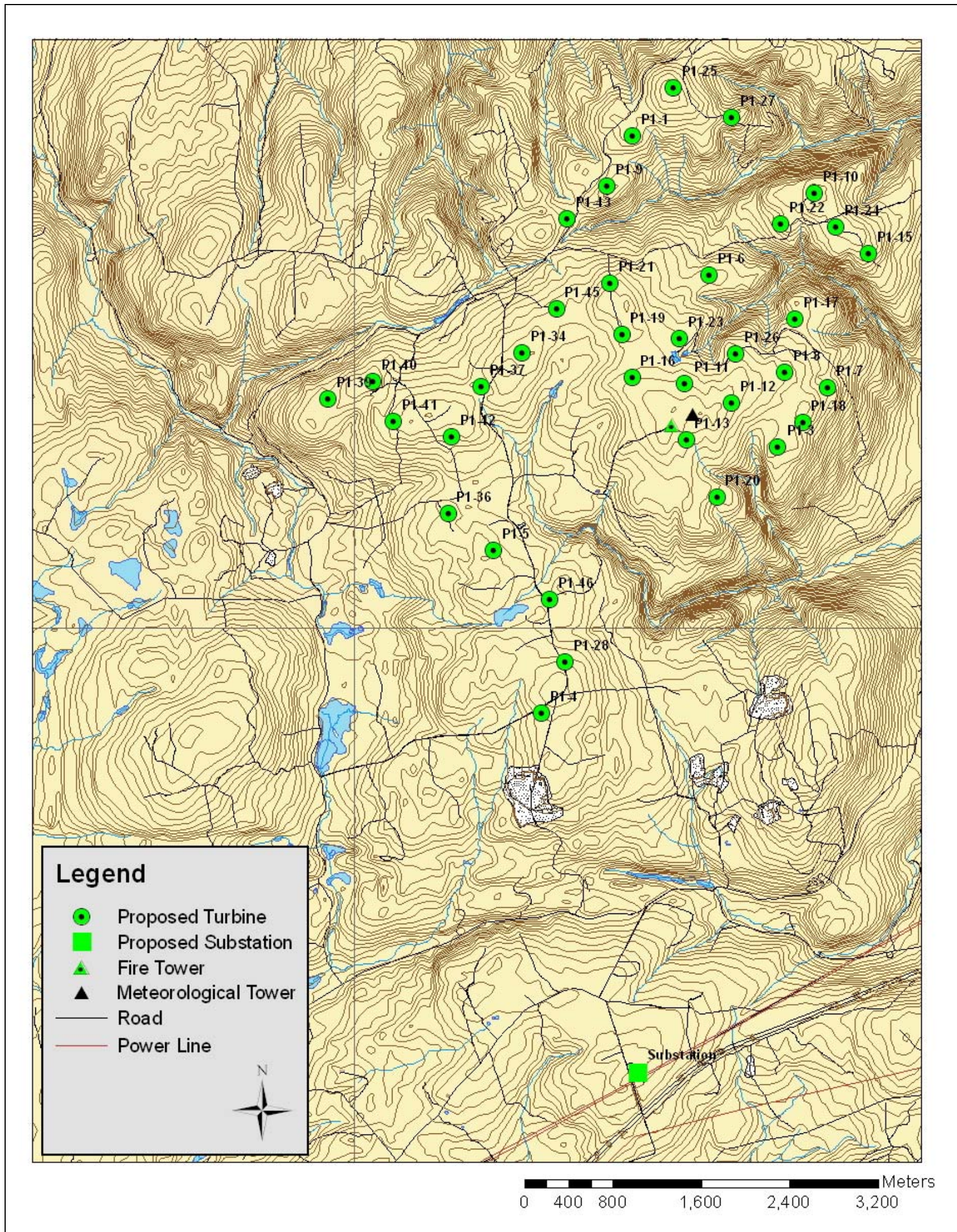


Figure 2.0-1: Proposed development area.

Table 2.0-1: RMSenergy Ltd. Proposed Turbine Sites.

<i>Projection UTM Datum NAD 83</i>	
Turbine	Location
P1-1	20 T 502536 5048514
P1-3	20 T 503855 5045693
P1-4	20 T 501712 5043282
P1-5	20 T 501276 5044754
P1-6	20 T 503230 5047250
P1-7	20 T 504302 5046229
P1-8	20 T 503917 5046372
P1-9	20 T 502303 5048052
P1-10	20 T 504185 5047990
P1-11	20 T 503008 5046265
P1-12	20 T 503434 5046095
P1-13	20 T 503021 5045754
P1-15	20 T 504678 5047441
P1-16	20 T 502531 5046320
P1-17	20 T 504008 5046851
P1-18	20 T 504078 5045910
P1-19	20 T 502438 5046716
P1-20	20 T 503299 5045236
P1-21	20 T 502335 5047176
P1-22	20 T 503878 5047716
P1-23	20 T 502962 5046678
P1-24	20 T 504383 5047681
P1-25	20 T 502906 5048941
P1-26	20 T 503469 5046540
P1-27	20 T 503435 5048674
P1-28	20 T 501925 5043745
P1-34	20 T 501533 5046546
P1-36	20 T 500862 5045090
P1-37	20 T 501163 5046238
P1-39	20 T 499777 5046126
P1-40	20 T 500184 5046287
P1-41	20 T 500370 5045920
P1-42	20 T 500897 5045788
P1-43	20 T 501939 5047761
P1-45	20 T 501844 5046945
P1-46	20 T 501785 5044312
Substation	20 T 502580 5040024

3.0 METHODOLOGY

A field reconnaissance was conducted by April MacIntyre and Donna Matheson-LeFort between 28 April and 30 April 2008 and by MacIntyre and Heather MacLeod-Leslie between 21 and 22 May 2008. Each of the turbine sites and access roads were surveyed using GPS data provided by RMSenergy Ltd., at sub-decametre accuracy (Figure 2.0-1 and Table 2.0-1). Approximately a 100-metre radius was surveyed around each proposed turbine site. For each of the proposed turbine sites and access roads, archaeologists made note of positive as well as negative evidence of cultural activity including potential cultivation, stone piles, stone property boundaries, modern cultural and natural disturbance, shallow soil, and rugged topography in the vicinity of the impact areas. Locations of archaeological resources were recorded using GPS technology and field notes and photographs were taken to document the survey. As per the standards followed by DAC on previous wind power projects, a 25-metre radial non-disturbance buffer was assumed around any significant heritage resource that might be encountered during the course of the survey. This standard is used by DAC to determine the potential impact to such resources when making recommendations for mitigation.

Five domestic sites as well as a possible cemetery were found in the study area and were recorded using GPS technology. The finds were documented and recorded on standard Maritime Archaeological Resource Inventory forms, as required by the Nova Scotia Heritage Division under the terms of the Special Places Protection Act. Surface artifacts were noted but no subsurface testing was conducted for this phase of the assessment as all six sites were located outside the current impact areas.

3.1 Historical Background

One previous archaeological desktop study was conducted for the study area and has been reported by Davis Archaeological Consultants Limited (A2007NS40).¹ First Nations' presence in Pictou County bordered the coast and river valleys to exploit both the food sources and transportation routes that the water afforded. There is little to suggest that Mi'kmaq people or their ancestors inhabited the mountaintops in and around the study area, though the valley in which Brookland is situated and the many streams, rivers, cascades and waterfalls are considered to have greater potential for Mi'kmaq archaeological resources, although this area is not included in the development zone. Approximately 2.5 km outside of the northeast edge of the study area, a Late Archaic (5000-2500 years BP) projectile point was previously recorded as having been found in an unused quarry near an extensive river system. The river system is on a much lower elevation. The potential for the existence of sites higher up on the mountain are much lower.

The earliest indications of British historic land use of Dalhousie Mountain and the area immediately surrounding it (which often includes Millsville and Rogers Hill) are its

¹ Davis Archaeological Consultants Limited, 2007

inclusion within the Philadelphia Grant (also referred to as Crawley and Company) of 200,000 acres on October 31st 1765. This grant encompassed much of the county of Pictou and extended into Colchester County.² With the exception of Rogers Hill, early development of this grant was limited to the area on or adjacent the shoreline at Pictou Harbour with some further improvement at Lyons Brook. Rogers Hill is immediately adjacent Dalhousie Mountain and a Geological Survey Map dated 1903 identifies the road that travels from Rogers Hill (near Millsville) over Dalhousie Mountain as “Old Road” (Figure 3.1-2). Perhaps this road was that blazed by Philadelphia Grant settlers with two men from Truro to facilitate passage between the two nascent communities.³ Certainly remains from this period of historic settlement are present in the local area, as Beer relates local tradition that the original foundation built by John Rogers at Rogers Hill was, at that time, still supporting the home of the modern owners of that property, the DeDeckers. These factors and the possibility of omission in the historical documentation suggest elevated potential for mid-to-late eighteenth century resources in the area.

The Philadelphia Grant was largely escheated and re-granted to settlers from Dumfriesshire, Scotland in the period 1815- 1818.⁴ The period between the Philadelphia Grant and the Dumfriesshire settlers saw the arrival of the Hector (1773) and hundreds of Scottish immigrants, however, many of them dispersed to areas beyond Pictou County, leaving Dalhousie Mountain and its immediate vicinity to await the Dumfriesshire settlers’ arrival. It is unclear what year Peter Arthur took up residence on Dalhousie Mountain, but it seems that this native of the Orkneys was the first Scottish immigrant to settle on Dalhousie Mountain, likely in the first decades of the 1800s. He received two fifty acre allotments for free from larger land grantees and built a home and log barn and is said to have been located five or six miles from any other of his contemporaries.⁵ Following the arrival of the Dumfriesshire settlers, the population of this place had become 961 in just a decade.⁶ These families continued to occupy the area within and around the study area throughout the 1800s and 1900s. The settlers’ names, Rae, Adamson, Willis, Ross, MacDonald, McKay, Munro, Arthur and many others, are consistent on mapping throughout the nineteenth and early twentieth centuries and properties associated with these across the top, perimeter and area surrounding Dalhousie Mountain (Figures 3.1-3 and 3.1-4).

² Beer 1967:5; Meacham & Co. 1879:6.

³ Beer 1967:15.

⁴ Rae Watt 1992:10.

⁵ Patterson 1877: 275.

⁶ Rae Watt 1992: 10.

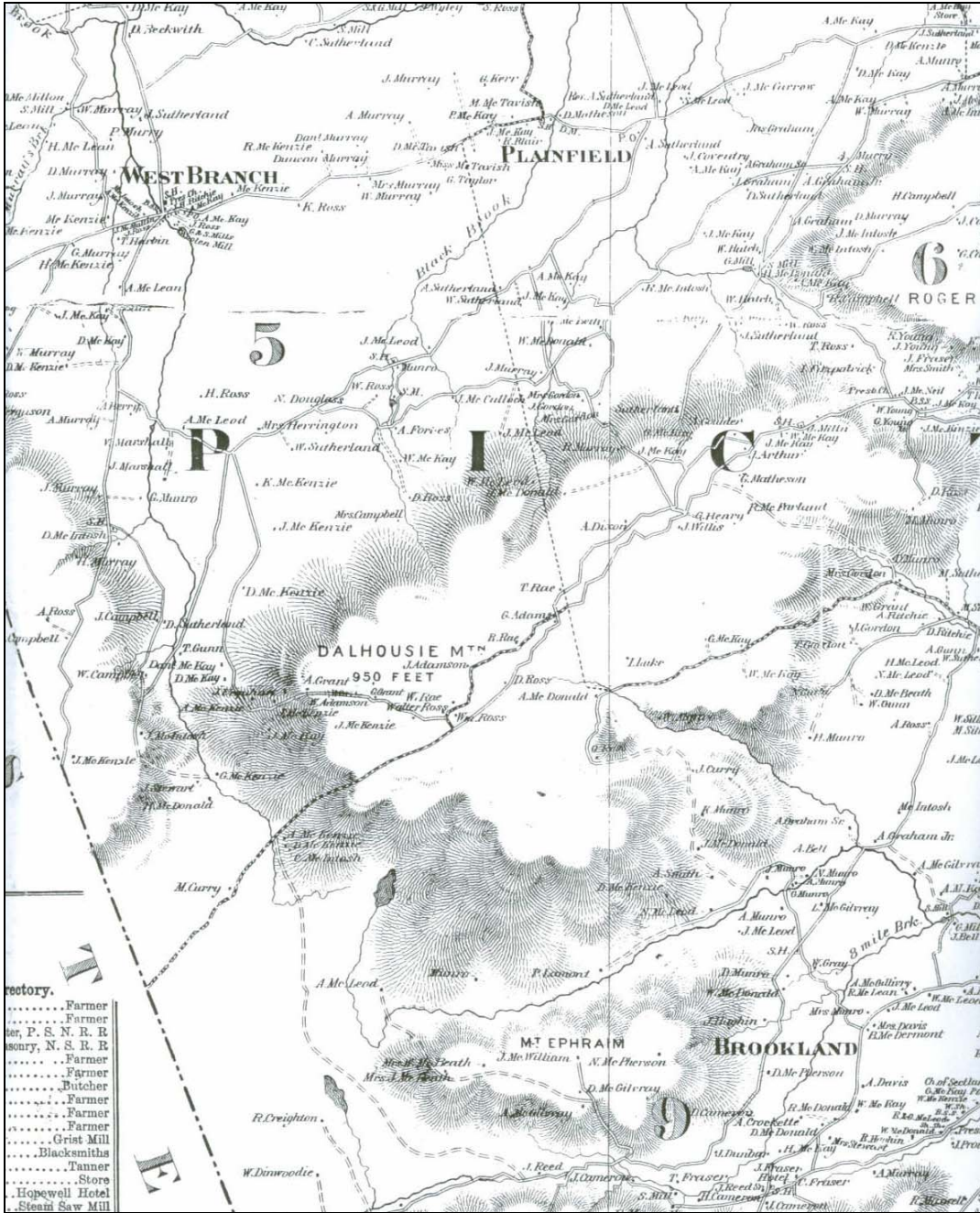


Figure 3.1-1: A portion of Ambrose F. Church’s map of Pictou County (1867) showing mid-nineteenth century settlement on Dalhousie Mountain.

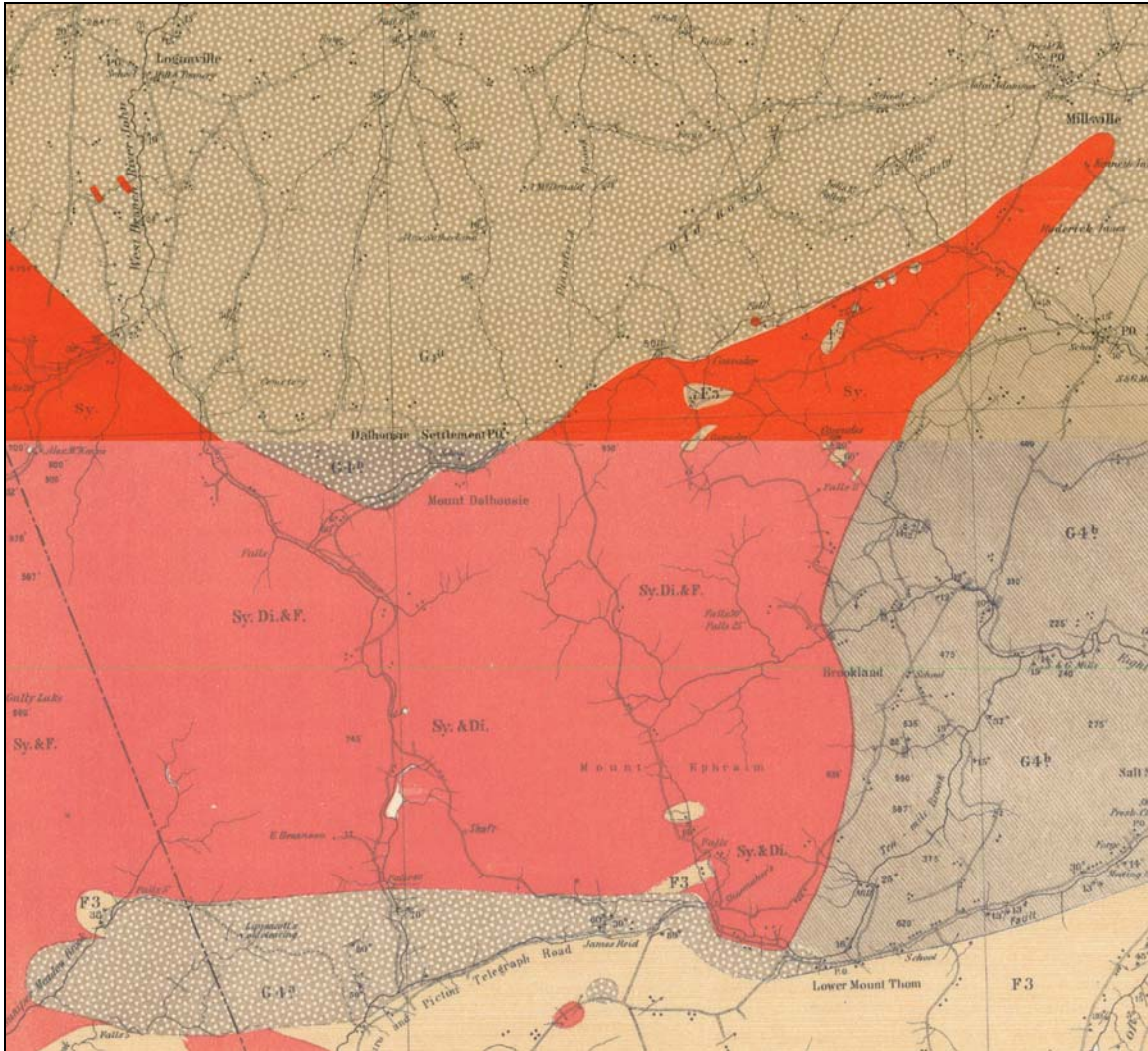


Figure 3.1-2: Geological Survey of Canada maps of 1902 and 1903 (joined) that shows remains of old settlement in Dalhousie. The Old Dalhousie Mountain Road from Rogers Hill is also shown.

In addition to the houses, barns and outbuildings constructed by the settlers, there were churches, mills, schoolhouses, forges, cemeteries, a printing press and bookbindery at Dalhousie Mountain and its immediate vicinity.⁷ Church's map (1867) (Figure 3.1-1) suggests that a minimum of fifty properties were improved at Dalhousie Mountain, though, certainly the number of structures associated with each exceeds this total.

⁷ Cameron 1972:165.

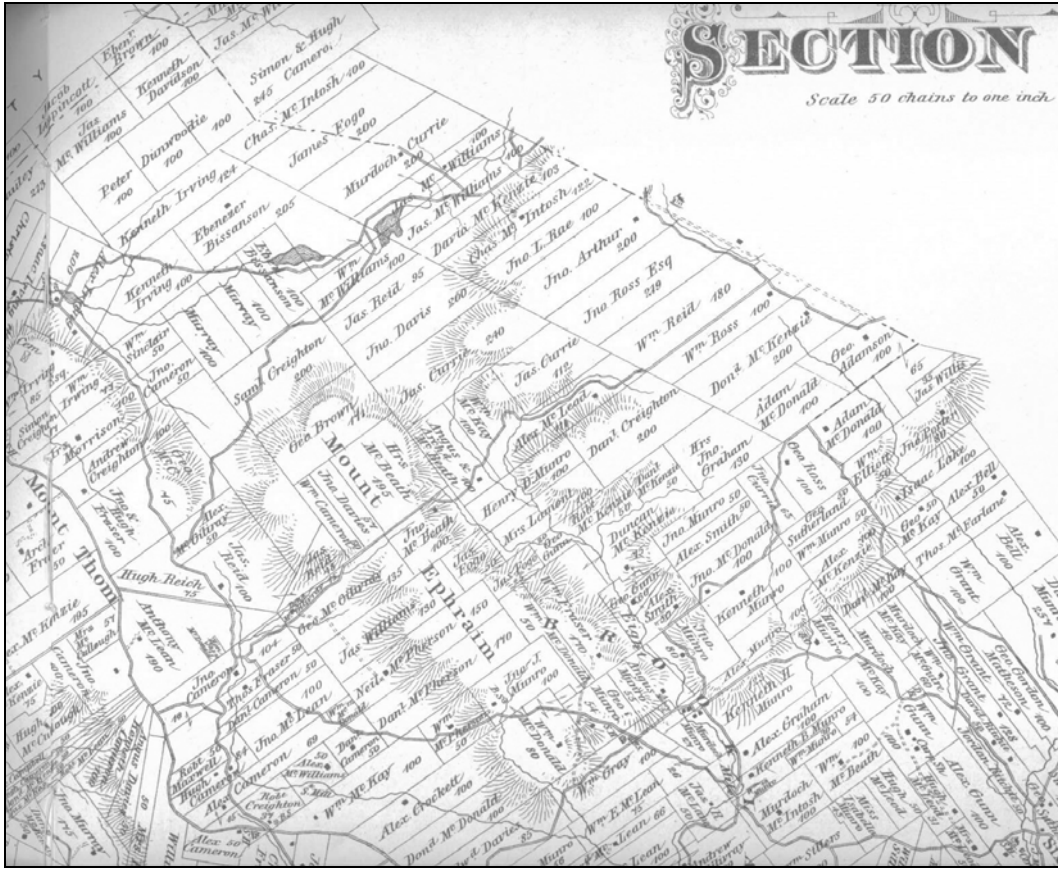


Figure 3.1-3: Section 9 of Meacham's Atlas of Pictou County (1879).

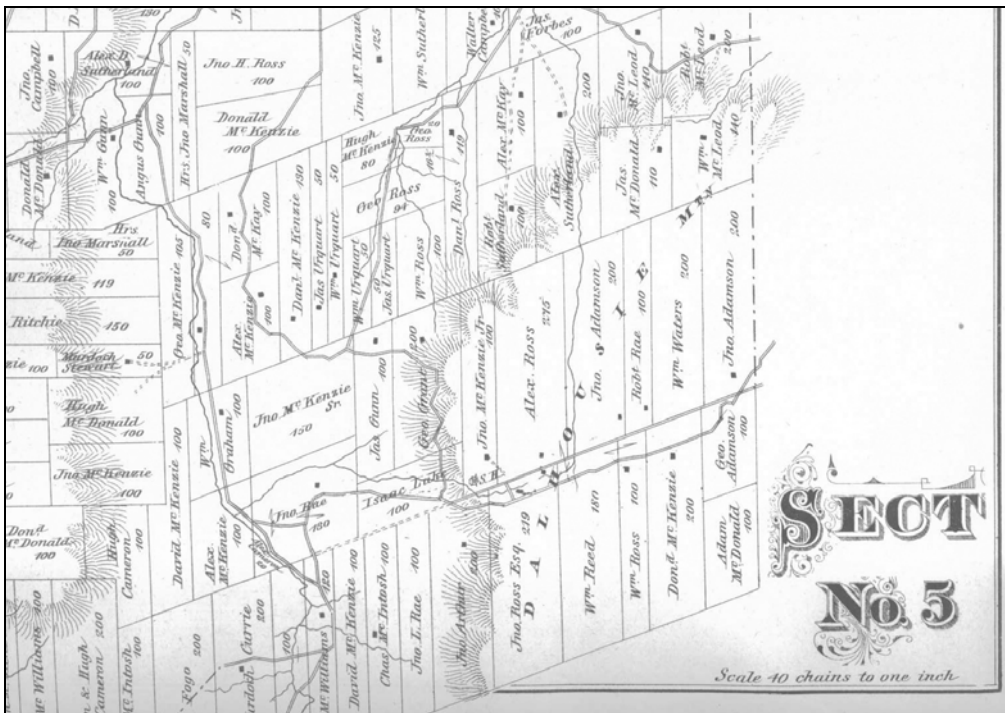


Figure 3.1-4: Section 5 of Meacham's Atlas of Pictou County (1879).

Geological Survey of Canada maps from 1902 and 1903 give a clear indication of the progression of land use and settlement in the study area when compared with the other historic maps for the time period between 1867 and 1902-03. While, toward the end of the nineteenth century and into the twentieth, farms and facilities remained, some fell into disuse and were abandoned, dismantled or moved, as the Hermon Church was in Millsville.⁸

There is no mention on any of the historic maps of a cemetery on the Jason Willis property on Dalhousie Mountain, however one does exist that was used at least by 1822 until 1911 and was restored in 1991 by local residents and descendants of the decedents.⁹ This name does appear on both the Church (1863) and Meacham (1879) maps, but appears to have been granted, originally, to Alexander Wells. It is likely that one of these surnames, Wells or Willis is improperly recorded and that the grant remained in the family. Rae Watt mentions that a forest fire prior had left the cemetery in a poor state. It is unclear the year or extent of this forest fire, however it may have affected archaeological remains of structures and other cultural resources that had been left abandoned in addition to the cemetery.

Aerial photos from 1945 and 1948 over the Dalhousie Mountain, Brookland and Mount Ephraim area clearly show vegetation and field delineation patterning that reflects property boundaries as defined in the Crown Land Grant maps and Meacham's 1879 Atlas of Pictou County.¹⁰ As well, these photos suggest that house and barn structures remained on the properties of George Gunn, Angus & Archibald McBeath, Charles McIntosh, John Rae, John Ross, Esquire, John McKenzie, Jr., Kenneth Munro and John McDonald within the study area until at least that time.¹¹ We know that structures from the early period of settlement remained into the late twentieth century as evidenced by the drawing of Bella Jane Munroe's House (circa 1800) at Brookland in the 1970s (Figure 3.1-5).¹²

4.0 RESOURCE INVENTORY

No significant historic cultural activity was noted within the impact areas. The majority of the terrain on Dalhousie Mountain is rugged with indications of past and current clear cutting (Plate 1). In most of the proposed turbine sites the surrounding area was either very wet/boggy or the soil was very thin and unsuitable for cultivation. Throughout the mountain there were several bedrock outcrops (Plate 2). With the exception of a small number of hardwood stands, the majority of the wooded areas surrounding the proposed turbine locations consist of White Spruce and Balsam Fir (Plate 2), which attest to the

⁸ Rae Watt 1996: 16.

⁹ Rae Watt 1996: 12-15.

¹⁰ A8471-109 (1945) & A8471-112 (1948).

¹¹ Meacham 1879: Section 5.

¹² Jenson 1974:27.

extensive clear cutting that has taken place on the mountain over the past 25 years or more. Six areas of cultural activity were recorded inside the study area (Table 4.0-1). Maritime Archaeological Resource Inventory forms were completed and submitted to the Nova Scotia Department of Tourism, Culture and Heritage for each of these sites.

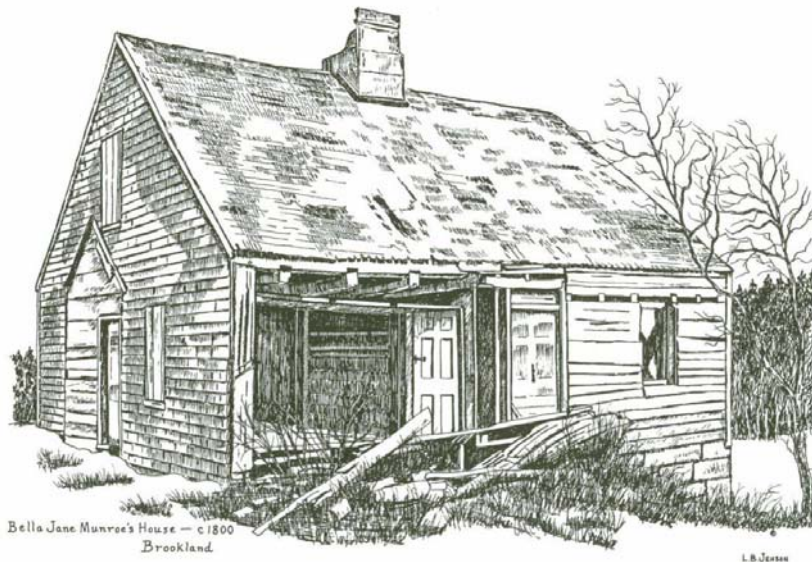


Figure 3.1-6: A drawing of Bella Jane Munroe's house at Brookland, built ca. 1800 and published in 1974. While this house was not located within the study area, it may have been typical of the houses of the period and indicates that houses of the period survived well into the twentieth century in this area.

The *John Arthur House* is located 500 metres northeast of turbine P1-40 and was not located on any access road (Figure 4.0-1, Plates 3 and 4). The site consists of an irregularly-shaped foundation measuring approximately 8 metres by 10 metres, with a dry stone-lined cellar underneath the north end of house. There is a wood sill under the main part of house which is partially obscured by overgrowth. Bricks are scattered around the foundation, but there is no apparent chimney mound. Artifacts were discovered on the surface in the northwest end of house which are consistent with nineteenth century occupation. This feature was located via a local woodsman. This property was occupied by John Arthur in the late nineteenth century, which is indicated by Meacham in his *Historical Illustrated Atlas* (1879).

Approximately 190 metres to the east southeast is an area that was indicated by the local woodsmen to be the site of a cemetery (*Possible Cemetery*, Figure 4.0-1). Approximately twelve years ago these woodsmen cleared the surrounding area which has since grown in enough to thwart easy detection. No headstones were visible, although an area approximately 2.5 metres by 2.5 metres was enclosed by a wire fence which has since fallen into disrepair. No historic reference to this possible cemetery was found, although

wood cutters indicated that the land had been set aside for burial ground. The site is located 520 metres northwest of the nearest proposed turbine (P1-37) and not on any proposed access road.

A linear stone field clearing pile was encountered 82 metres northwest of turbine P1-42 and may be impacted by turbine and/or access road construction. The field clearing runs for several hundred metres toward the John Arthur House, bearing 322°. It is most likely associated with the John Arthur House.

Local woodsmen also identified two homesteads to the south of turbines P1-39, P1-40 and P1-41. The *Charles McIntosh House* is represented by a single foundation above a small ravine. The foundation measures 14.2 metres northeast-southwest by 16.4 metres northwest-southeast and has a cellar under the southwest end of the house. The foundation is constructed of local undressed dry stone. At the northwest end of the cellar is an entrance into this part of the house (Plate 5). No associated features were encountered. It is likely that the occupants drew their water directly from the adjacent stream.

Nearby, a second dry stone foundation was reported by the woodsmen. This foundation measured 6.2 metres south southwest- north northeast by 7.6 metres east northeast-west southwest (Plate 6). The surface of this site was littered with sawn boards and wire nails, indicating occupation into the twentieth century. A 1950s Ford Fairlane and domestic refuse was deposited adjacent to the foundation. This property was occupied by *John L. Rae* in the late nineteenth century. Approximately 42 metres west northwest of the house is a barn measuring 11.6 metres east-west by 9.5 metres north-south and is represented by a dry stone footing. Several hand forged iron artifacts including a stirrup, bolts, a barrel hoop, decorative hardware, and spikes have been collected from the surface of the feature and deposited on top of the footing (Plate 7). Both the Charles McIntosh House and the John L. Rae House are located more than 550 metres away from the nearest turbine site (P1-36) are not expected to be impacted by development of access roads.

The *John MacKenzie Jr.* Site is located along the Old Dalhousie Mountain Road and is represented by a house foundation and barn footing. The house foundation is constructed primarily of local undressed dry stone and measures 8.9 metres east-west by 7.0 metres north-south and 1.1 metres in depth. Several cut lintel stones adorn the top of the foundation walls. An entrance into the cellar can be seen on the east side of the foundation (Plate 8). An old road runs roughly south-eastward to the headwaters of Six Mile Brook. Approximately 36 metres west of the house is an unidentified circular depression measuring 3.2 metres in diameter and 0.9 metres deep (Plate 9). Finally, approximately 48 metres southwest of the house on the south side of this old road is a stone barn footing measuring 7.9 metres east-west by 6.8 metres north-south (Plate 10). The house is located 110 metres from turbine P1-43 and approximately 45 metres from the current road alignment. However, the road is expected to be realigned further northward and is not expected to impact on this site.

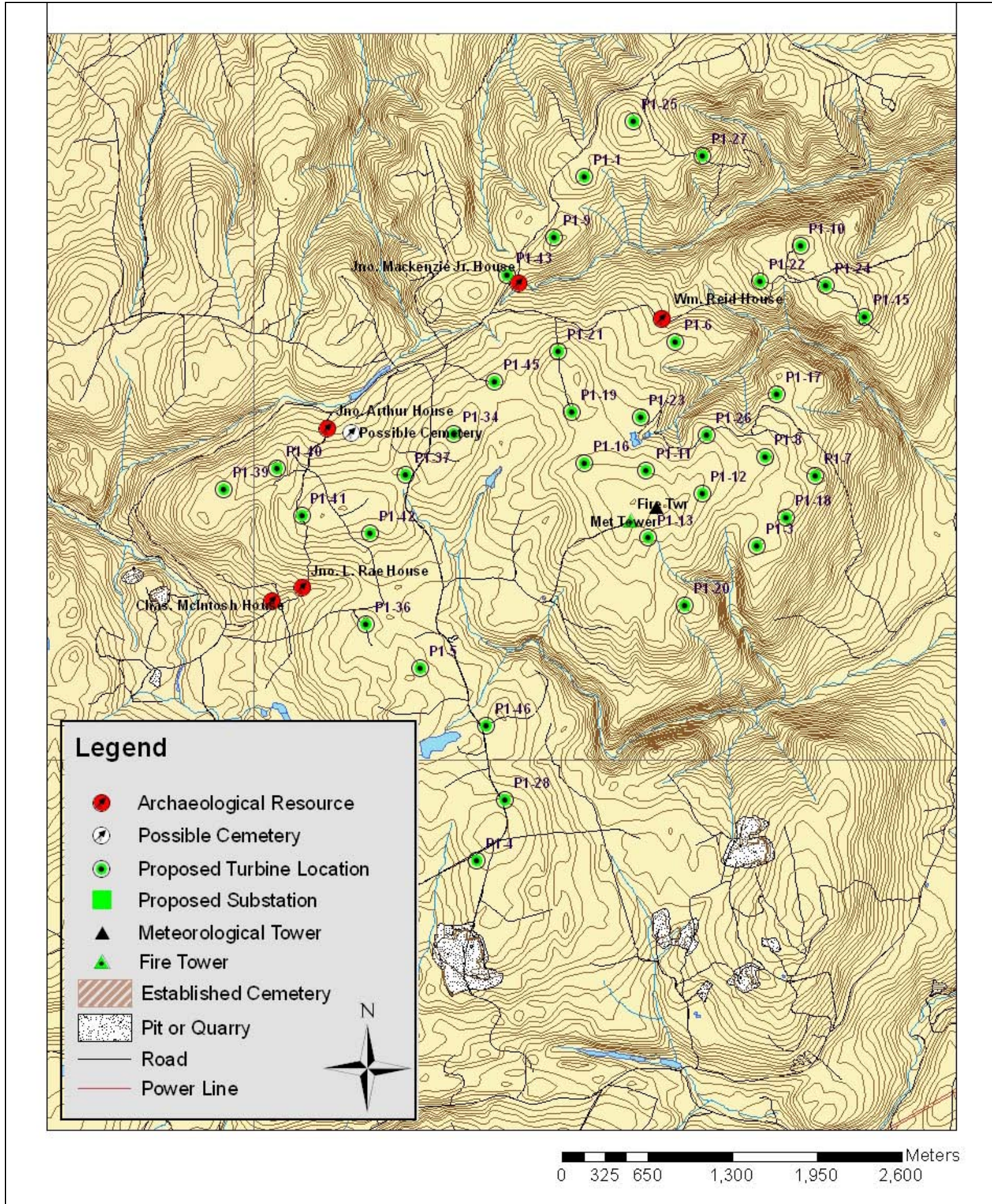


Figure 4.0-1: Locations of archaeological resources in relation to proposed development sites.

Table 4.0-1: GPS locations of the archaeological resources identified during 2008 field reconnaissance.

<i>Projection UTM Datum NAD 83</i>		
Archaeological Resource	GPS Location	Elevation
Jno. Arthur House	20 T 500565 5046590	280 m
Possible Cemetery	20 T 500748 5046554	284 m
Chas. McIntosh House	20 T 500143 5045271	247 m
Jno. L. Rae House	20 T 500374 5045368	270 m
Jno. Mackenzie Jr. House	20 T 502027 5047695	449 m
Barn	20 T 501985 5047677	387 m
Circular Depression	20 T 501993 5047688	406 m
Wm. Reid House	20 T 503122 5047424	351 m

Finally, the *William Reid House* is located at the north end of MacGillivray Road where it meets a woods road. The foundation is within 15 metres of the west edge of MacGillivray Road and 205 metres northwest of the nearest turbine (P1-6). This road is not expected to be used as an access road and, therefore, will not be impacted by construction of access roads. The site is represented by a local undressed dry stone foundation with a large central chimney footing which is still standing. The foundation is over 2 metres in depth, although its perimeter could not be determined due to extensive overgrowth and tree falls (Plate 11).

Additional heritage resources were reported by landowners but were not encountered by archaeologists as they were not located within the identified impact areas or had been buried by logging activities.

5.0 RESOURCE EVALUATION

Each of the cultural activity areas are evaluated according to their archaeological significance. Evaluation of site significance is based on consideration of the site's integrity, cultural and/or historical sensitivity, historical knowledge (or lack thereof), uniqueness, potential to produce associated archaeological resources, and existing or future impact (both natural and cultural). The process of determining site significance is somewhat subjective.

The *John Arthur House* is of high archaeological significance because it is representative of early nineteenth century settlement on Dalhousie Mountain. As the immediate surrounding land appears to be relatively undisturbed, the site may yield information regarding early settlement. The feature is located 500 metres from proposed turbine P1-40, and is not expected to be impacted. The stone property boundary/field clearing 250

metres southwest of the John Arthur House is of low archaeological significance in terms of its potential to yield additional information. The *Possible Cemetery* is also of high archaeological and spiritual significance as it may be associated with the early nineteenth century settlement on the mountain and may contain human remains. However, it is not expected to be impacted by the construction of the turbines associated access roads.

The *Charles McIntosh House* is also of high archaeological significance as it, too represents early settlement in the area and is relatively undisturbed. However, it is not expected to be impacted by the current development plan.

The *John L. Rae Site* is of moderate archaeological significance as its date of origin is not known but the site has been occupied into the twentieth century, as is evident in the wire nails and refuse that litter the site. The barn appears to be undisturbed with the exception of the gathering and redeposit of surface artifacts. This site is located well outside the current development area and is not expected to be impacted by construction.

The *John MacKenzie Jr. House* and the *William Reid House* are both of high archaeological significance as they are representative of the earliest European settlement on the mountain and remain undisturbed. However, they are not expected to be impacted by construction of the proposed wind power project.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Avoidance is the preferred method of mitigation in all instances where archaeological resources are present. No significant archaeological resources were discovered within the impact areas. Although several significant resources were encountered during the field reconnaissance, none are expected to be impacted by construction of the proposed turbines and access roads. Therefore no active mitigation plan is recommended for these features. Nevertheless, should adverse impact to these resources be unavoidable, further investigation is necessary.

As a standard precautionary mitigative measure, it is recommended that a 25-metre radius non-disturbance buffer zone be maintained around the *House* sites. Because the full extent of interment in the *Possible Cemetery* is not known, it is recommended that this buffer be extended to a 50 metre radius from the centre of the demarcated area.

Should the current development plan change, it is recommended that an archaeological assessment be conducted to determine the potential for archaeological resources in those areas not surveyed for the current proposed development. If turbines P1-17 and P1-20 are to be developed, it is recommended that these areas be subjected to an archaeological field survey to determine the potential for archaeological resources within their impact areas. Finally, in the unlikely event that archaeological resources are encountered during ground disturbance activities, it is recommended that all ground disturbance cease and the Manager of Special Places, Mr. Robert Ogilvie (902-424-6475) be contacted immediately regarding mitigation measures.

7.0 REFERENCES

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PLATES



Plate 1: Access road near proposed turbine P1-40 looking southeast.



Plate 2: Bedrock outcrops/softwood re-growth near turbine P1-28, looking west.



Plate 3: John Arthur foundation, near proposed turbine P1-40.



Plate 4: Artifacts (glass bottles) near foundation of John Arthur house.



Plate 5: Northwest corner of the Charles McIntosh House.



Plate 6: Southeast corner of the John L. Rae House.



Plate 7: John L. Rae barn, looking south southwest. Hand forged iron artifacts can be seen on top of the stone footing at right, centre.



Plate 8: Southwest corner of the John MacKenzie Jr. House. Heather is standing on a large dressed lintel stone.



Plate 9: Circular depression near the John MacKenzie Jr. House.



Plate 10: Barn near the John MacKenzie Jr. House, looking toward the northwest corner.



Plate 11: William Reid House, looking north northeast. The central chimney can be seen at right.

**APPENDIX A:
HERITAGE RESEARCH PERMIT**

NOVA SCOTIA
 Tourism, Culture and Heritage
 Heritage Division
 Special Places Protection Act,
 R.S.N.S. 1989

Application for
**Heritage
 Research Permit**
 (Archaeology)

Permit No. **A2008NS29**

(Original becomes Permit when approved
 by the Executive Director of the Heritage
 Division)

The undersigned April MacIntyre
 of c/o 6519 Oak Street, Halifax, NS B3L 1H6
 representing (institution) Davis Archaeological Consultants Limited

hereby applies for a permit under Section 8 of the Special Places Protection Act to carry out archaeological investigations during the period:

from 1 April 2008 to 31 July 2008

at Dalhousie Mountain Wind Farm

general location Pictou County

specific location(s) (cite Borden numbers and UTM designations where appropriate)

and as described separately in accordance with the attached Project Description. Please refer to the appropriate Archaeological Heritage Research Permit Guidelines for the appropriate Project Description format.

I certify that I am familiar with the provisions of the Special Places Protection Act of Nova Scotia, and that I will abide by the terms and conditions listed in the Heritage Research Permit Guidelines for the category (check one).

- Category A - Archaeological Reconnaissance
- Category B - Archaeological Research
- Category C - Archaeological Resource Impact Assessment

Signature of applicant *April MacIntyre* Date 18 March 2008

Approved: *Bea Hill* Date 25/03/08
 Executive Director

AS 3: Dalhousie Mountain Wind Farms: Botanical Survey

2008 vascular plant inventory of supplementary wind turbine sites, Dalhousie Mountain, Nova Scotia



Squashberry (*Viburnum edule* – ranked S2 and Sensitive provincially), found 80m from the central point of turbine P1-19.

August 1, 2008

Conducted by Sean Blaney
for RMSenergy Ltd.

METHODS

The present (2008) study is supplemental to the survey conducted by Sean Blaney and David Mazerolle in June 2007, which covered all proposed turbine sites and corridors. Sean Blaney covered six turbine sites in 2008, along with a linear powerline corridor, all within the general area covered in 2007. This report covers only the 2008 survey results and the 2007 results from the immediate area of the six turbine sites and powerline corridor covered in 2008.

Vascular Plant Inventory

I visited the study site on June 23, 2008, spending 7.5 hours on site. Figure 1 indicates site coverage in 2008 and in 2007 within the same areas, as recorded by a Garmin GPS 76Cx set to record location approximately every 15 seconds while moving (the “more often” track point setting). For certain turbine sites (P1-4, I visited the proposed site but was driven between the sites, meaning I covered only the turbine site itself and not the corridors between sites (which were along existing logging roads through largely cut-over forest with extensive conifer plantations). Figure 1 distinguishes areas walked vs. driven. I had pre-programmed the proposed turbine sites into a GPS unit before fieldwork and at each turbine site I took photographs, recorded notes on species composition, stand age for forested sites and any obvious disturbance history of the plant community present. I concentrated my search efforts on the footprint of the proposed development sites.

I compiled a full vascular plant list for the site as a whole and for plant species tracked by the Atlantic Canada Conservation Data Centre (those ranked S1, S2, S3 or S3S4 in Nova Scotia, for which all locations are databased), I recorded GPS locations along with habitat descriptions and more precise estimates of local abundance. Definitions for S-ranks and for Nova Scotia National General Status ranks (the primary ranks by which species’ significance is determined by Nova Scotia Department of Natural Resources), are given below. Both sets of ranks for Nova Scotia were developed through the consensus of the NS Flora Ranking Committee, led through the cooperation of NS Department of Natural Resources (NS DNR) and Atlantic Canada Conservation Data Centre. The ranks reflect the best understanding of plant status at the time of ranking, but are subject to revision as new information becomes available.

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

- S1 Extremely rare throughout its range in the province (typically 5 or fewer occurrences or very few remaining individuals). May be especially vulnerable to extirpation.
- S2 Rare throughout its range in the province (usually 6 to 20 occurrences or few remaining individuals). May be vulnerable to extirpation due to rarity or other factors.
- S3 Uncommon throughout its range in the province (usually 21 to 100 occurrences), or found only in a restricted range, even if abundant in at some locations.

- S4 Usually widespread, fairly common throughout its range in the province (usually 100+ occurrences), and apparently secure, but the element is of long-term concern.
- S5 Demonstrably widespread, abundant, and secure throughout its range in the province, and essentially ineradicable under present conditions (100+ occurrences).
- S#S# Numeric range rank: A range between two consecutive numeric ranks. Denotes range of uncertainty about the exact rarity of the Element (e.g., S1S2).
- SE Exotic: An exotic species established in the province (e.g., Purple Loosestrife or Coltsfoot); may be native in nearby regions.
- ? 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. In such instances, the decline will be highlighted by an asterisk and an associated comment.
- *Undetermined*: species for which insufficient data, information, or knowledge is available with which to reliably evaluate their general status
- *Not Assessed*: species that are known or believed to be present in the geographic area in Canada to which the general status rank applies but which have not yet been assessed
- *Exotic*: species that have been moved beyond their natural range as a result of human activity. In the *Wild Species 2005* report, exotic species have been purposefully excluded from all other categories.
- *Accidental*: species occurring infrequently and unpredictably outside their usual range

Results and Discussion

I. Site Coverage

Figure 1 maps the tracks covered during the site visits in 2007 and 2008. No site inventory is ever entirely complete, but with 2008 fieldwork combined with that in 2007, I sampled the full diversity of habitats within the turbine footprints. I am confident that the turbine sites are relatively thoroughly covered for vascular plants, especially for native species, and that there is a very low probability of significant numbers of additional rare vascular plant species being present within the turbine sites.

II. Plant Communities

General descriptions of the plant communities at the proposed turbine sites are given in Table 1, with detailed descriptions of species composition for herbaceous and shrub species available from Sean Blaney. Photos taken at the central point of each turbine are shown in Figures 3 to 10. The species composition of the plant communities at the proposed turbine sites and elsewhere in the study site were not rare in a provincial or even a local context. Potential issues relative to plant communities were as follows:

- 1) Most of the proposed footprint (50m radius) of turbine P1-46 was within a wetland, though upland areas were immediately adjacent to the 50m radius turbine footprint on three sides.
- 2) Turbine P1-19 was within intermediate-aged deciduous forest but the centre point was within 10m of a young spruce plantation. Moving the turbine centre roughly 50m northward into the plantation would eliminate impacts on the natural community that is in good condition.

Avoiding impacts on the more mature, natural forest where possible will improve the overall level of environmental impacts of the project, but obviously does not guarantee the persistence of any particular stand in a working landscape in which forest harvesting is actively taking place.

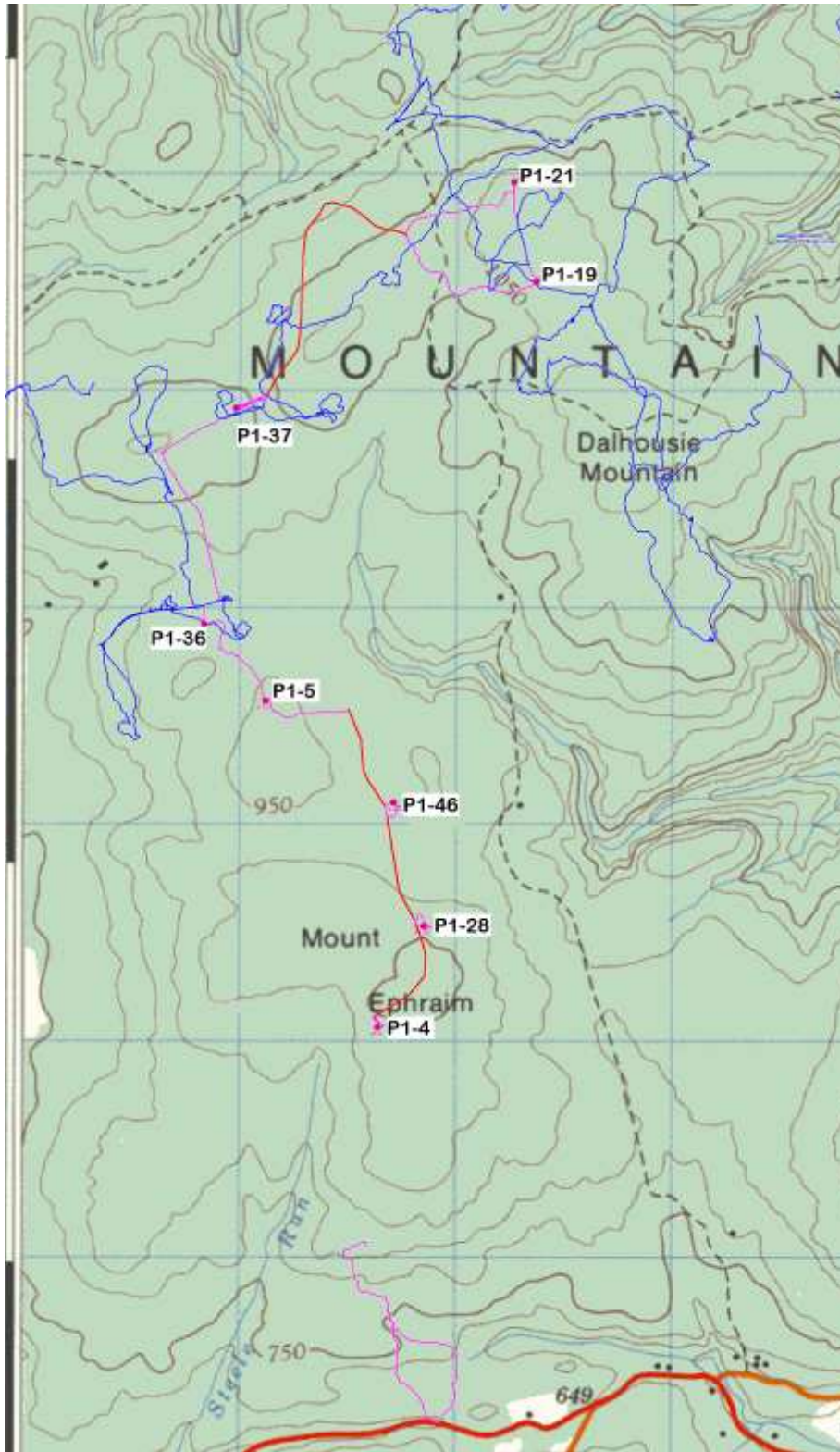


Figure 1. Map of site coverage within area surveyed in 2008. The labelled turbine sites are indicated by pink dots. Magenta lines are areas walked in 2008, red lines are areas driven in 2008, blue lines are areas walked in 2007.

Table 1. Plant communities of proposed turbine sites surveyed in 2008. Turbine sites correspond to those mapped in Figure 1. Common names for species listed here are given in the site plant list in Table 2. Species names in round brackets () are minor constituents.

Turbine#	Estimated Stand Age	Tree Composition	% Tree Cover	Community Description	Notes on Turbine Placement
P1-4	20	Norway spruce, white spruce, yellow birch, balsam fir (white birch, gray birch)	65%	Young spruce plantation	No rare plant species or significant plant community concerns.
P1-28	20	Norway spruce, white spruce, yellow birch, balsam fir (white birch, gray birch)	80%	Young spruce plantation	No rare plant species or significant plant community concerns.
P1-46	8	[Balsam fir – 30%, white birch – 30%, yellow birch – 20%, gray birch – 20%, (trembling aspen)] – almost entirely tall saplings	~10% as trees, 40% as saplings	Regenerating clearcut of peaty conifer swamp and adjacent upland; wettest portion of 50m radius circle around proposed turbine is the northeast quadrant, outer margins of other quadrants extend outside of wetland	No rare plant species or significant plant community concerns. Wetland the only potential issue with this site.
P1-5	15	Black or red spruce – 50%, balsam fir – 40%, white spruce – 10%	60%	Young spruce plantation, pre-commercial thinning about 4 years ago	No rare plant species or significant plant community concerns.
P1-36	15	Balsam fir, red or black spruce	35%	Open, regenerating mixed forest following cutting	No rare plant species or significant plant community concerns.
P1-37	25	Norway spruce, white spruce, balsam fir	80%	Young spruce plantation	No rare plant species or significant plant community concerns.
P1-21	15	Yellow birch – 60%, sugar maple – 20%, balsam fir – 20%, (striped maple)	95%	Centre of turbine site is on small logging trail regenerated to old field species but most of proposed footprint is within young deciduous forest regenerating following clearcutting	No rare plant species or significant plant community concerns.
P1-19	50	Sugar maple – 60%, yellow birch – 30%, beech – 10%	85%	Intermediate-aged deciduous forest near edge of recently cut deciduous forest converted to spruce plantation	Dwarf Ginseng (S3-Secure) present at turbine centre point. Squashberry (S2 – Sensitive, and very rare on mainland NS) occurs 80m WSW of turbine site. Moving turbine impacts into adjacent plantation would reduce impacts on natural community here.

III. Vascular Plants

Table 2 lists the 266 vascular plant taxa (223 native, 43 exotic) identified during fieldwork in 2007 and 2008 with their provincial status under both the S-rank system used continent-wide by all conservation data centres and the National General Status rank system, used by each province and territory.

Table 2. Vascular plants recorded in the study area, with abundance estimates and provincial status ranks. Site Status codes and provincial S-ranks are defined above. Taxonomy follows Kartesz (1999) – *Synthesis of the North American Flora*, CD-ROM. Status ranks in square brackets refer to an indefinite identification for which all potential species have the same rank.

Species / Family Name	Family / Species Common Name	Site Status	NS S-rank	NS General Status Rank	Note
LYCOPODIACEAE	Clubmoss Family				
<i>Huperzia lucidula</i>	Shining Fir-Clubmoss	c	S5	Secure	
<i>Lycopodium annotinum</i>	Stiff Clubmoss	r	S5	Secure	
<i>Lycopodium clavatum</i>	Running Pine	r	S5	Secure	
<i>Lycopodium dendroideum</i>	Treelike Clubmoss	f	S4?	Secure	
EQUISETACEAE	Horsetail Family				
<i>Equisetum arvense</i>	Field Horsetail	c	S5	Secure	
<i>Equisetum sylvaticum</i>	Woodland Horsetail	c	S5	Secure	
OSMUNDACEAE	Flowering-Fern Family				
<i>Osmunda cinnamomea</i>	Cinnamon Fern	c	S5	Secure	
<i>Osmunda claytoniana</i>	Interrupted Fern	c	S5	Secure	
DENNSTAEDTIACEAE	Hay-Scented Fern Family				
<i>Dennstaedtia punctilobula</i>	Eastern Hay-Scented Fern	c	S5	Secure	
<i>Pteridium aquilinum</i> var. <i>latiusculum</i>	Bracken Fern	f	S5	Secure	
THELYPTERIDACEAE	Marsh-Fern Family				
<i>Phegopteris connectilis</i>	Northern Beech Fern	c	S5	Secure	
<i>Thelypteris noveboracensis</i>	New York Fern	c	S5	Secure	
DRYOPTERIDACEAE	Wood-Fern Family				
<i>Athyrium filix-femina</i>	Lady-Fern	c	S5	Secure	
<i>Deparia acrostichoides</i>	Silvery Spleenwort	c	S4	Secure	
<i>Dryopteris campyloptera</i>	Mountain Wood-Fern	c	S5	Secure	
<i>Dryopteris carthusiana</i>	Spinulose Shield Fern	r	S5	Secure	
<i>Dryopteris cristata</i>	Crested Shield-Fern	u	S5	Secure	
<i>Dryopteris intermedia</i>	Evergreen Woodfern	c	S5	Secure	
<i>Gymnocarpium dryopteris</i>	Northern Oak Fern	c	S5	Secure	
<i>Matteuccia struthiopteris</i>	Ostrich Fern	f	S5	Secure	
<i>Onoclea sensibilis</i>	Sensitive Fern	c	S5	Secure	
<i>Polystichum acrostichoides</i>	Christmas Fern	c	S5	Secure	
<i>Polystichum braunii</i>	Braun's Holly-Fern	r	S3S4	Secure	
PINACEAE	Pine Family				
<i>Abies balsamea</i>	Balsam Fir	c	S5	Secure	
<i>Picea abies</i>	Norway Spruce	c	SE	Exotic	planted only
<i>Picea glauca</i>	White Spruce	c	S5	Secure	
<i>Picea mariana</i>	Black Spruce	r	S5	Secure	

Species / Family Name	Family / Species Common Name	Site Status	NS S-rank	NS General Status Rank	Note
<i>Picea rubens</i>	Red Spruce	f	S5	Secure	
<i>Tsuga canadensis</i>	Eastern Hemlock	r	S4S5	Secure	
RANUNCULACEAE	Buttercup Family				
<i>Actaea rubra</i>	Red Baneberry	c	S5	Secure	
<i>Aquilegia vulgaris</i>	European Columbine	r	SE	Exotic	
<i>Coptis trifolia</i>	Goldthread	c	S5	Secure	
<i>Hepatica nobilis var. obtusa</i>	Round-Leaved Hepatica	r	S1	May be at-risk	
<i>Ranunculus abortivus</i>	Kidney-Leaved Buttercup	c	S4S5	Secure	
<i>Ranunculus acris</i>	Tall Butter-Cup	u	SE	Exotic	
<i>Ranunculus recurvatus</i>	Hooked Crowfoot	f	S4	Secure	
<i>Ranunculus repens</i>	Creeping Butter-Cup	c	SE	Exotic	
<i>Thalictrum pubescens</i>	Tall Meadow-Rue	c	S5	Secure	
FUMARIACEAE	Fumitory Family				
<i>Dicentra cucullaria</i>	Dutchman's Breeches	c	S4	Secure	
MYRICACEAE	Bayberry Family				
<i>Morella pensylvanica</i>	Northern Bayberry	r	S5	Secure	
FAGACEAE	Beech Family				
<i>Fagus grandifolia</i>	American Beech	c	S5	Secure	
BETULACEAE	Birch Family				
<i>Alnus incana ssp. rugosa</i>	Speckled Alder	u	S5	Secure	
<i>Alnus viridis ssp. crispa</i>	Green Alder	r	S5	Secure	
<i>Betula alleghaniensis</i>	Yellow Birch	c	S5	Secure	
<i>Betula papyrifera var. papyrifera</i>	Heart-Leaved Paper Birch	c	S5	Secure	
<i>Betula populifolia</i>	Gray Birch	c	S5	Secure	
<i>Corylus cornuta</i>	Beaked Hazelnut	c	S5	Secure	
<i>Ostrya virginiana</i>	Eastern Hop-Hornbeam	r	S5	Secure	
PORTULACACEAE	Purslane Family				
<i>Claytonia caroliniana</i>	Carolina Spring-Beauty	c	S4	Secure	
CARYOPHYLLACEAE	Pink Family				
<i>Moehringia lateriflora</i>	Grove Sandwort	r	S5	Secure	
<i>Stellaria borealis</i>	Northern Stitchwort	r	S4	Secure	
POLYGONACEAE	Smartweed Family				
<i>Polygonum cilinode</i>	Fringed Black Bindweed	f	S5	Secure	
<i>Polygonum hydropiper</i>	Marshpepper Smartweed	u	SE	Exotic	
<i>Polygonum sagittatum</i>	Arrow-Leaved Tearthumb	u	S5	Secure	
<i>Rumex acetosa</i>	Garden Sorrel	r	SE	Exotic	
<i>Rumex acetosella</i>	Sheep Sorrel	c	SE	Exotic	
<i>Rumex crispus</i>	Curly Dock	u	SE	Exotic	
<i>Rumex obtusifolius</i>	Bitter Dock	r	SE	Exotic	
CLUSIACEAE	St. John's-wort Family				
<i>Hypericum ellipticum</i>	Pale St. John's-Wort	r	S5	Secure	
<i>Hypericum perforatum</i>	A St. John's-Wort	f	SE	Exotic	
VIOLACEAE	Violet Family				
<i>Viola blanda</i>	Smooth White Violet	c	S5	Secure	
<i>Viola cucullata</i>	Marsh Blue Violet	c	S5	Secure	
<i>Viola macloskeyi</i>	Smooth White Violet	f	S5	Secure	
<i>Viola pubescens</i>	Downy Yellow Violet	r	S4	Secure	
<i>Viola renifolia</i>	Kidney-Leaf White Violet	r	S4	Secure	

Species / Family Name	Family / Species Common Name	Site Status	NS S-rank	NS General Status Rank	Note
SALICACEAE	Willow Family				
<i>Populus grandidentata</i>	Large-Tooth Aspen	r	S5	Secure	
<i>Populus tremuloides</i>	Quaking Aspen	c	S5	Secure	
<i>Salix bebbiana</i>	Bebb's Willow	c	S5	Secure	
<i>Salix discolor</i>	Pussy Willow	c	S5	Secure	
<i>Salix eriocephala</i>	Heart-Leaved Willow	u	S5	Secure	
<i>Salix humilis</i>	Prairie Willow	u	S5	Secure	
<i>Salix petiolaris</i>	Slender Willow	r	S3	Secure	
<i>Salix pyrifolia</i>	Balsam Willow	u	S5	Secure	
BRASSICACEAE	Mustard Family				
<i>Barbarea vulgaris</i>	Yellow Rocket	r	SE	Exotic	
<i>Cardamine diphylla</i>	Two-Leaf Toothwort	c	S4	Secure	
<i>Cardamine pensylvanica</i>	Pennsylvania Bitter-Cress	c	S5	Secure	
ERICACEAE	Heath Family				
<i>Kalmia angustifolia</i>	Sheep-Laurel	u	S5	Secure	
<i>Ledum groenlandicum</i>	Common Labrador Tea	r	S5	Secure	
<i>Rhododendron canadense</i>	Rhodora	u	S5	Secure	
<i>Vaccinium angustifolium</i>	Late Lowbush Blueberry	c	S5	Secure	
<i>Vaccinium myrtilloides</i>	Velvetleaf Blueberry	r	S5	Secure	
PYROLACEAE	Pyrola Family				
<i>Moneses uniflora</i>	One-Flower Wintergreen	r	S5	Secure	
<i>Pyrola elliptica</i>	Shinleaf	u	S5	Secure	
MONOTROPACEAE	Indian Pipe Family				
<i>Monotropa uniflora</i>	Indian-Pipe	u	S5	Secure	
PRIMULACEAE	Primrose Family				
<i>Lysimachia terrestris</i>	Swamp Loosestrife	r	S5	Secure	
<i>Trientalis borealis</i>	Northern Starflower	c	S5	Secure	
GROSSULARIACEAE	Gooseberry Family				
<i>Ribes glandulosum</i>	Skunk Currant	c	S5	Secure	
<i>Ribes hirtellum</i>	Smooth Gooseberry	u	S5	Secure	
<i>Ribes lacustre</i>	Bristly Black Currant	u	S5	Secure	
<i>Ribes triste</i>	Swamp Red Currant	u	S4	Secure	
CRASSULACEAE	Stonecrop Family				
<i>Hylotelephium telephium</i>	Witch's-Moneybags	r	SE	Exotic	
SAXIFRAGACEAE	Saxifrage Family				
<i>Chrysozplenium americanum</i>	American Golden-Saxifrage	f	S5	Secure	
<i>Mitella nuda</i>	Naked Bishop's-Cap	c	S5	Secure	
ROSACEAE	Rose Family				
<i>Agrimonia striata</i>	Woodland Agrimony	r	S5	Secure	
<i>Amelanchier bartramiana hybrid</i>	Bartram's Serviceberry x serviceberry species	r			
<i>Amelanchier interior</i>	Shadbush	u	S?	Secure	ID probable only
<i>Amelanchier laevis</i>	Allegheny Service-Berry	r	S5	Secure	ID probable only vs. <i>A. arborea</i>
<i>Crataegus monogyna</i>	A Hawthorn	r	SE	Exotic	
<i>Fragaria virginiana</i>	Virginia Strawberry	c	S5	Secure	
<i>Geum macrophyllum</i>	Large-Leaved Avens	c	S5	Secure	
<i>Geum rivale</i>	Purple Avens	f	S5	Secure	
<i>Photinia melanocarpa</i>	Black Chokeberry	r	S5	Secure	

Species / Family Name	Family / Species Common Name	Site Status	NS S-rank	NS General Status Rank	Note
<i>Potentilla norvegica</i> ssp. <i>monspeliensis</i>	Norwegian Cinquefoil	u	S5	Secure	
<i>Potentilla recta</i>	Sulphur Cinquefoil	r	SE	Exotic	
<i>Potentilla simplex</i>	Old-Field Cinquefoil	c	S5	Secure	
<i>Prunus pensylvanica</i>	Fire Cherry	f	S5	Secure	
<i>Prunus serotina</i>	Wild Black Cherry	r	S5	Secure	
<i>Prunus virginiana</i>	Choke Cherry	c	S5	Secure	
<i>Rosa virginiana</i>	Virginia Rose	r	S5	Secure	
<i>Rubus</i> (X <i>Hispidi</i> group)	Trailing Blackberry species	r			perhaps <i>R. provincialis</i>
<i>Rubus allegheniensis</i>	Allegheny Blackberry	r	S5	Secure	
<i>Rubus canadensis</i>	Smooth Blackberry	c	S5	Secure	
<i>Rubus idaeus</i> ssp. <i>strigosus</i>	American Red Raspberry	c	S5	Secure	
<i>Rubus pubescens</i>	Dwarf Red Raspberry	c	S5	Secure	
<i>Sorbus americana</i>	American Mountain-Ash	f	S5	Secure	
<i>Sorbus aucuparia</i>	European Mountain-Ash	r	SE	Exotic	
<i>Sorbus decora</i>	Northern Mountain-Ash	u	S4	Secure	
<i>Spiraea alba</i> var. <i>latifolia</i>	Northern Meadow-Sweet	u	S5	Secure	
<i>Spiraea tomentosa</i>	Hardhack Spiraea	r	S5	Secure	
FABACEAE	Bean Family				
<i>Lotus corniculatus</i>	Birds-Foot Trefoil	r	SE	Exotic	
<i>Trifolium campestre</i>	Low Hop Clover	r	SE	Exotic	
<i>Trifolium hybridum</i>	Alsike Clover	r	SE	Exotic	
<i>Trifolium pratense</i>	Red Clover	r	SE	Exotic	
<i>Trifolium repens</i>	White Clover	r	SE	Exotic	
<i>Vicia cracca</i>	Tufted Vetch	u	SE	Exotic	
ONAGRACEAE	Evening-Primrose Family				
<i>Chamerion angustifolium</i>	Fireweed	c	S5	Secure	
<i>Circaea alpina</i>	Small Enchanter's Nightshade	c	S5	Secure	
<i>Epilobium ciliatum</i>	Hairy Willow-Herb	f	S5	Secure	
<i>Epilobium leptophyllum</i>	Linear-Leaved Willow-Herb	u	S5	Secure	
<i>Epilobium palustre</i>	Marsh Willow-Herb	r	S5	Secure	
<i>Oenothera biennis</i> or <i>parviflora</i>	Evening-Primrose species	f	[S5]	[Secure]	
<i>Oenothera perennis</i>	Small Sundrops	f	S5	Secure	
CORNACEAE	Dogwood Family				
<i>Cornus alternifolia</i>	Alternate-Leaf Dogwood	c	S5	Secure	
<i>Cornus canadensis</i>	Dwarf Dogwood	c	S5	Secure	
ACERACEAE	Maple Family				
<i>Acer pensylvanicum</i>	Striped Maple	c	S5	Secure	
<i>Acer rubrum</i>	Red Maple	c	S5	Secure	
<i>Acer saccharum</i>	Sugar Maple	c	S5	Secure	
<i>Acer spicatum</i>	Mountain Maple	c	S5	Secure	
OXALIDACEAE	Wood-Sorrel Family				
<i>Oxalis montana</i>	White Wood-Sorrel	c	S5	Secure	
<i>Oxalis stricta</i>	Upright Yellow Wood-Sorrel	u	S5	Secure	
GERANIACEAE	Geranium Family				
<i>Geranium robertianum</i>	Herb-Robert	r	S4S5	Secure	
BALSAMINACEAE	Touch-Me-Not Family				
<i>Impatiens capensis</i>	Spotted Jewel-Weed	c	S5	Secure	

Species / Family Name	Family / Species Common Name	Site Status	NS S-rank	NS General Status Rank	Note
ARALIACEAE	Sarsaparilla Family				
<i>Aralia hispida</i>	Bristly Sarsaparilla	r	S5	Secure	
<i>Aralia nudicaulis</i>	Wild Sarsaparilla	c	S5	Secure	
<i>Panax trifolius</i>	Dwarf Ginseng	c	S3	Secure	
APIACEAE	Carrot Family				
<i>Hydrocotyle americana</i>	American Water-Pennywort	u	S5	Secure	
<i>Osmorhiza claytonii</i>	Hairy Sweet-Cicely	u	S4S5	Secure	
SOLANACEAE	Nightshade Family				
<i>Solanum dulcamara</i>	Climbing Nightshade	r	SE	Exotic	
LAMIACEAE	Mint Family				
<i>Galeopsis tetrahit</i>	Brittle-Stem Hempnettle	f	SE	Exotic	ID refers to the species in the broad sense, including <i>G. bifida</i>
<i>Lycopus americanus</i>	American Bugleweed	r	S5	Secure	
<i>Lycopus uniflorus</i>	Northern Bugleweed	c	S5	Secure	
<i>Mentha arvensis</i>	Corn Mint	r	S5	Secure	
<i>Prunella vulgaris</i>	Self-Heal	c	S5	Secure	
<i>Scutellaria lateriflora</i>	Mad Dog Skullcap	c	S5	Secure	
PLANTAGINACEAE	Plantain Family				
<i>Plantago lanceolata</i>	English Plantain	r	SE	Exotic	
<i>Plantago major</i>	Nipple-Seed Plantain	f	SE	Exotic	
OLEACEAE	Olive Family				
<i>Fraxinus americana</i>	White Ash	f	S5	Secure	
SCROPHULARIACEAE	Snapdragon Family				
<i>Chelone glabra</i>	White Turtlehead	c	S5	Secure	
<i>Verbascum thapsus</i>	Great Mullein	r	SE	Exotic	
<i>Veronica officinalis</i>	Gypsy-Weed	c	S5SE	Exotic	
<i>Veronica serpyllifolia</i> ssp. <i>serpyllifolia</i>	Thyme-Leaved Speedwell	u	SE	Exotic	
RUBIACEAE	Bedstraw Family				
<i>Galium asprellum</i>	Rough Bedstraw	c	S5	Secure	
<i>Galium mollugo</i>	Great Hedge Bedstraw	u	SE	Exotic	
<i>Galium palustre</i>	Marsh Bedstraw	c	S5	Secure	
<i>Galium trifidum</i>	Small Bedstraw	u	S5	Secure	ID refers to the species in the broad sense, including <i>G. tinctorium</i>
<i>Galium triflorum</i>	Sweet-Scent Bedstraw	c	S5	Secure	
<i>Mitchella repens</i>	Partridge-Berry	r	S5	Secure	
CAPRIFOLIACEAE	Honeysuckle Family				
<i>Diervilla lonicera</i>	Northern Bush-Honeysuckle	u	S5	Secure	
<i>Linnaea borealis</i>	Twinflower	f	S5	Secure	
<i>Lonicera canadensis</i>	American Fly-Honeysuckle	c	S5	Secure	
<i>Sambucus racemosa</i>	Red Elderberry	c	S5	Secure	
<i>Viburnum edule</i>	Squashberry	r	S2	Sensitive	
<i>Viburnum lantanoides</i>	Alderleaf Viburnum	f	S5	Secure	
<i>Viburnum nudum</i> var. <i>cassinoides</i>	Wild Raisin	r	S5	Secure	
<i>Viburnum opulus</i> var. <i>americanum</i>	Highbush Cranberry	r	S5	Secure	

Species / Family Name	Family / Species Common Name	Site Status	NS S-rank	NS General Status Rank	Note
ASTERACEAE	Aster Family				
<i>Achillea millefolium</i>	Common Yarrow	c	S5	Secure	
<i>Anaphalis margaritacea</i>	Pearly Everlasting	c	S5	Secure	
<i>Antennaria neglecta or howellii</i>	Pussytoes species	r			neither species rare
<i>Arctium minus</i>	Lesser Burdock	r	SE	Exotic	
<i>Bidens frondosa</i>	Devil's Beggar-Ticks	r	S5	Secure	
<i>Cirsium arvense</i>	Creeping Thistle	r	SE	Exotic	
<i>Doellingeria umbellata</i>	Parasol White-Top	c	S5	Secure	
<i>Erigeron strigosus</i>	Daisy Fleabane	u	S5	Secure	
<i>Eupatorium maculatum</i>	Spotted Joe-Pye Weed	u	S5	Secure	
<i>Eupatorium perfoliatum</i>	Common Boneset	r	S5	Secure	
<i>Eurybia macrophylla</i>	Large-Leaf Wood-Aster	r	S5	Secure	
<i>Euthamia graminifolia</i>	Flat-Top Fragrant-Golden-Rod	c	S5	Secure	
<i>Hieracium caespitosum</i>	Meadow Hawkweed	c	SE	Exotic	
<i>Hieracium canadense</i>	Canada Hawkweed	r	S4S5	Secure	
<i>Hieracium lachenalii</i>	Common Hawkweed	c	SE	Exotic	
<i>Hieracium pilosella or x flagellare</i>	Hawkweed species (white leaf undersides)	c	[SE]	[Exotic]	
<i>Hieracium scabrum</i>	Rough Hawkweed	u	S5	Secure	
<i>Hieracium x floribundum</i>	Smoothish Hawkweed	f	SE	Exotic	
<i>Lactuca biennis</i>	Tall Blue Lettuce	f	S5	Secure	
<i>Lactuca canadensis</i>	Canada Lettuce	u	S5	Secure	
<i>Leontodon autumnalis</i>	Autumn Hawkbit	u	SE	Exotic	
<i>Leucanthemum vulgare</i>	Oxeye Daisy	f	SE	Exotic	
<i>Leucanthemum vulgare</i>	Oxeye Daisy	c	SE	Exotic	
<i>Matricaria discoidea</i>	Pineapple-Weed Chamomile	r	SE	Exotic	
<i>Oclemena acuminata</i>	Whorled Aster	c	S5	Secure	
<i>Packera schweinitziana</i>	Robbins Squaw-Weed	c	S4S5	Secure	
<i>Petasites frigidus var. palmatus</i>	Sweet Coltsfoot	r	S4S5	Secure	
<i>Prenanthes altissima</i>	Tall Rattlesnake-root	c	S4S5	Secure	
<i>Prenanthes trifoliolata</i>	Three-Leaved Rattlesnake-root	u	S5	Secure	
<i>Senecio jacobaea</i>	Tansy Ragwort	u	SE	Exotic	
<i>Solidago bicolor</i>	White Goldenrod	u	S5	Secure	
<i>Solidago canadensis</i>	Canada Goldenrod	c	S5	Secure	
<i>Solidago flexicaulis</i>	Broad-Leaved Goldenrod	f	S5	Secure	
<i>Solidago juncea</i>	Early Goldenrod	r	S5	Secure	
<i>Solidago macrophylla</i>	Large-Leaf Goldenrod	u	S4	Secure	
<i>Solidago puberula</i>	Downy Goldenrod	c	S5	Secure	
<i>Solidago rugosa</i>	Rough-Leaf Goldenrod	c	S5	Secure	
<i>Solidago uliginosa</i>	Bog Goldenrod	u	S5	Secure	
<i>Sonchus arvensis</i>	Field Sowthistle	r	SE	Exotic	
<i>Symphotrichum lateriflorum</i>	Farewell-Summer	c	S5	Secure	
<i>Symphotrichum novi-belgii</i>	New Belgium American-Aster	r	S5	Secure	
<i>Symphotrichum puniceum</i>	Swamp Aster	c	S5	Secure	
<i>Taraxacum officinale</i>	Common Dandelion	c	SE	Exotic	
<i>Tripleurospermum maritima</i>	False Mayweed	r	SE	Exotic	
<i>Tussilago farfara</i>	Colt's Foot	u	SE	Exotic	
ARACEAE	Arum Family				
<i>Arisaema triphyllum</i>	Swamp Jack-In-The-Pulpit	r	S4S5	Secure	

Species / Family Name	Family / Species Common Name	Site Status	NS S-rank	NS General Status Rank	Note
<i>Calla palustris</i>	Wild Calla	r	S4	Secure	
JUNCACEAE	Rush Family				
<i>Juncus balticus</i> var. <i>littoralis</i>	Baltic Rush	r	S5	Secure	
<i>Juncus brevicaudatus</i>	Narrow-Panicled Rush	r	S5	Secure	ID probable only – very young
<i>Juncus bufonius</i>	Toad Rush	u	S5	Secure	
<i>Juncus effusus</i>	Soft Rush	c	S5	Secure	
<i>Juncus filiformis</i>	Thread Rush	r	S5	Secure	
<i>Juncus tenuis</i>	Slender Rush	f	S5	Secure	
<i>Luzula acuminata</i>	Hairy Woodrush	r	S5	Secure	
<i>Luzula multiflora</i>	Common Woodrush	c	S5	Secure	
CYPERACEAE	Sedge Family				
<i>Carex arctata</i>	Black Sedge	c	S5	Secure	
<i>Carex brunnescens</i> ssp. <i>sphaerostachya</i>	Brownish Sedge	c	S5	Secure	
<i>Carex canescens</i>	Hoary Sedge	u	S5	Secure	
<i>Carex communis</i>	Fibrous-Root Sedge	c	S5	Secure	
<i>Carex crawfordii</i>	Crawford Sedge	r	S5	Secure	
<i>Carex crinita</i>	Fringed Sedge	r	S4S5	Secure	
<i>Carex debilis</i>	White-Edge Sedge	c	S5	Secure	
<i>Carex deweyana</i>	Short-Scale Sedge	c	S4	Secure	
<i>Carex disperma</i>	Softleaf Sedge	c	S5	Secure	
<i>Carex flava</i>	Yellow Sedge	u	S5	Secure	
<i>Carex gracillima</i>	Graceful Sedge	u	S4S5	Secure	
<i>Carex gynandra</i>	A Sedge	c	S5	Secure	
<i>Carex interior</i>	Inland Sedge	f	S4S5	Secure	ID probable only
<i>Carex intumescens</i>	Bladder Sedge	c	S5	Secure	
<i>Carex lenticularis</i>	Shore Sedge	r	S4	Secure	
<i>Carex leptalea</i>	Bristly-Stalk Sedge	c	S5	Secure	
<i>Carex leptoneuria</i>	Finely-Nerved Sedge	c	S5	Secure	
<i>Carex magellanica</i> ssp. <i>irrigua</i>	A Sedge	r	S5	Secure	
<i>Carex novae-angliae</i>	New England Sedge	c	S5	Secure	
<i>Carex pallescens</i>	Pale Sedge	u	S5	Secure	
<i>Carex projecta</i>	Necklace Sedge	c	S4S5	Secure	
<i>Carex scabrata</i>	Rough Sedge	u	S5	Secure	
<i>Carex scoparia</i>	Pointed Broom Sedge	f	S5	Secure	
<i>Carex stipata</i>	Stalk-Grain Sedge	c	S5	Secure	
<i>Carex torta</i>	Twisted Sedge	r	S5	Secure	
<i>Carex trisperma</i> var. <i>trisperma</i>	Three-Seed Sedge	u	S5	Secure	
<i>Eleocharis tenuis</i>	Slender Spike-Rush	r	S5	Secure	ID refers to the species in the broad sense, including <i>E. elliptica</i>
<i>Scirpus atrocinctus</i>	Black-Girdle Bulrush	r	S5	Secure	
<i>Scirpus cyperinus</i>	Cottongrass Bulrush	c	S5	Secure	ID probable only vs. <i>S. atrocinctus</i>
<i>Scirpus hattorianus</i>	Bulrush	f	S5	Secure	
<i>Scirpus microcarpus</i>	Small-Fruit Bulrush	f	S5	Secure	
POACEAE	Grass Family				
<i>Agrostis gigantea</i>	Black Bentgrass	u	SE	Exotic	
<i>Agrostis perennans</i>	Perennial Bentgrass	u	S4S5	Secure	ID probable only
<i>Anthoxanthum odoratum</i>	Sweet Vernal Grass	u	SE	Exotic	

Species / Family Name	Family / Species Common Name	Site Status	NS S-rank	NS General Status Rank	Note
<i>Brachyelytrum septentrionale</i>	Bearded Short-Husk	u	S4S5	Secure	
<i>Bromus ciliatus</i>	Fringed Brome	r	S4S5	Secure	
<i>Calamagrostis canadensis</i>	Blue-Joint Reedgrass	f	S5	Secure	
<i>Cinna latifolia</i>	Slender Wood Reedgrass	c	S5	Secure	
<i>Dactylis glomerata</i>	Orchard Grass	r	SE	Exotic	
<i>Danthonia spicata</i>	Poverty Oat-Grass	c	S5	Secure	
<i>Dichanthelium acuminatum</i>	Panic Grass	c	S5	Secure	
<i>Dichanthelium boreale</i>	Northern Witchgrass	r	S5	Secure	
<i>Elymus repens</i>	Quackgrass	r	SE	Exotic	
<i>Festuca filiformis</i>	Hair Fescue	c	SE	Exotic	
<i>Festuca rubra</i>	Red Fescue	u	S5	Secure	
<i>Glyceria canadensis</i>	Canada Manna-Grass	r	S5	Secure	
<i>Glyceria striata</i>	Fowl Manna-Grass	c	S5	Secure	
<i>Milium effusum</i> var. <i>cisatlanticum</i>	Tall Millet-Grass	u	S3	Secure	
<i>Phalaris arundinacea</i>	Reed Canary Grass	u	S5	Secure	
<i>Phleum pratense</i>	Meadow Timothy	r	SE	Exotic	
<i>Poa alsodes</i>	Grove Meadow Grass	u	S4	Secure	
<i>Poa annua</i>	Annual Bluegrass	u	SE	Exotic	
<i>Poa compressa</i>	Canada Bluegrass	u	SE	Exotic	
<i>Poa palustris</i>	Fowl Bluegrass	f	S5	Secure	
<i>Poa pratensis</i>	Kentucky Bluegrass	c	S5	Secure	
<i>Poa saltuensis</i>	Drooping Bluegrass	r	S4S5	Secure	
<i>Torreyochloa pallida</i> var. <i>fernaldii</i>	Pale Manna Grass	r	S4S5	Secure	
TYPHACEAE	Cattail Family				
<i>Typha latifolia</i>	Broad-Leaf Cattail	r	S5	Secure	
LILIACEAE	Lily Family				
<i>Clintonia borealis</i>	Clinton Lily	c	S5	Secure	
<i>Erythronium americanum</i>	Yellow Trout-Lily	c	S4S5	Secure	
<i>Maianthemum canadense</i>	Wild Lily-of-The-Valley	c	S5	Secure	
<i>Maianthemum racemosum</i>	Solomon's-Plume	c	S4S5	Secure	
<i>Medeola virginiana</i>	Indian Cucumber-Root	f	S5	Secure	
<i>Polygonatum pubescens</i>	Downy Solomon's-Seal	c	S4S5	Secure	
<i>Streptopus amplexifolius</i>	Clasping Twisted-Stalk	f	S4S5	Secure	
<i>Streptopus lanceolatus</i>	Rosy Twistedstalk	c	S5	Secure	
<i>Trillium cernuum</i>	Nodding Trillium	f	S4	Secure	
<i>Trillium erectum</i>	Red Trillium	f	S3	Secure	
<i>Trillium undulatum</i>	Painted Trillium	r	S5	Secure	
IRIDACEAE	Iris Family				
<i>Sisyrinchium montanum</i>	Strict Blue-Eyed-Grass	u	S5	Secure	
ORCHIDACEAE	Orchid Family				
<i>Corallorhiza trifida</i>	Early Coralroot	u	S3	Secure	
<i>Cypripedium acaule</i>	Pink Lady's-Slipper	u	S5	Secure	
<i>Listera convallarioides</i>	Broad-Leaved Twayblade	r	S3	Secure	
<i>Platanthera dilatata</i>	Leafy White Orchis	u	S4S5	Secure	
<i>Platanthera orbiculata</i>	Large Roundleaf Orchid	r	S3	Secure	ID probable only vs. <i>P. macrophylla</i>
<i>Platanthera psycodes</i>	Small Purple-Fringe Orchis	u	S4	Secure	ID probable only vs. <i>P. grandiflora</i>

IV. Rare vascular plants

Six rare plant species tracked by the Atlantic Canada Conservation Data Centre (S-ranks of S1 to S3S4) were found on the site, with locations and status given in Table 2. Their status on the site and within Nova Scotia is described in detail below. Only one of these rare species has General Status rank of *Maybe at Risk* or *Sensitive*, which make them of concern to NS DNR. The remaining seven species are ranked *Secure* in Nova Scotia under the National General Status of Wildlife process and are thus of limited concern to NS DNR. Figure 2 maps rare species locations.

Table 2. Rare plant observations from 2007 and 2008 within area surveyed in 2008, with status ranks. Site numbers correspond to those mapped in Figure 2.

Site#	Species	Common Name	Latitude	Longitude	S-rank	General Status Rank	Year Observed
01	<i>Viburnum edule</i>	Squashberry	45.572369	-62.966668	S3	Sensitive	2007
10	<i>Corallorhiza trifida</i>	Early Coralroot	45.56936	-62.968342	S3	Secure	2007
31	<i>Panax trifolius</i>	Dwarf Ginseng	45.574426	-62.977276	S3	Secure	2007
32	<i>Panax trifolius</i>	Dwarf Ginseng	45.573863	-62.976953	S3	Secure	2007
33	<i>Panax trifolius</i>	Dwarf Ginseng	45.572501	-62.980501	S3	Secure	2007
34	<i>Panax trifolius</i>	Dwarf Ginseng	45.568403	-62.984621	S3	Secure	2007
35	<i>Panax trifolius</i>	Dwarf Ginseng	45.569361	-62.987024	S3	Secure	2007
36	<i>Panax trifolius</i>	Dwarf Ginseng	45.560894	-62.99049	S3	Secure	2007
62	<i>Panax trifolius</i>	Dwarf Ginseng	45.571249	-62.964063	S3	Secure	2007
63	<i>Panax trifolius</i>	Dwarf Ginseng	45.570521	-62.965492	S3	Secure	2007
69	<i>Panax trifolius</i>	Dwarf Ginseng	45.56951	-62.969589	S3	Secure	2007
71	<i>Panax trifolius</i>	Dwarf Ginseng	45.57363	-62.964401	S3	Secure	2007
119	<i>Salix petiolaris</i>	Slender Willow	45.57666	-62.975319	S3	Secure	2008
121	<i>Panax trifolius</i>	Dwarf Ginseng	45.573963	-62.96875	S3	Secure	2008
122	<i>Viburnum edule</i>	Squashberry	45.57368	-62.969694	S3	Sensitive	2008
124	<i>Milium effusum</i> var. <i>cisatlanticum</i>	Wild Millet	45.533928	-62.979573	S3	Secure	2008
126	<i>Trillium erectum</i>	Red Trillium	45.53371	-62.980129	S3	Secure	2008

i) Very rare species, of concern to Nova Scotia Department of Natural Resources, mapped in Figure 2.

Squashberry - *Viburnum edule* (S2, Sensitive)

In 2007, One small patch was found over a 3m x 3m area in balsam fir – black spruce swamp 250m southeast of turbine P1-19. This represented the first mainland Nova Scotia record for this northern species, 190 km from the nearest records in Cape Breton, where it is locally fairly frequent along rivers in the Cape Breton Highlands and 160 km from records in Fundy National Park in New Brunswick. In 2008, another small population of about 15 shoots in 203 clones were found in a moist area within mature sugar maple – yellow birch forest, 80m from the central point of turbine P1-19.

ii) Marginally rare species, tracked by Atlantic Canada Conservation Data Centre but of limited concern to Nova Scotia Department of Natural Resources, mapped in Figure 3 except for Dwarf Ginseng

Early Coralroot - *Corallorhiza trifida* (S3, Secure)

Plants were seen in three areas in 2007, one of which was within 500m of turbine P1-19 (sites separated by 90m). This site was unusually large for the species with hundreds of stems. In all cases, plants were in small, wet, seepage areas with *Sphagnum* moss and Cinnamon Fern (*Osmunda cinnomomea*) within sugar maple – yellow birch forest. The species is widespread but uncommon across northern Nova Scotia from the Annapolis Valley to Cape Breton and is rare in southern Nova Scotia.

Tall Millet-Grass - *Milium effusum* var. *cisatlanticum* (S3, Secure)

Plants were seen in three sites outside the area surveyed in 2008 and at a single site in 2008 in mature sugar maple-beech forest along the proposed powerline south of the Mount Thom quarry. This grass species is uncommon to locally common in richer, higher elevation sugar maple forests in the Cape Split area, the Cobequid Mountains and in Cape Breton. It is very rare in lowland deciduous forests in Nova Scotia.

Dwarf Ginseng - *Panax trifolius* (S3, Secure)

This species was present in large numbers, primarily in more mature deciduous forests, in 54 recorded sites within the proposed development area (mapped in Figure 4), including many stretches where it was present for many metres. Recent 2007 fieldwork by Sean Blaney and the AC CDC in Cobequid Mountain sites between Portapique and Marshy Hope has found this species to be widespread and locally abundant in deciduous forests. If this level of abundance (which is not known in other regions of the Maritimes) is general across the eastern part of the Cobequid Mountains, this species' S-rank should be revised to S4. Dwarf Ginseng occurrences observed on site are mapped in Figure XX, but these undoubtedly under-represent the total distribution of the species in the study area. It appears to be present in most deciduous forest on-site. Because of the widespread occurrence of Dwarf Ginseng, avoiding impacts on more mature and less-disturbed forest habitats, where possible, is probably more valuable for conserving the natural heritage value of the site than is concern over particular Dwarf Ginseng populations, especially the few that occur in already significantly disturbed habitats. The locations where Dwarf Ginseng is most abundant do, however, tend to correlate with the highest quality deciduous forest habitats on site.

Red Trillium - *Trillium erectum* (S3, Secure)

This species was scattered in sugar maple forest outside the 2008 survey area, with only a few plants found at one site along the proposed powerline south of the Mount Thom quarry. It has a relatively limited distribution in Nova Scotia, being restricted to the Annapolis Valley and Cobequid Mountains north to about the New Glasgow area but it can be locally abundant within those regions to the point where it is a strong candidate for ranking revision to S4, which would remove it from the AC CDC tracking list.

Slender Willow – *Salix petiolaris* (S3, Secure)

Seven small clumps were observed over 2m in a moist area at the edge of a recently cut stand regenerated from an old field, 450m from turbine site P1-21. This species was not found in Nova Scotia until relatively recently (after 1969), but has recently been shown to be widely scattered in Cumberland County and occurring from the Stewiacke area south almost to Kejimikujik National Park. It often occurs in highly disturbed sites such as ditches or logging road margins and may be increasing in association with those habitats. As a result, it was given a General Status rank of Secure by the Nova Scotia Department of Natural Resources.

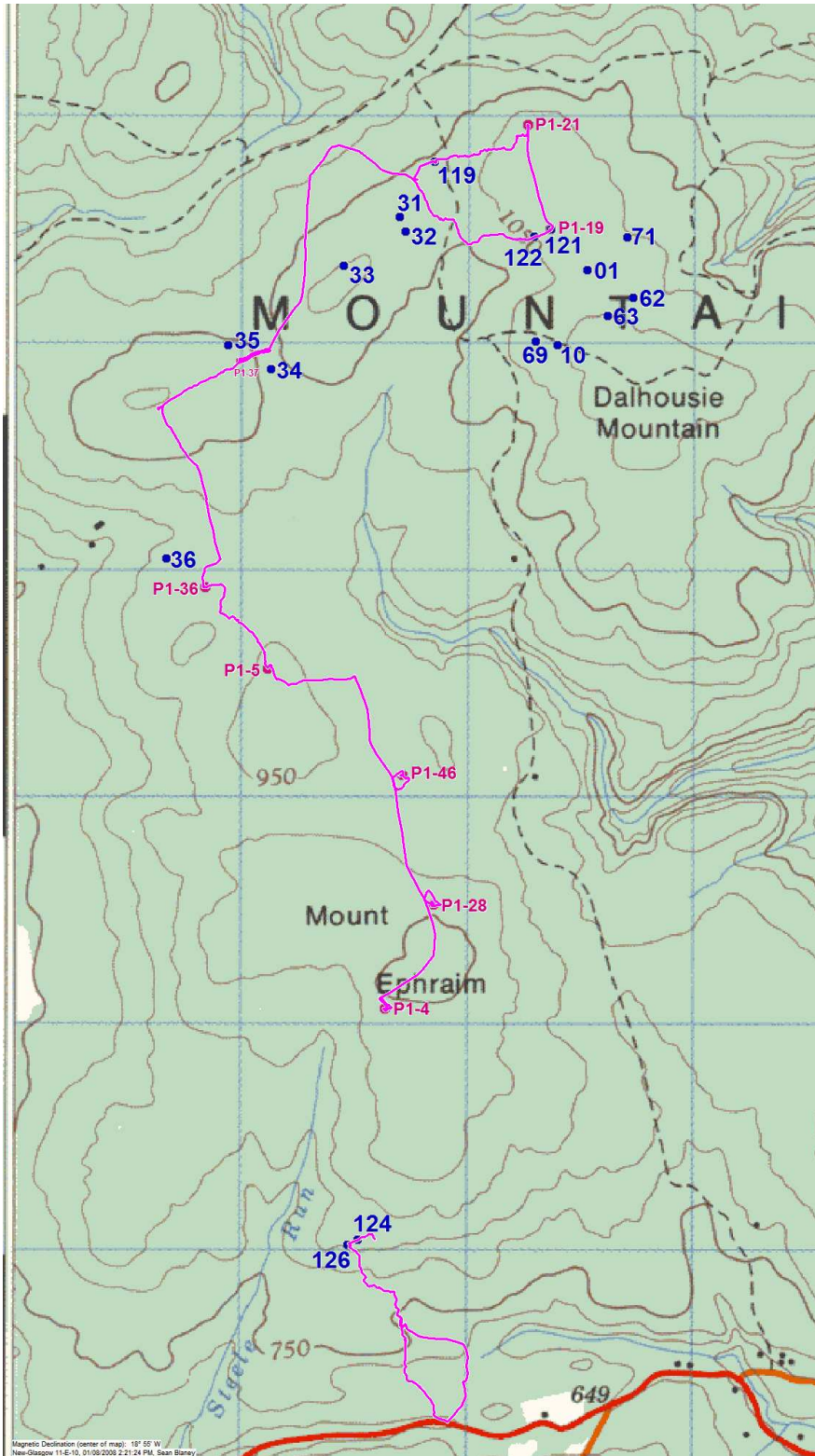


Figure 2. Rare vascular plant locations (blue numbered dots) relative to turbine locations (pink numbered dots) and tracks taken in the field in 2008 (magenta lines). Rare plant location numbers correspond to those given in Table 2.

V. *Photographs of proposed turbine sites*



Figure 3. Turbine site P1-4, looking in from the existing logging road. The turbine centre point is within the low trees at the back of the picture.

Figure 4. Turbine site P1-5 at turbine centre point.



Figure 5. Turbine site P1-19 at turbine centre point.



Figure 6. Turbine site P1-21 at turbine centre point.



Figure 7. Turbine site P1-28, from existing logging road. Turbine centre point is within the spruces at the back of the picture.



Figure 8. Turbine site P1-36 at turbine centre point.



Figure 9. Turbine P1-37, from turbine centre point.



Figure 10. Turbine P1-46, from turbine centre point.

AS 4: Agreement on Trail Location

COOPERATION AGREEMENT

BETWEEN

Reuben Burge, President of RMS energy

AND

Gordon Young, Representative of the Pictou County Trails Association (PCTA)

RMSenergy is proposing to install and operate wind turbines on Dalhousie Mountain using the “Old Dalhousie Mountain Settlement Roads” from Fitzpatrick’s Mountain through to Mount Thom.

The PCTA is proposing to route a trail to connect the existing Fitzpatrick’s Mountain walking trail to the existing trail system in the Gully Lake Wilderness Protected Area located to the west of the proposed wind farm

Reuben Burge and Gordon Young agree that if acting reasonably the placement of wind turbines and walking trails on Dalhousie Mountain may be compatible land uses. We agree that working together by sharing knowledge and resources for both of the projects will have a positive outcome for the environment and the public.

We acknowledge the fact that the Wind Farm is located on privately owned property with long term agreements in place to use the land for Wind Energy Production only and that all other uses must be approved by the individual owners.

DATE _____

REUBEN BURGE

WITNESS

DATE _____

GORDON YOUNG

WITNESS

AS 5: Report on Spring Migration and Breeding Bird Survey

**PRE-CONSTRUCTION BIRD MONITORING:
DALHOUSIE MOUNTAIN WIND FARM
PROJECT**

Prepared by: Steve Vines, M.E.S.

July 2008

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INTRODUCTION

RMS Energy Limited has proposed to construct and operate a 60 megawatt wind turbine facility in Western Pictou County, Nova Scotia. The project would see the construction of forty 1.5 megawatt wind turbines over a 28 square kilometer area of Dalhousie Mountain and Mount Ephraim.

As part of the environmental assessment process for such a project, RMS Energy Limited is required to carry out a pre-construction bird monitoring program to establish the baseline populations of breeding, migrating, and wintering birds. This report details the established pre-construction methodology for sampling avian populations of the project area during each of these critical periods and includes the findings of the monitoring program.

METHODOLOGY

Literature Review

There has been a great deal of research done on the potential impacts of wind turbines on avian populations. In recent years, the Canadian Wildlife Service of Environment Canada (CWS) has published a number of documents to help the proponents of wind turbine projects to establish appropriate monitoring protocols. This monitoring is designed to measure the impact of wind turbine projects on avian populations through first establishing the baseline bird population and species composition. Monitoring continues through the construction and post-construction phases of the project.

The monitoring protocols established in this document were designed using information from personal communication with Dan Busby of CWS and two documents published by CWS:

- Canadian Wildlife Service. (2006). *Recommended protocols for monitoring impacts of wind turbines on birds*. Environment Canada
- Canadian Wildlife Service. (2006). *Wind turbines and birds: A guidance document for environmental assessment*. Environment Canada

Bird Migration Surveys

Bird migration surveys were carried out to determine if the study area is an important migration route for birds. The migration period can extend over several months as different species will move at different times. It is also impossible to predict exactly

when birds may be moving through the region. Determining the project area's importance to migrating birds required multiple visits in the spring and fall months.

In this region there is generally a core migration period when large numbers of birds will pass through in the spring and fall. There are also shoulder migration periods when birds can be observed migrating in smaller numbers. The core spring migration period is the first three weeks of May. In the fall of the year, core migration can be observed during the first three weeks of September. The shoulder migration period can extend several weeks on either side of the core period (Pers. Com. Dan Busby, 2007).

During the core migration periods site surveys were carried out two days per week. During spring migration two surveys per week were carried out for the entire month of May as the peak migration period actually seemed to be later than anticipated. The core fall migration surveys were carried out during the first 3 weeks of September 2007. As with the spring, 2 surveys were completed during each of these weeks. During the shoulder periods site surveys we carried out one day per week. These surveys were carried out during the weeks of April 13, 20, 27, May 25, June 1, 8, 15, 2008 and August 29, September 23, 30, October 7, 14, 2007.

The same survey methodology was used in the spring and the fall migration. Each survey followed the protocols established by the Canadian Wildlife Service (CWS) for migration stopover counts. Each stopover count used standardized area searches and sampled each of the habitat types identified in the project area. The area searches consisted of transects used during other phases of the bird monitoring program. Each survey date involved walking four transects each between 1 and 1.2 kilometres in length. The transects passed through the variety habitats found in the project area and also sampled areas which were thought to be attracted to migrants including areas with secondary growth and edge areas which offered food sources and cover. Surveys were only conducted on days when weather conditions were within expected parameters. Each survey was conducted between one-half hour before sunrise and four hours after sunrise.

Breeding Bird Surveys

Breeding bird populations were sampled during the month of June through the use of area searches and point counts. Point counts were established to sample each of the major habitat types in the project area (see Table 2). Each point count was within 500 metres of a proposed wind turbine location. Several point counts were performed at proposed turbine locations, others sampled the slopes below proposed turbine locations while others sampled the same habitat as proposed turbine locations. Point counts were carried out in the mornings between one-half hour before sunrise and four hours after sunrise. Thirty-two areas were sampled between June 10, 2007 and June 18, 2007. The point counts were repeated using the same geo-referenced positions between June 25th and June 30th. A total of 65 point counts were completed. Weather conditions in June were not optimal for conducting point counts and many days were not suitable due to excessive

wind, precipitation and/or fog. Several of the days point counts were conducted the wind speed did increase as the morning went on but not to the point that recommended parameters were exceeded. When the wind-speed did increase, attempts were made to conduct point counts which were in the lee of the wind. Due to the fragmented nature of the project area due to forest harvesting it was at times difficult to sample only one habitat type per point count.

Each point count followed the protocols established by the Canadian Wildlife Service (CWS). Ten minute point counts were conducted in two 5 minute consecutive intervals. All species and numbers of individuals detected were recorded for the first 5 minute interval. During the second 5 minute interval additional species and individuals not detected in the first interval were recorded. The results of the two intervals were then added together.

Species at Risk

A desk-top search was conducted to determine if there are any species of conservation concern which may be found in the area of the proposed wind project. The following websites were consulted:

- Committee on the Status of Endangered Wildlife in Canada – www.speciesatrisk.ca
- The Nova Scotia Department of Natural Resources General Status Ranks of Wild Species in Nova Scotia – www.gov.ns.ca/natr/wildlife/genstatus
- The Atlantic Canada Conservation Data Centre – www.accdc.com/products/lists

The search revealed a number species of conservation concern which may be present in the project area. In April of 2007, COSEWIC raised the status of the Common Nighthawk and the Chimney Swift to ‘Threatened’. The Department of Natural Resources lists 10 species as ‘Yellow’ or sensitive to human activities or natural events which could potentially be found in the project area. No ‘Red’ or endangered listed species are likely to be present.

Raptor Watch

The raptor watch was conducted between mid September and the end of October 2007. During that period four days were spent watching for migrating raptors. Had there been more observations of raptors on these and other monitoring days in the project area, additional monitoring days would have been added had the project area been determined to be in an area important to migrating raptors.

Two vantage points were identified in the project area that provide good panoramic views of the project area. Effort was divided between these two viewing areas. Observations were made between 9 am and 4 pm. All raptors observed were identified and notes taken on observed behavior (i.e. hunting).

Wintering Birds

During the winter months (December-March) standardized area searches sampling the variety of habitats in the project area were conducted. One visit each month during the winter was carried out to determine the over-wintering species composition of the project area and population estimates. The area searches made use of transects used during other phases of the bird monitoring program.

RESULTS AND DISCUSSION

Breeding Birds Survey

A total of 58 bird species were detected in the study area during the point count surveys and the area searches (See Table 1). The most common species observed in the project area during breeding season include, the Black-throated Green Warbler, American Robin, White-throated sparrow, Ovenbird, Red-eyed Vireo, and Common Yellowthroat.

One species observed, the Olive-sided Flycatcher, is listed by the Committee on the Status of Endangered Species in Canada (COSEWIC) as a species of conservation concern. Listed as Threatened, which describes a "...species that is likely to become endangered if limiting factors are not reversed" (COSWIC, 2008). Unfortunately, the exact cause of the decline in numbers is not known.

Three species found in the project area, Olive-sided Flycatcher, Gray Jay, and Boreal Chickadee, are described as 'Yellow' or sensitive to human activities or natural events by the Nova Scotia Department of Natural Resources (DNR). The Olive-sided Flycatcher may benefit from the forest harvesting activities in the region. The project area is comprised of approximately 40% regenerating young forest with many dead snags scattered throughout. Such environments provide excellent feeding areas for the Olive-sided Flycatcher. It was been suggested that the decline in numbers of the Olive-sided

Table 1. Breeding Bird Species List for Dalhousie Mountain Project area

COMMON NAME	SCIENTIFIC NAME	SRANK	BREEDING EVIDENCE	ABUNDANCE 1st SURVEY	ABUNDANCE 2nd SURVEY

Ruffed Grouse	Bonasa umbellus	S5B	H	1	
Spruce Grouse	Falcipennis canadensis	S5B	H	1*	
Sharp-shinned Hawk	Accipiter striatus	S4B	H		1F
Red-tailed Hawk	Buteo jamaicensis	S5B	T	1*	1*
American Kestrel	Falco sparverius	S5B	H	1*	
Mourning Dove	Zenaida macroura	S5B	S	1*	
Barred Owl	Strix varia	S5B	T	1*	
Ruby-throated Hummingbird	Archilochus colubris	S5B	H		1F
Yellow-bellied Sapsucker	Sphyrapicus varius	S5B	NY	4	4
Downy Woodpecker	Picoides pubescens	S5B	NY	1	1
Hairy Woodpecker	Picoides villosus	S5B	NY	2	3
Black-backed Woodpecker	Picoides arcticus	S4B	NY	2*	
Northern Flicker	Colaptes auratus	S5B	T	2	2+1F
Olive-sided Flycatcher	Contopus cooperi	S4B	T	9	6
Eastern Wood-Pewee	Contopus virens	S4B	S	1	1
Yellow-bellied Flycatcher	Empidonax flaviventri	S5B	T	7	5
Alder Flycatcher	Empidonax alnorum	S5B	T	11	6
Least Flycatcher	Empidonax minimus	S5B	T	7	6
Blue-headed Vireo	Vireo solitarius	S5B	CF	3	4
Red-eyed Vireo	Vireo olivaceus	S5B	CF	18	31
Gray Jay	Perisoreus canadens	S4B	T	3*	
Blue Jay	Cyanocitta cristata	S5B	T	3	2
American Crow	Corvus brachyrhynchos	S5B	FY	3	4
Common Raven	Corvus Corax	S5B	FY	1	1
Black-capped Chickadee	Poecile atricapillus	S5B	FY	4	9
Boreal Chickadee	Poecile hudsonica	S4B	S	1	1
Red-breasted Nuthatch	Sitta canadensis	S5B	H	1	2
White-breasted Nuthatch	Sitta carolinensis	S4B	H		1
Winter Wren	Troglodytes troglodytes	S5B	T	7	12
Golden-crowned Kinglet	Regulus satrapa	S5B	S	2	3
Ruby-crowned Kinglet	Regulus calendula	S5B	CF	14	10
Swainson's Thrush	Catharus ustulatus	S5B	CF	4	5
Hermit Thrush	Catharus guttatus	S5B	T	20	17
American Robin	Turdus migratorius	S5B	CF	35	43
Cedar Waxwing	Bombycilla cedrorum	S5B	S	6F	2
Nashville Warbler	Vermivora ruficapilla	S5B	S		1
Northern Parula	Parula americana	S5B	NB	5	2
Chestnut-sided Warbler	Dendroica pensylvanica	S5B	T	3	1
Magnolia Warbler	Dendroica magnolia	S5B	A	11	16
Black-throated Blue Warbler	Dendroica caerulescens	S4B	S	2	
Yellow-rumped Warbler	Dendroica coronata	S5B	CF	7	10
Black-throated Green Warbler	Dendroica virens	S5B	CF	49	40
Blackburnian Warbler	Dendroica fusca	S4S5B	S	4	1
Palm Warbler	Dendroica palmarum	S5B	S	2	2
Bay-breasted Warbler	Dendroica castanea	S5B	S	1*	
Black-and-white Warbler	Mniotilta varia	S5B	CF	12	15
American Redstart	Setophaga ruticilla	S5B	A	7	3

Ovenbird	<i>Seiurus aurocapilla</i>	S5B	CF	40	24
Mourning Warbler	<i>Oporornis philadelphia</i>	S5B	T	2	4
Common Yellowthroat	<i>Geothlypis trichas</i>	S5B	CF	25	15
Song Sparrow	<i>Melospiza melodia</i>	S5B	NY	7	7
Lincoln's Sparrow	<i>Melospiza lincolni</i>	S5B	T	7	5
Swamp Sparrow	<i>Melospiza georgiana</i>	S5B	S	1*	
White-throated Sparrow	<i>Zonotrichia albicollis</i>	S5B	CF	40	35
Dark-eyed Junco	<i>Junco hyemalis</i>	S5b	CF	7	12
Common Grackle	<i>Quiscalus quiscula</i>	S5B	H	1F	
Purple Finch	<i>Carpodacus purpure</i>	S5B	S	2	1
American Goldfinch	<i>Carduelis tristis</i>	S5B	T	8	4

*Species found in area search or between point counts

F – Species flew through point count area without stopping

¹Nova Scotia S-ranks from the Atlantic Canada Conservation Data Centre Website

²Breeding Evidence Codes: (Taken from Maritime Breeding Bird Atlas Project)

POSSIBLE

H – Species observed in its breeding season in suitable nesting habitat

S – Singing male(s) present, or breeding calls heard, in suitable nesting habitat in breeding season

PROBABLE

P – Pair observed in suitable nesting habitat in nesting season

T – Permanent territory presumed through registration of territorial song, or the occurrence of an adult bird, at the same place, in breeding habitat, on at least two days a week or more apart, during its breeding season

D – Courtship or display, including interaction between a male and a female or two males, including courtship feeding or copulation

A – Agitated behavior or anxiety calls of an adult

CONFIRMED

NB – Nest-building or carrying nest materials, for all species except wrens and woodpeckers

DD – Distraction display or injury feigning

NU – Used nest or egg shells found (occupied or laid within the period of the survey)

FY – Recently fledged young or downy young, including incapable of sustained flight

AE – Adults leaving or entering nest site in circumstances indicating occupied nest

FS – Adult carrying fecal sac

CF – Adult carrying food

NE – Nest containing eggs

NY – Nest with young seen or heard

Flycatcher is due to loss of wintering areas. (Cornell Website) The same cannot be said for the Gray Jay and the Boreal Chickadee which have suffered from the fragmentation and loss of mature coniferous habitats. Gray Jays were only encountered during one visit while traveling between point counts. The Gray Jays location was not within 500 metres of any proposed wind turbine location and at a lower elevation. Boreal Chickadee was detected on the same point count during both survey periods. Only one individual was

found on each point count. The low number of Gray Jays and Boreal Chickadees encountered during the surveys and the lack of suitable habitat suggest that the project area is of low importance to both species.

Area searches were conducted at various times during the day to detect species which may not be easily detected by listening or are more active at other times than the early morning hours. Area searches were conducted in each of the major habitat types in the project area. The amount of effort for each search was recorded both in time and distance traversed. Each species encountered by a search was recorded and individual birds counted.

Habitats

The project area consists largely of two major habitat types, mature deciduous forest and regenerating young forest. There is mature coniferous forest in the project area; however, this habitat type is greatly reduced due to commercial forest harvesting. The mature coniferous forest that does exist in the project area is generally in ravines or on the lower portion of slopes at much lower elevations than the proposed turbine locations. One small area of mature coniferous forest was sampled during the later survey period. The site is so small it was not found during the first survey. At less than 2 hectares in size, the area was found to be too small to sample by point count as species from bordering habitats were also detected. The open upland surrounding the Dalhousie Mountain fire tower was sampled. See Table 2 for a list of habitats sampled and the number of point counts conducted in each.

Table 2. Habitats Sampled During Point Count Surveys

HABITAT TYPE	NUMBER OF POINT COUNTS COMPLETED		
	1 ST SURVEY	2ND SURVEY	TOTAL
Mature Deciduous Forest	13	13	26
Mature Mixed Forest	3	3	6
Mature Coniferous Forest		1	1
Young Deciduous Forest	1	1	2
Young Coniferous Forest	5	5	10
Young Mixed Forest	8	8	16
Young Pine Forest	1	1	2
Open Upland Country	1	1	2
TOTAL	32	33	65

Spring Migration

Spring migration sampling was carried out from Mid-April to Mid-June 2008. The methodology shared the same sampling techniques that were used for the fall migration period in 2007. Monitoring was carried out during the period between sunrise and four hours after sunrise.

A total of 60 species were observed during the spring migration period. A small number of those species are known to be non-migratory. All of the species detected are known to breed in northern Nova Scotia (Erskine, 1992).

Similar to the results noted during fall migration monitoring, an examination of the records for each species does not clearly demonstrate whether many of the birds observed were migrating through the project area or birds arriving and establishing breeding territories. A number of factors suggest that many of the birds observed are actually

Table 3. Spring Migration Monitoring Results

	SRANK	19- Apr	27- Apr	03- May	07- May	10- May	15- May	18- May	22- May	26- May	30- May	05- Jun	11- Jun	17- Jun
Ruffed Grouse	S5B	1	1	2		1	1	1	2		1			
Spruce Grouse	S5B	1		3										
Red-tailed Hawk	S5B					1					1			
American Kestrel	S5B						2	1	1		2			
Wilson's Snipe	S5B,SZN				1									
American Woodcock	S4S5B								1					
Mourning Dove	S5B		1		1									
Barred Owl	S5		1		1	1								
Ruby-throated Hummingbird	S5B										1			
Yellow-bellied Sapsucker	S5B	1		1	4	2		1		2	1	1	1	1
Downy Woodpecker	S5B	1			1	1								
Hairy Woodpecker	S5B	1	2	1	2	1	1		3	2	1	1	1	1
Northern Flicker	S5B	2	4	3	2		3	2	2					2
Pileated Woodpecker	S5B			1										
Olive-sided Flycatcher	S4B											1	2	2
Yellow-bellied Flycatcher	S5B									2	6	5	5	4
Alder Flycatcher	S5B									2	4	4	7	1
Least Flycatcher	S5B									2	6	5	5	4
Blue-headed Vireo	S5B					1	7	1	3	5	3	1	2	2
Red-eyed Vireo	S5B									1	8	7	8	12
Gray Jay	S4B								2		1	4		
Blue Jay	S5B	2	1	2	3	2	1	1	2	4	3	2	1	
American Crow	S5B													
Common Raven	S5B	2	1	4	3		1		1	2	1		1	2
Black-capped Chickadee	S5B	3	5	9	9	7		6	1	3	3	4		3
Boreal Chickadee	S4B	4	1	3		3	3	3	3		2	3	2	3
Red-breasted Nuthatch	S5B													
Winter Wren	S5B	1	3	7	8	7	5	6	6	5	7	4	4	6

Golden-crowned Kinglet	S5B	1	6	9	9	6	4	8	5	1	5	5	2	
Ruby-crowned Kinglet	S5B	1	13	19	16	13	17	15	15	17	10	8	6	9
Swainson's Thrush	S5B								1	2	4	7	4	3
Hermit Thrush	S5B	3	1	7	9	3		3	4	1	4	6	4	4
American Robin	S5B	21	10	20	22	18	21	6	18	8	14	11	17	24
Gray Catbird	S5B												1	
Cedar Waxwing	S5B												3	3
Nashville Warbler	S5B						1							
Northern Parula	S5B							2	3	1	3	3		1
Magnolia Warbler	S5B							3	14	21	18	17	16	7
Black-throated Blue Warbler	S4B								1	1	1		1	
Yellow-rumped Warbler	S5B			4	20	9	35	13	30	9	16	8	5	5
Black-throated Green Warbler	S5B					1	3	12	18	27	22	24	22	14
Blackburnian Warbler	S4S5B											1	1	1
Palm Warbler	S5B			2		3	3	2	3	1				1
Bay-breasted Warbler	S5B										2	1		1
Blackpoll Warbler	S4B										1			
Black-and-white Warbler	S5B					4	5	13	7	4	2	8	7	5
American Redstart	S5B							1		3	2	3	3	5
Ovenbird	S5B						2	8	12	11	10	9	9	8
Mourning Warbler	S5B												1	3
Common Yellowthroat	S5B													
Chipping Sparrow	S5B						2				1		1	
Savannah Sparrow	S5B													
Fox Sparrow	S4B													
Song Sparrow	S5B	4		1	5		4		3	1	5	3	2	3
Lincoln's Sparrow	S5B										3	2	3	2
White-throated Sparrow	S5B			14	16	18	34	17	16	16	19	17	10	10
Dark-eyed Junco	S5B	18	8	15	10	4		2	16	7	8	5	5	4
Common Grackle	S5B					1								
Purple Finch	S5B			3	3		1		3	2	1	3		2
American Goldfinch	S5B								2	4				2

arriving breeding populations. Migration would typically be characterized by variability in the number of individuals observed as birds moved through the region prior to the breeding season. In the project area the numbers for many species observed built to a maximum number and remained near that population leading into the breeding season. At that time the number of observations would decrease presumably as nesting began and birds were less easily detected.

Another indication that the birds observed were mainly breeding populations in the project area is the late date many species were first detected. With few exceptions, species were generally observed in the river valley regions of Pictou County one to two weeks earlier than in the project area. An example of this is the White-throated sparrow, a species which is easily detected when present. The migration of White-throated

sparrows through the lower elevations of northern Nova Scotia peaked during the middle of the month of April. This species was not observed in the project area until May 3rd. In addition, many individuals were noted singing in the same location each visit. Winter Wrens for example were noted singing in the same locations on nearly every visit. Finally, species observed in the highest numbers are also known to be common breeders in the area. These factors suggest that many of the birds observed were arriving and establishing breeding territories as opposed to migrating through.

Fall Migration

Fall migration sampling was carried out between the months of August and October 2007. The primary method used involved stopover counts to determine the species composition and relative abundance of birds using the project area during the migration period. The stopover counts involved walking four established routes which were selected to sample the variety of habitats in the project area. Each route was along established roads and trails edged with secondary growth which would be attractive to foraging migrants. These routes were also used during the breeding bird survey to access a number of the point count locations. All counts were conducted between sunrise and 4 hours after sunrise.

Each bird observed during the migration monitoring period was counted, including those considered permanent residents. A number of individuals which were not identified for various reasons (i.e. poor viewing conditions and/or no sounds made) were also counted.

Table 4. Fall Migration Monitoring Results

COMMON NAME	SCIENTIFIC NAME	SRANK	Aug 26	Sept. 2	Sept 6	Sept.10	Sept.15	Sept. 19	Sept 22	Sept.29	Oct. 6	Oct. 13
Ruffed Grouse	Bonasa umbellus	S5B									1	
Spruce Grouse	Falcapennis canadensis	S5B								1		
Sharp-shinned Hawk	Accipiter striatus	S4B	1			1				1		
Red-tailed Hawk	Buteo jamaicensis	S5B		1		1	1					
Ruby-throated Hummingbird	Archilochus colubris	S5B	4									
Downy Woodpecker	Picoides pubescens	S5B			1			1				1
Hairy Woodpecker	Picoides villosus	S5B					1	1		1		
Northern Flicker	Colaptes auratus	S5B	1	1			2	2	1	2		
Pileated Woodpecker	Dryocopus pileatus	S5B								*		
Alder Flycatcher	Empidonax alnorum	S5B	8		3							
Blue-headed Vireo	Vireo solitarius	S5B	1	1	2	2	2	1				
Red-eyed Vireo	Vireo olivaceus	S5B	6	14	11	1	5	4		2		
Gray Jay	Perisoreus canadens	S4B		1	5	2		3	2	2	2	2
Blue Jay	Cyanocitta cristata	S5B	4	4		5	12	1	1	2		1
American Crow	Corvus brachyrhynchos	S5B	1									
Common Raven	Corvus Corax	S5B		1		6		2	3	3		1
Black-capped Chickadee	Poecile atricapillus	S5B	17	18	17	7	35	28	26	24	12	28
Boreal Chickadee	Poecile hudsonica	S4B	1	3	1	2	2	3	1	5	2	15
Red-breasted Nuthatch	Sitta Canadensis	S5B	5	1	1		1	1	1	2		1
Winter Wren	Troglodytes troglodytes	S5B	1									
Golden-crowned Kinglet	Regulus satrapa	S5B	2	8	6	2	4	4	2	9	4	19
Ruby-crowned Kinglet	Regulus calendula	S5B		5	5	7	14	13	5	18		2
Hermit Thrush	Catharus guttatus	S5B					2	4	1	1	1	
American Robin	Turdus migratorius	S5B	9	7	10		7	13	4	2	2	6
Thrush Species	Catharus sp.				2							
Cedar Waxwing	Bombycilla cedrorum	S5B					12	3				

Tennessee Warbler	Vermivora peregrina					1						
Nashville Warbler	Vermivora ruficapilla	S5B	1					1				
Northern Parula	Parula americana	S5B			3		1					
Yellow Warbler	Dendroica petechia	S5B			1							
Chestnut-sided Warbler	Dendroica pensylvanica	S5B	1									
Magnolia Warbler	Dendroica magnolia	S5B	15	17	8	8	11	4	1	1		
Black-throated Blue Warbler	Dendroica caerulescens	S4B	1									
Yellow-rumped Warbler	Dendroica coronata	S5B		5	5	7	21	20	10	8		2
Black-throated Green Warbler	Dendroica virens	S5B	12	11	17	8	11	5	1			
Blackburnian Warbler	Dendroica fusca	S4S5B	4	1			1					
Palm Warbler	Dendroica palmarum	S5B				2	2	11	2	10		
Blackpoll Warbler	Dendroica striata	S4B								2		
Black-and-white Warbler	Mniotilta varia	S5B	4			2	4	1				
American Redstart	Setophaga ruticilla	S5B	2	1	2							
Ovenbird	Seiurus aurocapilla	S5B		1	3							
Common Yellowthroat	Geothlypis trichas	S5B	9	8	7	3	5	6	1	4		
Savannah Sparrow	Passerculus sandwic	S5B								1		
Fox Sparrow	Passerella iliaca	S4B										1
Song Sparrow	Melospiza melodia	S5B	4	9	4	2	7			9		10
White-throated Sparrow	Zonotrichia albicollis	S5B	4	4	8	6	18	7	3	7	1	18
Dark-eyed Junco	Junco hyemalis	S5b	11	16	12	11	17	17	6	13	9	10
Sparrow Species												2
Common Grackle	Quiscalus quiscula	S5B						1				
Purple Finch	Carpodacus purpure	S5B						12		1		
American Goldfinch	Carduelis tristis	S5B	4	1	8	3	6	5	1			2
Finch Species												2
Unidentified			7	2					1			2

A total of 55 species of birds were observed during the fall migration monitoring period. Table 3 contains a complete listing of all birds observed and the date of the observation. Most of the species observed in the project area during the fall migration period are also known to breed in the region. An examination of the numbers observed for many species over the monitoring period does not reveal any clear picture that the project area is along an important fall migration route. This is certainly the case for many of the most common species known to breed in the area and it's unclear from the data if birds are migrating through the project area or if the numbers are more reflective of the breeding population leaving the area.

Several species do seem to migrate through the project area. Yellow-rumped warbler numbers increased notably on September 15 and 19. Palm Warblers were not detected during the first two weeks of fall migration monitoring. During the last two weeks of September Palm Warblers were noted on each visit. The highest single day count for Ruby-crowned Kinglets occurred on September 29 when 18 individuals were recorded. After that date their numbers dropped significantly with zero records for October 6 and two records for October 13.

Only three species of neo-tropic birds were detected during fall migration and not observed during the breeding season. These include Tennessee Warbler, Yellow Warbler, and Blackpoll Warbler. In each case, there was only a single record for each of these species with lone individuals of Tennessee Warbler and Yellow Warbler and two Blackpoll Warblers noted.

Of those species known to have wintering populations in this region the number of observations per visit was relatively stable through the monitoring period. The only exception is the Black-capped Chickadee which showed a notable increase in numbers in the later half of September.

Raptor Watch

Raptor watches were conducted on 4 days in September and October. Watches were conducted at two locations in the project area near proposed turbine locations which offered a good panoramic view to the east, north, and west. Observations were carried out on clear days with the wind from a northerly direction (northwest to northeast). Observations were conducted between 9 a.m. and 3 p.m.

While the project area is at elevation, there do not appear to be any strong geological features which would concentrate migrating raptors. Very few raptors were observed in the project area. None of the birds observed were flying at high altitude. The highest number of raptors observed in one day occurred on September 16 when four birds were noted. On October 9 no raptors were observed (See Table 5).

At other times during the year only small numbers of raptors were observed. During spring migration a pair of American Kestrels was observed in a particular area during the second half of May. Red-tailed Hawk, a common species in northern Nova Scotia, was seen hunting over the area during the spring, summer and fall monitoring periods and in all likelihood nests in the mature deciduous forest in or near the study area.

Table 5. Raptor Migration Results

DATE	TIME	WIND	COMMON NAME	SCIENTIFIC NAME	SRANK	HEADING	BEHAVIOR
Sept 16	11:28	NW	American Kestrel	Falco sparverius	S5B	South	Hunting
	12:03		Northern Harrier	Circus cyaneus	S5B	North	Hunting
	13:43		Sharp-shinned Hawk	Accipiter striatus	S4B	East	Low Flight
	14:02		Bald Eagle	Haliaeetus leucocephalus	S5B	East	Fly Over
Sept 27	12:45	NE	American Kestrel	Falco sparverius	S5B	West	Hunting
Oct. 9		N	No Observations				
Oct. 22	10:57	NW	Sharp-shinned Hawk	Accipiter striatus	S4B	West	Low Flight

Winter Monitoring

Winter monitoring was carried out one day each month from December 2007 to March 2008. Each day of monitoring involved an area search of the project area, visiting the variety of habitats present. The area searches made use of the stopover count routes used during the spring/fall migration as well as snowmobile trails found in the project area. Monitoring began each day approximately one hour after sunrise and concluded when the established route was complete. On February 9, 2008 the monitoring period was stopped before the route was complete as wind speeds had increased making listening conditions less than ideal. A greater emphasis was placed on visiting coniferous and mixed habitats during the winter monitoring. Table 6 summarizes the results of the winter monitoring program.

Winter monitoring revealed only a small permanent population of birds dominated by boreal species including Boreal Chickadees and Golden-crowned Kinglets. Common Ravens were observed each visit but only in small numbers. Over wintering migrant species were limited to 3 species of finches. The winter of 2007/08 proved to be an eruptive year for finch species in Nova Scotia. Many local birders have commented that it was the best year for observing finches in the last decade. Despite this, only small

numbers of Pine Grosbeaks, White-winged Crossbills and a single Common Redpoll were found in the project area.

Table 6. Winter Monitoring Results

	SCIENTIFIC NAME	SRANK	Dec. 27	Jan. 16	Feb. 9	Mar. 7
Black-backed Woodpecker	Picoides arcticus	S4			1	
Blue Jay	Cyanocitta cristata	S5B	1			2
American Crow	Corvus brachyrhynchos	S5B		3		
Common Raven	Corvus Corax	S5B	4	2	2	1
Black-capped Chickadee	Poecile atricapillus	S5B	4	8	2	2
Boreal Chickadee	Poecile hudsonica	S4B	12	2	5	4
Red-breasted Nuthatch	Sitta canadensis	S5B	1	2		
Golden-crowned Kinglet	Regulus satrapa	S5B	2	5		2
Pine Grosbeak	Pinicola enucleator	S4	20	6		
White-winged Crossbill	Loxia curvirostral	S5	2			
Common Redpoll	Carduelis flammea	S5N			1	

Species of Special Management Concern

One of the primary reasons for undertaking an environmental monitoring program such as this is to determine if the proposed project will have any impact on identified species at risk and the habitat critical to their long-term survival.

The Olive-sided Flycatcher is the only bird species found in the project area which is listed nationally to be of special management concern. The Olive-sided Flycatcher is considered ‘Threatened’ by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). This species is also listed by the Nova Scotia Department of Natural Resources as ‘Yellow’ or sensitive. Both the threatened and yellow status indicates a species that is not in immediate risk of extinction or extirpation but is at risk of this fate if the current population trend continues.

In the study area, the Olive-sided Flycatcher is generally found in areas which have been clear-cut and are regenerating with a mixture of young deciduous and coniferous species. This habitat is generally found at the lower elevations of the study area. The proposed turbine locations are at higher elevations.

Other species found in the project area listed by the NSDNR include the Gray Jay and the Boreal Chickadee. Both of these species have small permanent populations in the study area. Both species are found in the young to medium aged regenerating coniferous

forests of the project area. This habitat is found at the lower elevations of the study area and not the preferred locations for the wind turbines.

Summary

With one full year of monitoring the avian population complete in the project area there are a number of findings to report. Results of the spring and fall migration monitoring suggest that the project area is not along an important migration flyway. Many of the bird species observed during migration monitoring are common breeders in the area and likely many of the individual birds counted are from the local breeding population in the project area and nearby surrounding areas.

During the winter monitoring only a small population of permanent residents was detected. The most common winter species were Boreal Chickadee and Golden-crowned Kinglet. Despite the fact that the winter of 2007/08 was an eruptive year for finch species, only small numbers were observed in the project area as compared to the numbers seen in the nearby river valleys of Pictou County.

The only species listed by COSWIC as a species of conservation concern found in the project area is the Olive-sided Flycatcher. While the species is found in the project area, it seems to prefer the lower elevations and areas where forest harvesting operations have resulted in the creation of a young regenerating forest habitat. In the case of this species, it appears that disturbance to the natural habitats of the area are actually beneficial, although this is not known for certain.

Given these results and the size of the Dalhousie Wind Farm Project, the level of concern category which best describes the project's potential impact on avian populations is Category 2.

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AS 6: Watercourse Alteration and Culvert Installation Permit

July 24, 2008

Ms. Lisa Fulton
Fulton Energy Research
796 Dan Fraser Road
RR # 3 Westville, NS
B0K 2A0

Dear Ms. Fulton;

**RE: Approval to Construct - Culvert and/or Culvert Repairs
Within the County of Pictou, Approval No. 2008-063400**

Enclosed please find Approval # 2008-063400 issued to RM Senergy Limited to construct Culvert and/or Culvert Repairs as specified in Section 2.0 of this Approval at various locations in the County of Pictou. Please ensure that you forward the original Approval to RM Senergy Limited.

The watercourse alterations for Culvert and/or Culvert Repairs shall be constructed by or under the direct supervision of the following Recognized Individuals; Lisa Fulton, Certificate # 0711222.

This approval or a copy is to be kept on-site at all times. All personnel involved in the project must be made fully aware of the terms and conditions of this approval. The terms and conditions are shown as attached and it is the Approval Holder's responsibility to ensure that they are followed. Failure to comply with the terms and conditions is an offence under the *Environment Act*.

It is the Approval Holder's duty to advise the Department of any new and relevant information respecting any adverse effect that results or may result from the approved activity, which comes to the Approval Holder's attention after the issuance of the approval. This is required under Section 60 of the *Environment Act*.

This Approval does not constitute an Authorization to harmfully alter, disrupt or destroy fish habitat as regulated under 35(1) of the Fisheries Act. The Department of Fisheries and Oceans (DFO) may assess whether a harmful alteration, disruption or destruction of fish habitat (HADD) will occur as a result of the work and its interaction with fish including species protected under the Species at Risk Act (SARA). To aid in the review of some low risk activities a series of Operational Statements (OS) have been developed by DFO outlining conditions for avoiding HADD. You can access the OS's from the Canada Waters Internet site; http://www.dfo-mpo.gc.ca/oceans-habitat/index_e.asp, or by contacting the Department of Fisheries and Oceans.

If the activity is altered, extended or modified beyond the description given in this approval,

please reapply as a new approval may be required.

Despite the issuance of this Approval, the Approval Holder is still responsible for obtaining any other authorization which may be required to carry out the activity, including those which may be necessary under provincial, federal or municipal law.

Please call at once, if you or the Approval Holder have any questions about the conditions of this approval, especially those pertaining to the actual construction.

Should you or the Approval Holder have any questions, please contact Bonnie MacDonald, Northern Region, Pictou Office at (902) 369-4194.

Yours truly,


Bonnie MacDonald
Inspector

cc DFO

Eimas #: 2008-063400

APPROVAL

Province of Nova Scotia
Environment Act, S.N.S. 1994-95, c.1, s.1

APPROVAL HOLDER: RM Senergy Limited

APPROVAL NO: 2008-063400

EXPIRY DATE: June 1, 2009

Pursuant to Part V of the *Environment Act, S.N.S. 1994-95, c.1, s.1* as amended from time to time, approval is granted to the Approval Holder subject to the Terms and Conditions attached to and forming part of this Approval, for the following activity:

Construction of a Culvert and/or Culvert Repairs within the County of Pictou, Nova Scotia.

Administrator Penny McLeod

Effective Date July 24, 2008

AS 7: Environment Protection Plan

Environmental Protection Plan **Dalhousie Mountain Wind Farm**

RMSenergy will implement the following Environmental Management Plan (EMP) to minimize potential environmental effects during the construction and operation of the Dalhousie Mountain Wind Farm:

EPP1: Vehicle Operation:

- Public access to the construction site will be restricted. “Restricted Access” signs will be posted at the entrance of each access road.
- During the transport of materials including turbine components and turbine blades to the site, transportation companies, suppliers and drivers will abide with local traffic management regulations. Project manager will coordinate with RCMP and Nova Scotia Transportation and Infrastructure to ensure that the permitting for wide or heavy loads and safe transport of these materials are in place and that there is with minimal disturbance to the public.
- All drivers will obey local traffic laws, speed limits, and practice safe, defensive driving.
- Construction will be completed in a timely manner as to minimize the amount of time the construction equipment is on site.
- The Contractor responsible for Road Construction will provide dust suppression measures as needed to ensure there are no health risks to site workers, nearby communities and the environment.
- An emergency spill containment kit will be maintained on site by the Construction Contractor to adequately control any loss of fuel or lubricant.
- Most construction equipment will operate on diesel fuel and will be maintained so as to minimize noise and exhaust emissions.
- There will be a designated site, away from wetlands or watercourses, which will be used for fueling and parking construction equipment and vehicles.
- The use and transportation of petroleum, oils and lubricants will be conducted in compliance with the Transportation of Dangerous Goods Act and sound environmental practices.
- RMSenergy will establish a system to receive and respond to noise complaints.

EPP2: Site clearing, road and tower foundation construction.

- Tower foundations will be constructed in strict accordance with the manufacturer's specifications and site specific engineering design.
- Turbine sites will be selected to avoid wetlands and water courses to the extent possible.
- Construction activities will be restricted to approved work spaces and turbine sites.
- To the extent possible, the road and turbine site construction and grading will not be conducted during heavy rain events where runoff could result in sediment transport to drainage ditches or watercourses.
- A buffer area of no less than 50m will be established around rare plants in which vegetation will not be disturbed where possible.
- Shipments of imported materials must have fumigation certificates before arriving in Nova Scotia to ensure that harmful species are not transferred to the region.
- Construction equipment will be cleaned before being brought to the site.
- Access roads will be located and designed to pose minimal disturbance to existing watercourses.
- Watercourses will be spanned by bridges and culverts that do not alter the existing flow regime of any watercourse and all water crossings will take place at designated crossing sites.
- To the extent possible, rock excavation will be performed by ripping rather than blasting.
- The sides of any excavation pit will be sloped so that the pit does not present a safety hazard to site workers or the public (offsite pit). Where the public may have access, signs will be posted and/ or fencing erected. Borrow pits solely used for construction of this project will be backfilled with native material and seeded with non invasive, native, herbaceous plant species.
- Excess soils which are unsuitable for use as fill or dressing slopes will be disposed of at a site approved by the project engineer.
- Upon completion of construction work, exposed soils which have been disturbed by the work will be re-vegetated or allowed to re-grow naturally with non invasive, native, herbaceous plant species.

EPP3: Construction Waste

- The disposal of construction waste will be managed by RMSenergy and the Contractor so as to prevent a release or impact to watercourses and wetlands. These wastes may include minor amounts of scrap metal, timber, soils and non combustible material.
- Domestic refuse and waste will be collected and disposed of on a full time bases by Keltic Trucking Ltd. in accordance with the procedures of Pictou County Solid Waste Management and internally managed by the Proponent's Safety Officer.
- Disposal sites for fill are to be located by the Contractor and will be approved by RMSenergy.
- Limbs and timber will be chipped and or crushed and disposed of at the site. Non-combustible material, overburden and rock will be disposed of where their use as fill material is impractical.
- Waste disposal areas will be located away from rivers or any other watercourse.
- Portable toilets will be used at the construction site so that no untreated sewage is disposed in the watercourses.
- Petroleum, oils and lubricants and their wastes will be stored on site in a designated lay down area and will be managed in compliance with applicable provincial and federal regulations, codes and guidelines. Wastes will be contained and disposed of in compliance with the Provincial regulations for such substances.

EPP4: Preservation of Water Quality

- The disposal of any agent, either directly or indirectly, will not be permitted into any watercourse at any time during the project.
- The contractor will follow the provisions of Nova Scotia Environment's *Erosion and Sediment Control Manual, 1998* to ensure the preservation of water quality in watercourses or wetlands at the site. These provisions include the installation and maintenance of silt fences, hay bales in the manner proscribed in the document. The Proponent's Safety Officer and the Contractor will be responsible for maintaining these erosion/sedimentation control systems to ensure their effectiveness.
- Any water which must be pumped out of excavations will not be discharged directly into any wetland or watercourse. Water containing total suspended solids (TSS) at a concentration exceeding 25 mg/l above the background condition of a watercourse at the site must be pumped to a control area where the sediment can be allowed to settle. Settlement areas will be designated in an area up-gradient and downstream of the excavation. The discharge from the settlement area may be allowed to spill onto the ground and return to a watercourse following the natural topography providing that the discharge does not erode or entrain of soil particles in its flow.

- Erosion and sediment barriers will be removed from those areas which may be flooded by watercourses under high flow seasonal conditions to prevent these materials from being entrained in the watercourses following the completion of construction.
- Immediately after completion of construction, materials placed in or adjacent to the river for the temporary diversion of the river will be removed by the Contractor. This will be done in controlled manner as to minimize sedimentation of the flow.
- RMSenergy will be responsible for sampling and monitoring of TSS as conditions warrant. Water samples will be collected and analyzed for TSS from the watercourses at locations upstream, adjacent to and downstream of the site prior to construction. The average value of these three samples will be used to establish the background TSS value.
- Erosion control measures will be monitored to ensure their effectiveness.

EPP5: Fires and Medical Emergencies

- An emergency response plan will be established which incorporates appropriate response and reporting procedures. These will be addressed with the local fire department.
- All turbines will be equipped with lightening protection systems.
- Flammable waste will not be stored on site and will be collected and disposed of in a timely and appropriate manner.
- Smoking will be prohibited within 50 m of flammable products.
- The contractor will provide on-site fire fighting equipment and will maintain the equipment in good working order. Operations and maintenance personnel will be trained in the proper use and maintenance of fire-fighting equipment.
- In the event of a fire, on-site personnel will attempt to put out the fire, if it is safe to do so, using the on-site fire-fighting equipment. All fires, even those put out by on-site personnel, will be reported to the West River Fire Department.
- In case of medical emergencies and/ or fires, assistance will be requested from 9-1-1.
- RMSenergy will work with members of local emergency response, fire departments and medical rescue personnel to develop local capability to handle fire and medical emergencies within a wind farm setting.

EPP6: Wildlife Encounters

- RMSenergy will provide a set of appropriate procedures for personnel to use in the event of a wildlife encounter,
- Personnel will be instructed in the proper methods of garbage disposal at designated locations so as not to attract wildlife (ie. bears, raccoons, etc.). Personnel will keep the work area clean of food scraps.

- No attempt to harass wildlife will be made by any person at the work site (Grounds for Dismissal).
- Equipment and vehicles will yield the right-of-way to wildlife.
- In the event of encounters with injured or diseased wildlife at the work site, the encounter will be report immediately to the site supervisor who will contact the local Provincial Wildlife Officer. No attempt will be made to harass the animal, and no person at the work site will come into direct contact with the animal.
- Dead animals will be reported to the local Provincial Wildlife Officer as soon as possible and dead animals will only be removed by or with the approval of the local Provincial Wildlife Officer.
- Personnel will report the presence of wildlife to the site supervisor. When wildlife sightings are reported to management, the manager will initiate any reasonable action to reduce the chance of disruption or injury. Should disruption or injury to the wildlife occur, management will contact local Provincial Wildlife Officer.
- If an injured or dead bird or bat is encountered, the following information will be recorded: date and time it was found, state of decomposition, estimated number of days since death, injury sustained (if identifiable), and species. This information will be logged into the post-construction bird monitoring program.

AS 8: Environment Management Plan

ENVIRONMENTAL MANAGEMENT PLAN **DALHOUSIE MOUNTAIN WIND FARM**

EMP1: Erosion Control: Silt Fence Filter Fabric Barrier

DESIGN CONSIDERATIONS

Erosion control practices will be followed in compliance with the design criteria of the *Erosion and Sedimentation Control Handbook for Construction Sites* prepared by Nova Scotia Environment, 1988. Control of sedimentation is a fundamental principle to be followed by RMSenergy and its Contractors in managing the environmental issues related to the construction and operation of the Dalhousie Mountain Wind Farm.

IMPLEMENTATION STEPS

1. Location: The locations of filter barriers should be selected to prevent damage from heavy equipment.
2. Preventing End-Flow: Where barriers are constructed across a wide ditch or swale carrying low flow, end flow will be prevented by keying in the ends of the filter to the sides of the ditch. The side slopes should be re-graded to a stable slope (see Factsheet 2.7, Check Dams – General).
3. Excavating Trenches: A trench 100 mm (4 in.) by 100 mm (4 in.) should be excavated in a crescent shape across the flow path, with ends pointing upslope.
4. Setting Wood Stakes: Square wood stakes, 50 mm (2 in.), spaced at 1 m (3.3 ft.) intervals should be driven securely into the ground along the downslope side of the trench. If the ground is hard, a pick or steel bar will be needed.
5. Installing the Filter Barrier: To avoid seams and improve the strength and efficiency of the barrier, filter fabric should be drawn from a continuous roll and cut to its required length. The filter fabric should be stapled to the upstream side of the stakes with the bottom extending 200 mm (8 in.) into the trench. A filter barrier should not exceed a height of 900 mm (36 in.).
6. Backfilling: Backfill and compact the soil in the trench over the filter fabric.
7. Covering Exposed Soil: Re-vegetate exposed soil immediately.

MAINTENANCE

Accumulated sediment should be removed at regular intervals and after severe rainstorms. Repairs to the barrier should be conducted promptly if undercutting or end flow has occurred. The barrier can be removed on completion of the work and stabilization of the area.

Source: *Erosion and Sediment Control Fact Sheet No. 2.9*

EMP2: Sediment Retention and Control: Straw Filter Barrier

DESIGN CONSIDERATIONS

Straw filter barriers are designed to allow water to flow through, not over, the barrier. If properly installed and maintained no apron is required for straw filter barriers. Constant inspection and maintenance is required as straw bales may plug up with sediment very quickly. The life expectancy of a straw filter barrier is approximately 3 months, or less under wetter conditions or successive storms. A rock apron must be constructed on the down-slope side of the straw filter barrier if the bales are not replaced when plugged with sediment.

IMPLEMENTATION STEPS

The following installation procedures will be required to reduce potential failure because of improper installation and use. Undercutting and end flow can occur due to improper installation. These conditions can actually increase the quantity of sediment which is eroded and transported in the runoff.

1. Excavating Trenches: A trench the width of a straw bale and the length of the proposed barrier should be excavated to a minimum depth of 100-150mm (4-6in.) below the surface.
2. Placing Straw Bales: The straw bales should be placed on their sides and packed tightly together in the trench. Bales tied with non-degradable twine, should be placed flat. Two sturdy wooden or steel stakes should be driven through each bale, deep enough to anchor them securely. The first stake in each bale should be driven toward the previously laid bale to force the bales together. A wedge of loose straw should be placed between cracks or other openings and loose straw should be scattered over the soil on the uphill side of the barrier. The movement of the loose straw acts as a seal for any undetected openings in the barrier.
3. Backfilling: Backfilling and light compacting of the excavated soil should be conducted up to a depth of 100mm (4in.) on the upper slope side of the barrier. Backfilling and compaction of the excavated soil should be conducted to ground level on the downslope side.
4. Constructing the sediment trap: The sediment trap should be excavated on the upslope side of the barrier.

MAINTENANCE

Regular inspections of straw filter barriers are required after rainstorms. Bales which have become clogged with sediment must be replaced. Sediment trapped in the upslope sediment trap should be removed. Typically, straw filter barriers can be removed after other measures have been completed and control is well established.

Source: *Erosion and Sediment Control Fact Sheet No. 2.8*