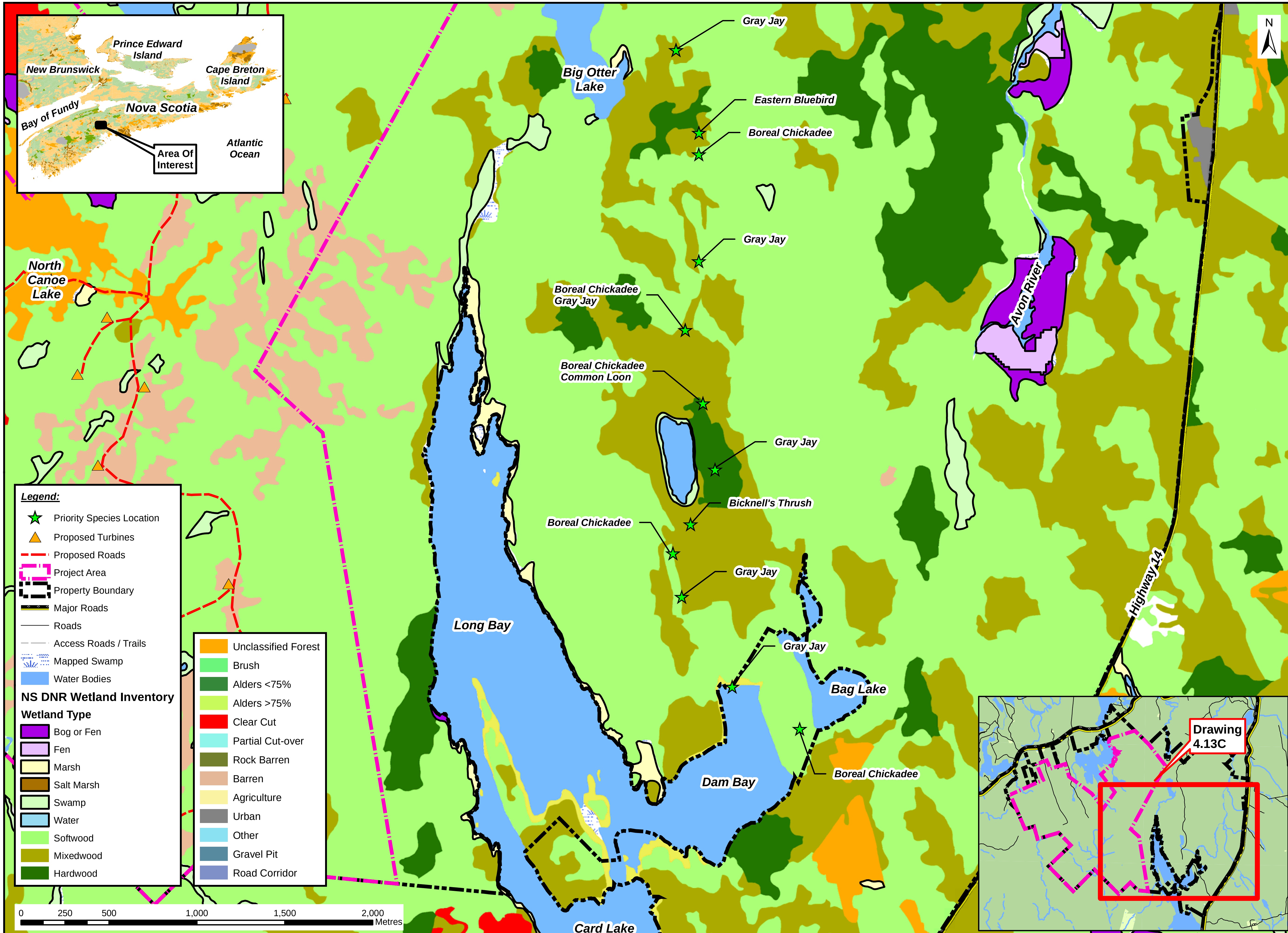


Notes:

1. Reference: NS Forest Inventory by NSDNR. 1:10,000 digital topo mapping by Nova Scotia Geomatics Centre.
2. Projection: NAD83(CSRS), UTM Zone 20 North.

Priority Species Sightings

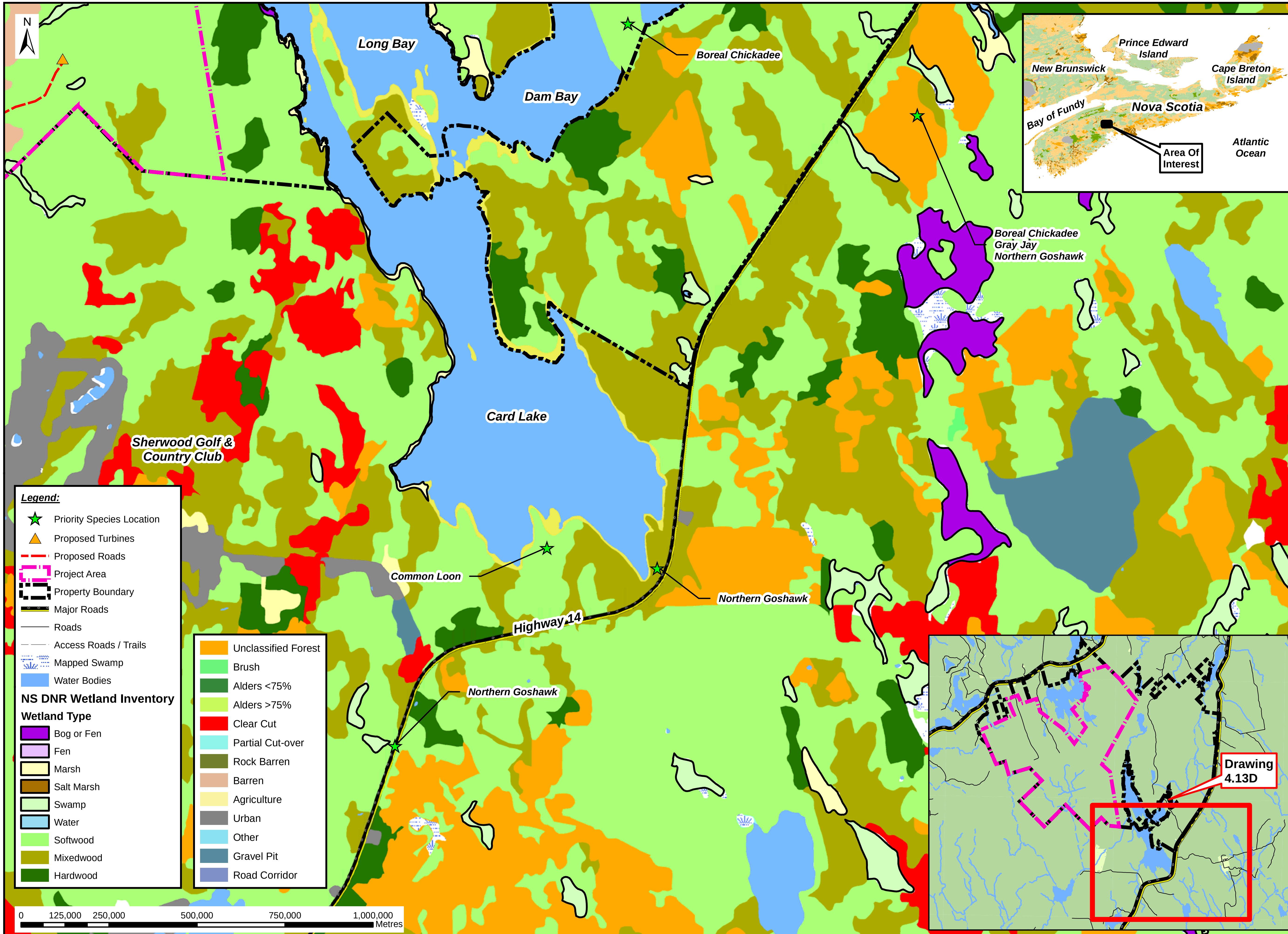
OXFORD

MINAS BASIN

Nova Scotia POWER An Emera Company

Strum ENVIRONMENTAL

Date: May 2012	Project #: 12-4361
Scale: 1:20,000	Sheet: 4.13C
Drawn By: G. Gregory	
Checked By: M. Smith	



Notes:

1. Reference: NS Forest Inventory by NSDNR. 1:10,000 digital topo mapping by Nova Scotia Geomatics Centre.
2. Projection: NAD83(CSRS), UTM Zone 20 North.

Priority Species Sightings

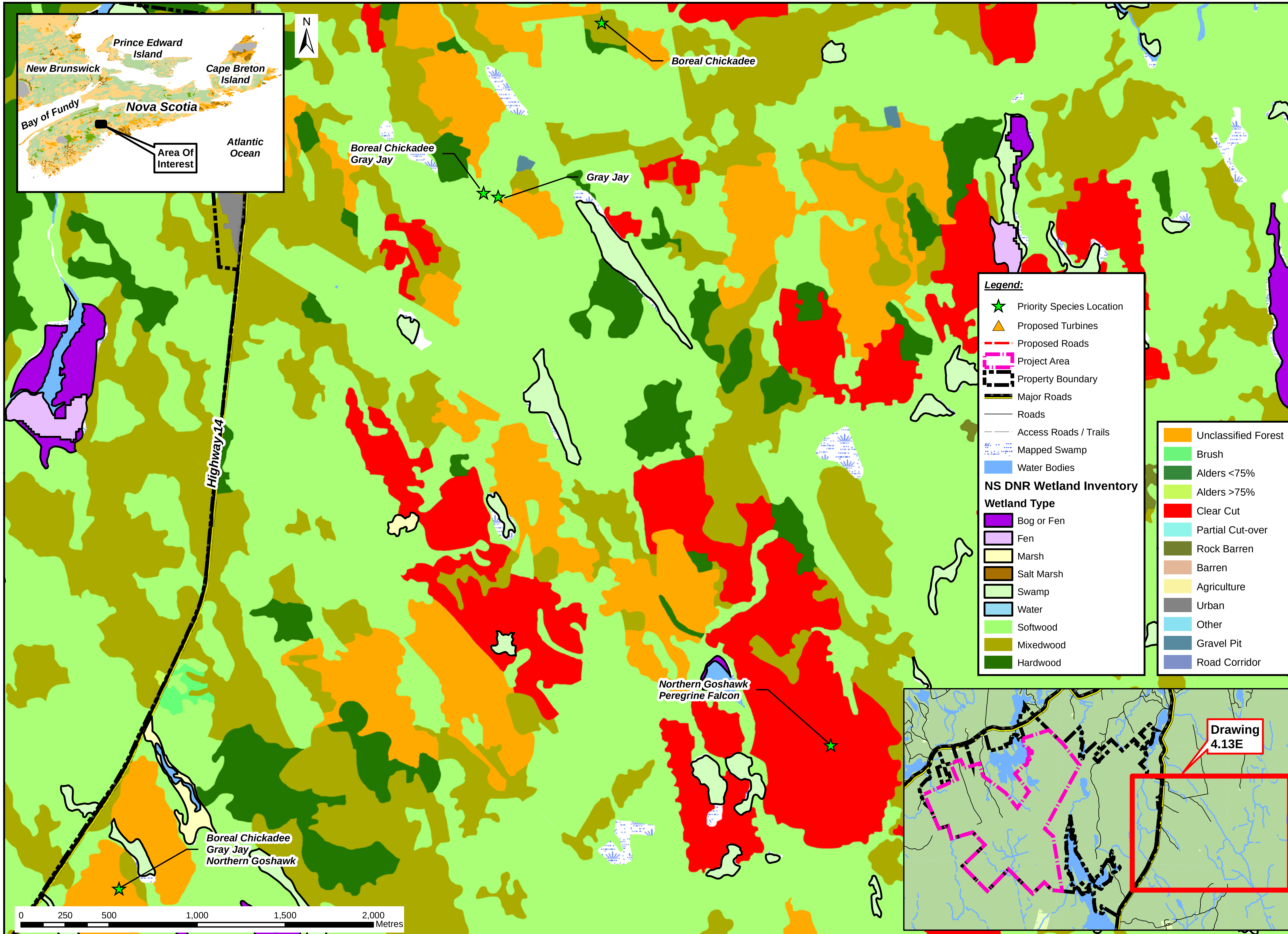
OXFORD

MINAS BASIN

Nova Scotia POWER An Emera Company

Strum ENVIRONMENTAL

Date: May 2012	Project #: 12-4361
Scale: 1:20,000	Sheet: 4.13D
Drawn By: G. Gregory	
Checked By: M. Smith	



Notes:

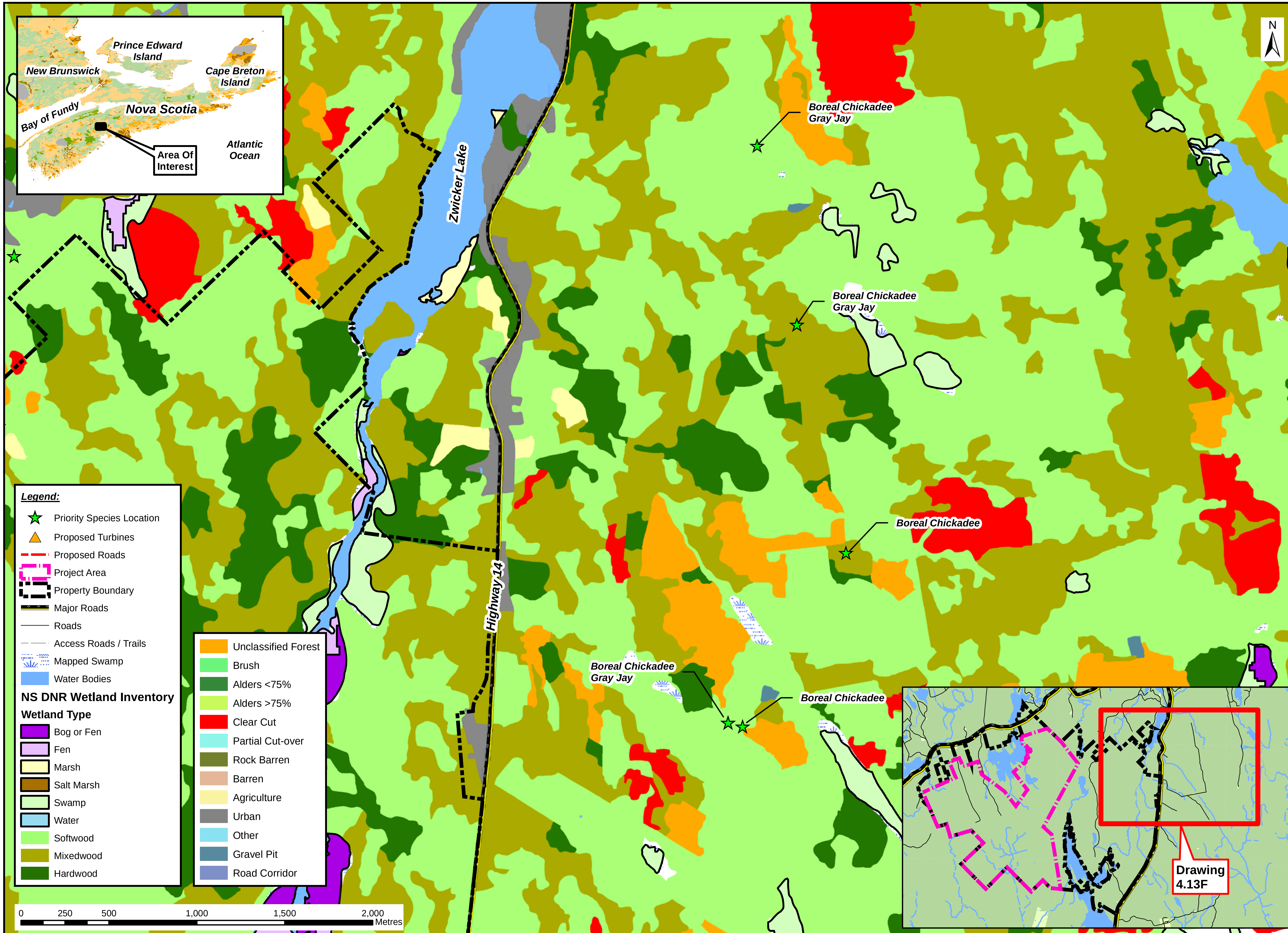
1. Reference: NS Forest Inventory by NSDNR. 1:10,000 digital topo mapping by Nova Scotia Geomatics Centre.
2. Projection: NAD83(CSRS), UTM Zone 20 North.

Priority Species Sightings

Nova Scotia POWER An Emera Company

Strum ENVIRONMENTAL

Date: May 2012	Project #: 12-4361
Scale: 1:20,000	Sheet: 4.13E
Drawn By: G. Gregory	
Checked By: M. Smith	



Notes:

1. Reference: NS Forest Inventory by NSDNR. 1:10,000 digital topo mapping by Nova Scotia Geomatics Centre.
2. Projection: NAD83(CSRS), UTM Zone 20 North.

Priority Species Sightings

OXFORD

MINAS BASIN

Nova Scotia POWER An Emera Company

Strum Environmental

Date: May 2012	Project #: 12-4361
Scale: 1:20,000	Sheet:
Drawn By: G. Gregory	4.13F
Checked By: M. Smith	

Summary of Bird Surveys

The diversity of habitat types, within the Property Boundary, creates an area attractive to a wide variety of bird species.

A total of 124 were identified at or near the Property Boundary during surveys conducted throughout the seasons, including thrushes, sparrows, warblers, birds of prey, and other passerine and non-passerine species. Although the numbers of migrating waterfowl were lower than anticipated, the presence of several unusual, long-distance migrants such as White-eyed Vireo, Philadelphia Vireo, Lark Sparrow, and Prairie Warbler suggest that the habitat within the Property Boundary has features which create an attractive stopover area for migratory species. In addition, 14 priority species were identified, suggesting that the general region may be composed of areas of important bird habitat.
With respect to the Project Area, habitat appears slightly less attractive to the bird community with a greater percentage of clear cut and fewer waterbodies than offered across the broader Property Boundary. However, softwood stands continue to dominate the landscape creating favourable habitat for bird species. All species identified within the Property Boundary can be assumed to exist within the Project Area as similar habitat cover is present. Four priority species were identified suggesting the general area may be composed of areas of important bird habitat.

4.7.2 Bird Acoustic Analysis of Nocturnal Migrants

Acoustic monitoring equipment was deployed to supplement the nocturnal surveys and to gain additional insight into bird utilization within the Property Boundary by nocturnal migrants, during the fall. Many nocturnal migrants are known to emit flight calls as during migration, and recording these flight calls can provide an index of the number of birds flying over a site. Acoustic data was collected using a Wildlife Acoustics “SongMeter” and night-call microphone installed at 44.74°N, 64.26°W in a clear cut adjacent to Highway 14, near the eastern Property Boundary. Equipment was programmed to collect data from civil twilight to civil dawn each evening between September 30 and November 15, 2011.

Individual flight calls were extracted from the resulting audio files using acoustic analysis software (Appendix E). A sub-sample of the total monitoring period was manually analyzed for each night, such that five 15-minute portions from the across the nighttime period were examined. Extracted flight calls were identified to broad groups (thrushes and sparrows/warblers) based on call frequency, representing the area’s most common nocturnal migrants.

A total of 160 individual flight calls were identified during the analysis, consisting of 115 from the sparrow/warbler complex, and 45 thrushes. Calls were identified from 18 nights, with the most productive nights being September 19, October 3, October 8, October 10, and October 31. For a full description of the methodology and results of the analysis, please refer to Appendix E.

4.7.3 Bat Surveys

Information regarding the bat community in the vicinity of the Project Area, including any SAR, was obtained through a combination of desktop review and field studies. The desktop component included a review of the Nova Scotia Significant Species and Habitat Database and ACCDC data on species recorded within a 100 km radius of the Property Boundary, and the comparison of habitat mapping data (Section 4.4) to known habitat requirements for species expected to occur within the Project Area and for all SAR. Table 4.24 presents bat species recorded within a 100 km radius of the Property Boundary.

Table 4.24: Bat Species Recorded within a 100 km radius of the Property Boundary

Common Name	Scientific Name	NSDNR Status[1]	COSEWIC Status[2]	NSESA Status[3]
Northern Long-eared bat	*Myotis septentrionalis*	Yellow	Not Listed	Not Listed
Hoary bat	*Lasiurus cinereus*	Undetermined	Not Listed	Not Listed
Eastern pipistrelle	*Pipistrellus subflavus*	Yellow	Not Listed	Not Listed

[1] NSDNR, 2009b; [2] COSEWIC, 2009; [3] NSESA, 2007
Source: ACCDC, 2011

Table 4.25 presents bat species observed during field studies conducted during the general wildlife field exercise.

Table 4.25: Bat Species Observed during Field Studies

Common Name	Scientific Name	NSDNR Status[1]	COSEWIC Status[2]	NSESA Status[3]
Little brown bat	*Myotis lucifugus*	Yellow	Not Listed	Not Listed
Northern Long-eared bat	*Myotis septentrionalis*	Yellow	Not Listed	Not Listed
Hoary bat	*Lasiurus cinereus*	Undetermined	Not Listed	Not Listed
Silver haired bat	*Lasionycteris noctivagans*	Not Listed	Not Listed	Not Listed

[1] NSDNR, 2009b; [2] COSEWIC, 2009; [3] NSESA, 2007

4.7.3.1 Fall Bat Surveys

Field surveys of bat populations were carried out during fall migration to determine which species use the Project Area at this specific time of year.

Acoustic bat surveys were carried out from August to September 2011. Acoustic monitoring does not involve handling the bats so confirmed species ID, sex and age classifications cannot be made. The numbers of passes, rather than the number of individuals are recorded using this system.

The AnaBat system records echolocation sounds made by the bats as they fly near the detector which are then downloaded into Analook software and, where possible, are interpreted into species and number of passes.

Four AnaBat detectors (in waterproof casings) with external microphones were located at ground level in locations chosen for vegetation types, landscape features, security, access permissions and preliminary turbine locations provided by Minas Basin. Three of the detectors were moved during the sampling period, to cover as much of the site as possible, but remained in the same vegetation type (R. McCallum pers comm. February 16, 2012). One detector was vandalized by bears, and two were removed from the site (presumed stolen) near the end of the sampling period.

AnaBat I was located near Big Otter Lake and a watercourse/wetland complex draining into the lake. It was subsequently moved to the north to avoid construction work. It collected data August 15 – 20 and August 25 to September 14. Due to changes in turbine locations in consultation with NSDNR, this location is now outside of the Project Area; however it provides additional information about species likely to be present in this region.

AnaBat II was located near the MET tower in a shrubby open area but was moved to a forest edge habitat due to excessive bear interest. It collected data August 15–26.

AnaBat III was first located at the western edge of the Property Boundary and was moved due to changes in Project Area locations. This detector was in forested edge habitat and then moved to a wetland edge complex in a clear cut area to the south of Joe Long Lake. It collected data from August 14 – 15 and August 19 to September 29.

AnaBat IV was located near an access road and clear cut in the southwest portion of the Property Boundary. It was moved to a more central location (to provide greater coverage across the Property Boundary) within an open shrub area near forest. This system recorded from August 14 to September 29.

Detectors were set to record between 1900 and 0630 daily to capture as many bat passes as possible. Each distinct call or pass was recorded as a single file and data was downloaded every four to seven days during the sampling period.

Acoustic data was analyzed by a wildlife biologist. Once the files of background noise were removed, the numbers of passes were counted for each detector and species identification made, where possible. The results were tallied according to species, total passes, and total nights the system operated.

Echolocation surveys were conducted over a period of 121(94 nights excluding Ana Bat I) nights between the four detectors with a total of 21,081 files recorded. 4,211(2815 excluding Ana Bat I) files were determined to be bat generated data with the rest thought to be generated by background noise such as wind.

The majority of calls were associated with *Myotis* species (e.g. Little brown bat and Northern long-eared bat), both of which are common species in Nova Scotia. A high percentage (37%) of calls were classified as unknown species. These calls were bat generated, however, background noise and call quality made identification challenging.

Table 4.26 presents a summary of bat acoustic survey results. For full results and a breakdown of dates, refer to Appendix F.

Table 4.26 Summary of Bat Acoustic Survey Results

Deployment	AnaBat I	AnaBat II	AnaBat III	AnaBat IV	Totals
Habitat	Forest edge	Regrowth	Regrowth	Trail, 10-15 year regrowth	
Myotis	696	755	272	878	**2601**
Non-*Myotis*	3	0	0	0	**3**
Other species	*Lasionycterisnoctivigans* (Silver haired bat) 1	0	*Lariurus cinereus* (Hoary bats) 11	0	**12**
Unknown species	696	474	227	197	**1594**
Total Passes	1396	1229	511	1075	**4211**
% unknown Species	49%	38%	44%	18%	**37%**
Total nights	27	12	37	45	**121**
% passes per night	51.7%	102.4%	13.8%	23.9%	

Ana Bat I, now outside of the Project Area, held the only recorded Silver Haired bat, with the majority of passes being made by *Myotis* species. This site also had three records of non-*Myotis* species, the only records of this type during the survey.

Species at Risk

Bat species identified during field studies or that have been recorded within a 100 km radius of the Property Boundary were screened against the criteria outlined in the "Guide to Addressing Wildlife Species and Habitat in an EA Registration Document" (NSE, 2005) to develop a list of priority species. These priority species include:

- Eastern pipistrelle – "Yellow" (NSDNR, 2009b);
- Northern long-eared bat – "Yellow" (NSDNR, 2009b); and
- Little brown bat – "Yellow" (NSDNR, 2009b).

The Eastern pipistrelle, like other bat species in Nova Scotia, inhabit hibernacula in the winter season (Fujita and Kunz, 1984), and these areas of congregation are very important from a population perspective. This species prefers to forage close to waterways, and is considered locally abundant in the vicinity of Kejimkujik National Park, in southwest Nova Scotia (Broders et al., 2003). However, six known Nova Scotia bat hibernacula were surveyed in 2009, including several within the same general region as the Property Boundary, and no Eastern pipistrelles were identified (Burns and Broders, 2010).

Northern long-eared bats were the second most common species surveyed in Nova Scotia bat hibernacula in 2009 (Burns and Broders, 2010). This species prefers to forage in forested areas, and maternity colonies have been located in eastern hemlock stands (Broders et al., 2003), such as those found in the vicinity of the Property Boundaries. As the species is probably ubiquitous throughout forested areas of Nova Scotia (Broders et al., 2003), it is likely that Northern long-eared bats occur at or near the Project Area throughout the year.

The Little-brown bat was also identified within the Property Boundary during field studies. Although listed as “Yellow” (sensitive to disturbance) by NSDNR (2009b), this species is the most common bat in Nova Scotia, and constituted the majority of individuals surveyed in bat hibernacula in 2009 (Burns and Broders, 2010). The sensitivity of this species to disturbance is a function of its habitat of congregating in large numbers in caves, at which time populations may be vulnerable.

The Hoary bat is Canada’s largest bat and utilizes open water as well as forest habitats, both of which are within the Project Area. This species is one of the few truly migratory species in Nova Scotia, but is not listed by NSDNR. This species is considered to probably occur irregularly in the province (Broders, 2004). Although generally a solitary species, 11 passes by Hoary bats were identified during the survey.

Two hibernacula are known to have been identified within 25 km of the Project Area (data is current up to 2005) which would mean site sensitivity would be classed as ‘Very High’ according to the “Proponent’s Guide to Wind Power Projects: Guide to preparing an Environmental Assessment Registration Document” (NSE, 2009b). In addition, several abandoned mine sites (known to be potentially good hibernacula), which have not been investigated for bats are located within 25 km of the Project Area.

The AnaBat I location on the eastern edge of the Project Area (now outside the Project Area) resulted in the most passes during the sampling period (1396), while AnaBat II had the highest number of calls per night (102.4), this is potentially due to statistical anomaly as it operated for fewer number of nights (12) than other detectors (27, 37 and 45) and one night had a very high number of passes for the Project Area (937) the night before it was moved to a new location, compared to the next highest number of passes at 250 on AnaBat I 11 days previously).

Positive identification of the unknown species in this study would have required visual data such that is recorded during trapping and handling. This survey is a snapshot in time and species not identified during this time period may move through the Project Area at various other times of the year.

4.7.4 Effects and Mitigation

The effects of a wind farm on birds are variable and depend on such factors as the development design, topography of the area, habitats affected, and the bird community in the wind farm area (Drewitt and Langston, 2006).

Similar to birds, bats are also affected by siting choices, including topography, design, and the habitats affected during construction.

Collision Mortality

The most overt potential effect of the Project on birds is direct mortality resulting from collision with Project infrastructure, namely turbine blades. Most evidence suggests that mortality levels resulting from turbine collisions are low (Drewitt and Langston, 2006) although many studies do not adequately consider carcass removal by scavengers into their mortality estimates. In a review of night migrant fatalities at wind farm sites in North America, Kerlinger et al. (2010) found fatality rates of less than 1 bird/turbine/year to approximately 7 birds/turbine/year, even with corrections made for scavenger removal and searcher efficiency. Furthermore, multi-bird fatality events, in which more than three birds were killed at a turbine site in a single night, were found to be rare and may have been related to lighting and/or inclement weather (Kerlinger et al., 2010). Lighting required for safety and security reasons, including outdoor lights and building lights as well as lights on turbines, may attract and/or disorient nocturnal migrants increasing the risk of collisions (Kuvlevsky Jr. et al., 2007; Kerlinger et al., 2010).

Collision risk is greater on or near areas used by large numbers of foraging or roosting birds or in important migratory flyways (Drewitt and Langston, 2006). This risk can therefore be greatly reduced by incorporating knowledge of the area's bird community into the design and placement of a wind power project. A few large-scale wind farms constructed in the 1980's, specifically at Altamont Pass and Tehachapi Pass in California, did not adequately consider local factors and the result was the death of dozens of birds, with a high proportion of iconic raptor species (Kingsley and Whittam, 2005). The probability of raptor collision with wind turbines depends on the species, turbine height, and local topography (de Lucas, 2008); considerations which when included in the planning stages can reduce the risk of raptor collisions. Indeed, in the review by Kingsley and Whittam (2005), raptor collision rates were found to be quite low.

In summary, available research suggests that the probability of large-scale fatality events occurring at wind farms is extremely low (Kerlinger et al., 2010) and the observed mortality caused by wind energy facilities is low compared to other sources of human caused bird mortality (i.e. buildings, communications towers, vehicles, etc.) (Kingsley and Whittam, 2005). Baseline information gained from avian surveys can be combined with site specific considerations to greatly reduce the already low risk of bird collisions.

While bats are thought to collide with the turbines less than birds, the possibility of barotrauma, (where the air pressure in the bats lungs increases with the change in air pressure near moving turbine blades), may result in their lungs exploding. This is thought to primarily affect migratory species (Baerwald et al., 2008).

Experience at two wind sites in Nova Scotia suggests that there would be fewer bat mortalities than birds.

Disturbance

Sensory disturbance to birds can occur during both the construction and operational phases of wind power projects, and can be caused by the increased presence of personnel, vehicle movement, operation of heavy equipment, and the operation of the turbines themselves (Drewitt and Langston, 2006). It is thought that disturbance to birds may have a greater population impact than collisions themselves, although research is lacking in this area (Kingsley and Whittam, 2005). Primary concerns with regards to sensory disturbance are related to displacement and potential effects on key physiological processes such as breeding.

Some studies have shown that birds will exhibit avoidance behaviours post-construction, leading to a variable degree of displacement from previously used habitat (reviewed in Drewitt and Langston, 2006) which essentially amounts to habitat loss. In most cases, such displacement is on the scale of tens to hundreds of metres, which can lead to localized changes in bird densities (Leddy et al., 1999; Pearce-Higgins et al., 2009). However, while birds may avoid specific sites, the evidence does not suggest that they abandon the general area as a whole. Other research indicates that the presence of wind turbines has no effect on the distribution of the bird community (Devereux et al., 2008). The tolerance to Project related disturbance may be species specific but may also be related to the availability of alternative habitat (Kingsley and Whittam, 2005). Thus, careful site selection for turbines to avoid unique habitat types will likely alleviate disturbance and/or displacement concerns, especially during the operational phase of the Project.

Bats can also be affected by disturbance and avoidance behaviours which may lead to the reduced use of feeding or roosting areas. However, provided some connectivity is maintained, bats are likely to return to the area once the construction phase has finished.

Potential effects to birds and bats, during the different phases of the Project, are summarized in Table 4.27.

Table 4.27: Potential Environmental Effects of the Project on Birds and Bats (Drewitt and Langston, 2006)

Effect	Source of Effect	*Phase Applicable to		
		C	M/O	D
Direct mortality	Collisions (and risk of barotrauma)with Project infrastructure.		✔	
Disruption to breeding and nesting	Noise, vibration, and/or visual disturbance from site personnel, equipment, and/or turbines; habitat loss	✔	✔	✔
Disruption to roosting and feeding	Noise, vibration, equipment, and/or turbines; habitat loss	✔	✔	✔
Displacement	Noise, vibration, and/or visual disturbance from site personnel, equipment, and/or turbines; alteration of migration flyways or local flight paths	✔	✔	
Habitat loss and fragmentation	Clearing of vegetation for Project infrastructure; hydrologic alterations leading to wetland loss	✔	✔	

**C – Construction phase M/O Maintenance/Operational Phase D – Decommissioning Phase*

The following mitigative measures will be implemented to minimize or eliminate impacts to birds and bats:

- Development and implementation of an EPP for the Project, which will include provisions for spill prevention, post-construction monitoring, timing of Project activities, lighting, and the protection of avifauna species. EPP will be approved by NSE prior to starting construction.
- Clearing of site vegetation will be conducted outside of the breeding and nesting season (April to August). If clearing during nesting period is required, the Proponent with DNR and CWS will develop an appropriate mitigation plan to ensure that incidental take of species will not be possible. No activities which could result in incidental take will occur without the consultation of DNR and CWS.
- Use existing access roads to the greatest extent possible.
- Limit the use of lighting on turbine hubs and blades to the minimum as required by Transport Canada (2012).
- Ensure all outdoor building lights are shaded and directed towards the ground.
- Avoid placing Project infrastructure in habitats significant to bird species as identified through avian surveys. These habitats include wetlands, lakeshores, mature forests, areas with large, hollow trees, and areas along ridge lines.

Potential impacts to birds and bats will be further evaluated, as a VEC, in Section 8.