8.4.3 Wetlands

Desktop Review
A desktop identification of the location and extent of potential wetlands across the Project site was completed by reviewing the following information sources:

- Satellite and aerial photography;
- Nova Scotia Wet Areas Mapping database (WAM) (NSDNR 2012b);
- Nova Scotia Geomatics Centre; and
- NS Significant Species and Habitats database (NSDNR 2012c). ;

As shown on Drawing 8.4, topographic mapping from the Nova Scotia Geometrics Centre and the NS Significant Species and Habitats database identifies two large swamps in close proximity to the Project site. One is located immediately to the west of the Project site, at the northern extent of Mill Lakes. The other is located approximately 500 m east of the Project site, within a valley.

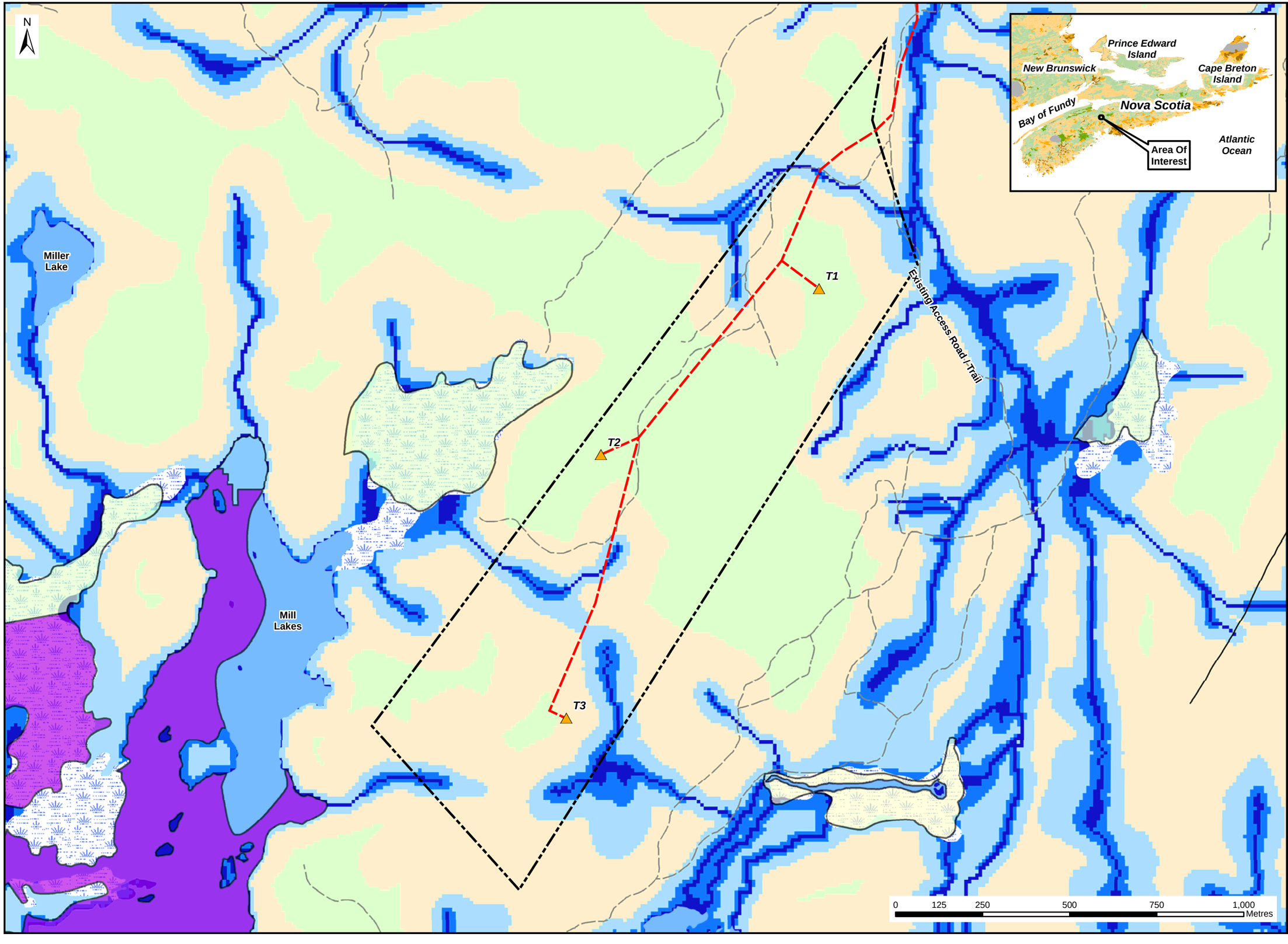
Satellite imagery indicates an open area that may be a swamp within the southern extent of the Project site. WAM indicates the potential for several watercourses and/or areas of wetland habitat to exist throughout the Project site, one of which overlaps with the open area observed on the satellite imagery.

Field Assessment
Based on the results of the desktop review and the preliminary layout, a field assessment strategy was developed and subsequently completed in July 2012. Strategic transects, designed to intercept preliminary access roads and turbine pads, were completed by experienced wetland delineators within the assessment areas shown in Drawing 8.5A. A minimum 30 m easement buffering proposed access roads and a 5 ha area centered on proposed turbine locations was assessed.

The assessment areas were walked to assess for potential wetland habitat. Defined wetland boundaries were delineated based on the methodology outlined in the US Corps of Engineers Wetland Delineation Manual (1987).

Wetland boundaries were walked and flagged using pink flagging tape marked ‘wetland delineation’. The boundaries were documented by recording the position of each flag using the track function on a GPS receiver capable of sub-5m accuracy. Detailed data point analysis was completed within the assessment areas to confirm wetland conditions and boundaries.

Eleven areas of wetland habitat were observed within the assessment areas (Drawings 8.5B-E). Wetland habitat characterizations are provided in Table B1, Appendix B.



Notes:

1. Reference: Nova Scotia Property Records. Digital Topo Mapping And Property Management Unit MU9937 by Nova Scotia Geomatics Centre.
   Wetland Inventory And Wet Areas Mapping By Nova Scotia Department Of Natural Resources (NS DNR).
2. Projection: NAD83(CSRS), UTM Zone 20 North.

Legend:

- Proposed Turbine
- Proposed Road
- Project Site Boundary
- Roads
- Access Roads / Trails
- Water Bodies
- Mapped Wet Area

NS DNR Wetland Inventory

Wetland Type

- Bog or Fen
- Fen
- Marsh
- Salt Marsh
- Swamp
- Water

Depth to Water Table

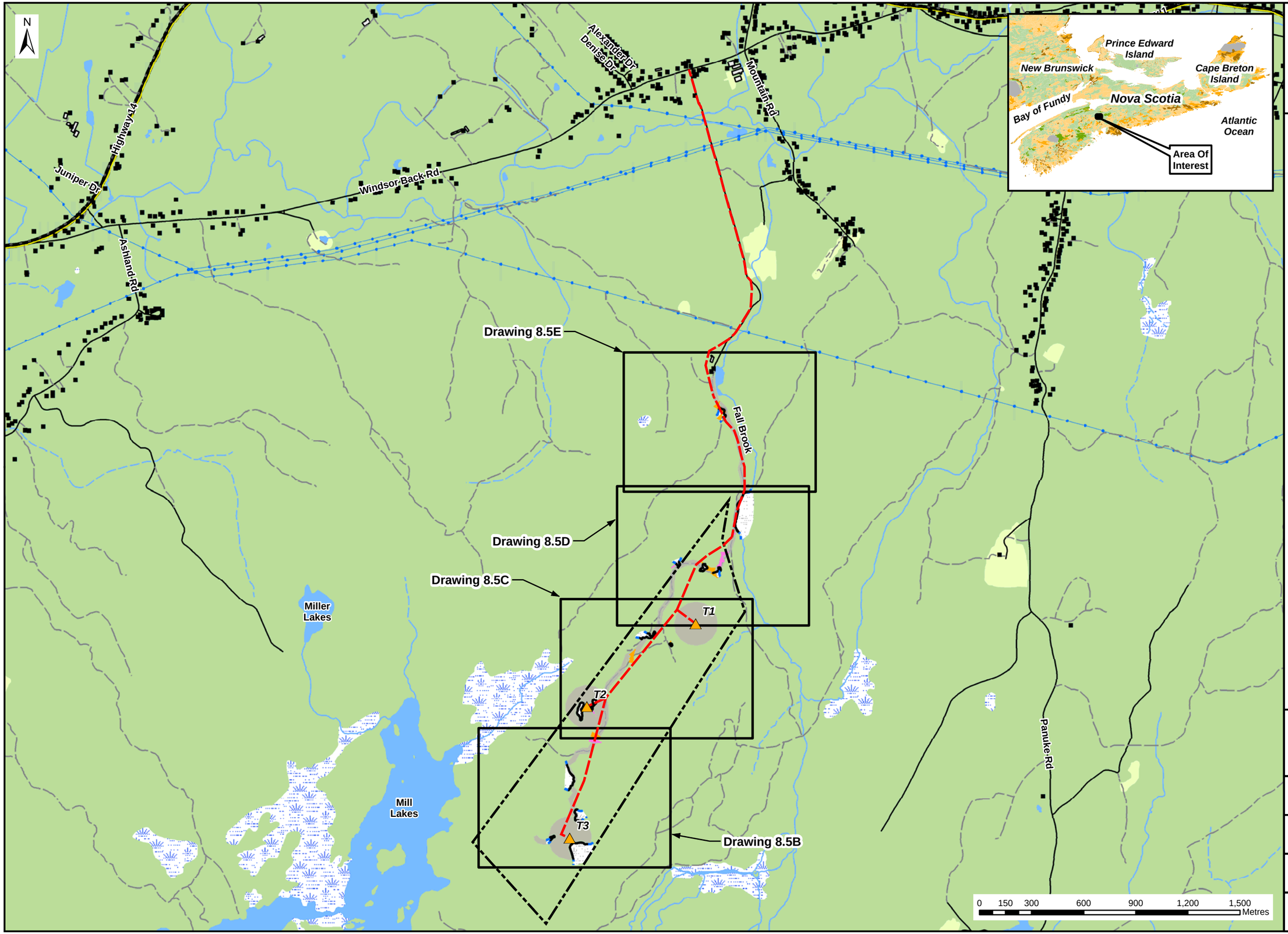
Depth (metres)

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

Wetland Assessment: Desktop Review

Strum Environmental

Date: January 2013	Project #: 12-4402
Scale: 1:10,000	Drawing #: **8.4**
Drawn By: H. Serhan	
Checked By: A. Walter	



Notes:

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

Legend:

- Proposed Turbine
- Proposed Road
- Project Site Boundary
- Assessment Area

Watercourses

Type

- Watercourse
- Drainage Channel

Wetland Boundary

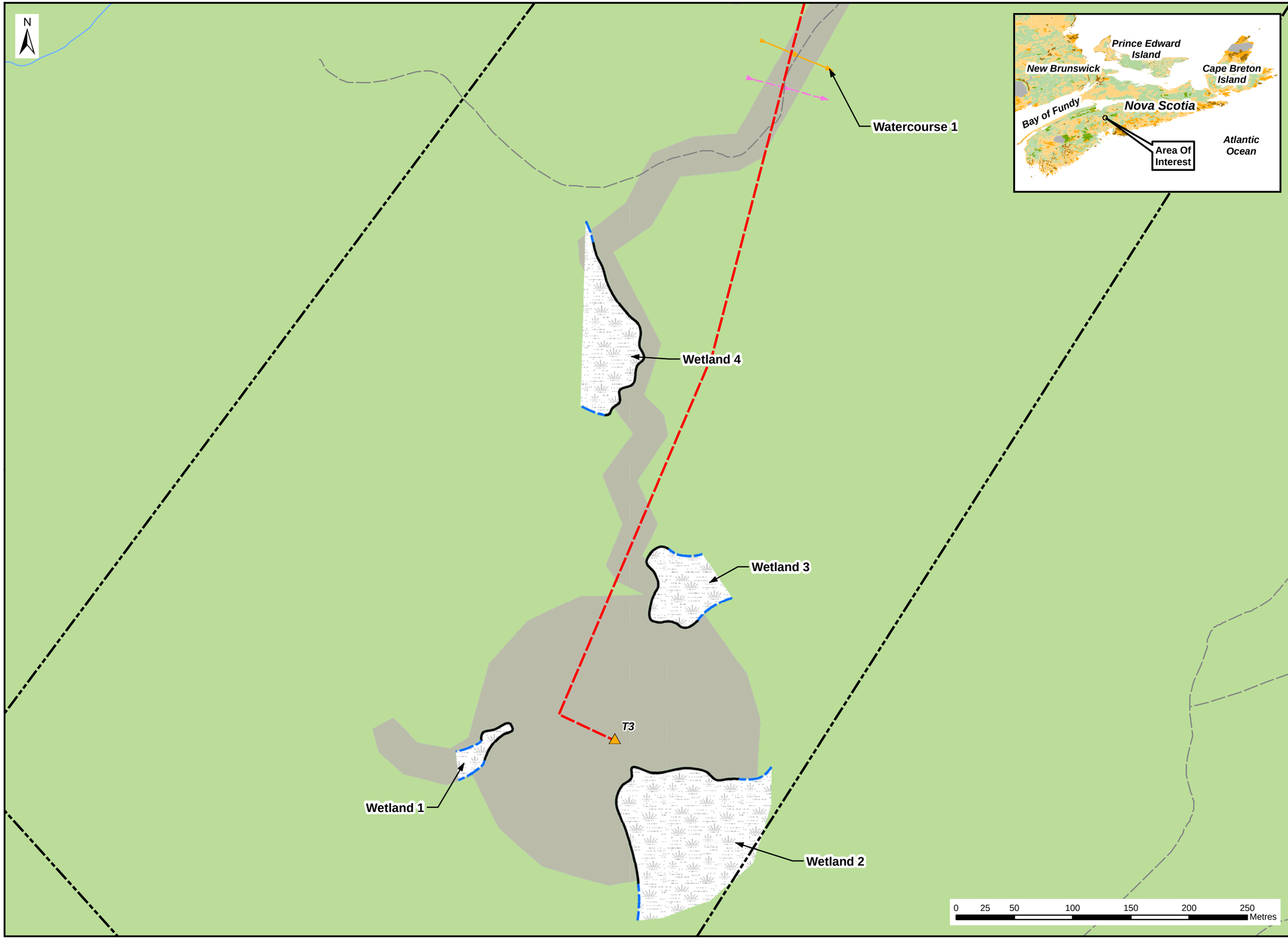
Type

- Confirmed
- Approximate
- Field Identified Wetland
- Building
- Roads
- Access Roads / Trails
- Existing Transmission Lines
- Large Structure
- Mapped Stream
- Indefinite Stream
- Water Bodies
- Mapped Wet Area
- Cleared Area

Wetland Assessment: Survey Results

Strum Environmental

Date: January 2013	Project #: 12-4402
Scale: 12,000	Drawing #: **8.5A**
Drawn By: H. Serhan	
Checked By: A. Walter	



Notes:

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

Legend:

- Proposed Turbine
- Proposed Road
- Project Site Boundary
- Assessment Area

Watercourse Type

- Field Identified Watercourse
- Field Identified Drainage Channel

Wetland Boundary Type

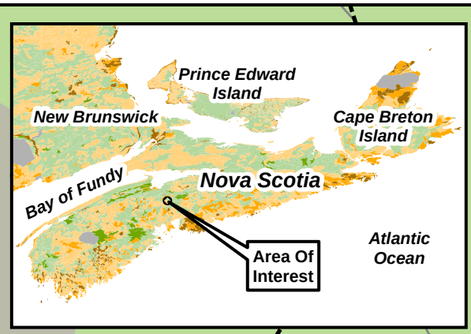
- Confirmed
- Approximate
- Field Identified Wetland
- Roads
- Access Roads / Trails

Wetland Assessment: Survey Results

Strum Environmental

Date: January 2013	Project #: 12-4402
Scale: 1:3000	Drawing #: ***8.5B***
Drawn By: H. Serhan	
Checked By: A. Walter	

N



T1

Wetland 11

Watercourse 3

Watercourse 2

Wetland 6

T2

Wetland 5

Watercourse 1

0 25 50 100 150 200 250 Metres

Notes:

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

Legend:

- Proposed Turbine
- Proposed Road
- Project Site Boundary
- Assessment Area

Watercourse Type

- Field Identified Watercourse
- Field Identified Drainage Channel

Wetland Boundary Type

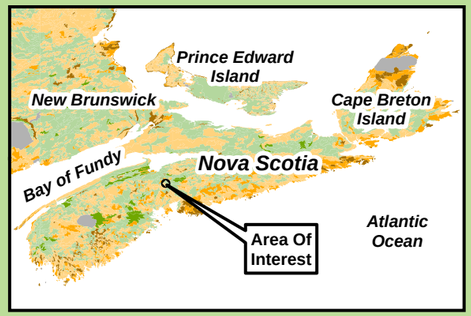
- Confirmed
- Approximate
- Field Identified Wetland
- Roads
- Access Roads / Trails
- Mapped Stream
- Indefinite Stream

Wetland Assessment: Survey Results

Strum Environmental

Date: January 2013	Project #: 12-4402
Scale: 1:3000	Drawing #: **8.5C**
Drawn By: H. Serhan	
Checked By: A. Walter	

N



Wetland 9

Wetland 7

Wetland 8

Watercourse 4

Fall Brook

T1

0 25 50 100 150 200 250 Metres

Notes:

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

Legend:

- Proposed Turbine
- Proposed Road
- Project Site Boundary
- Assessment Area

Watercourse Type

- Field Identified Watercourse
- Field Identified Drainage Channel

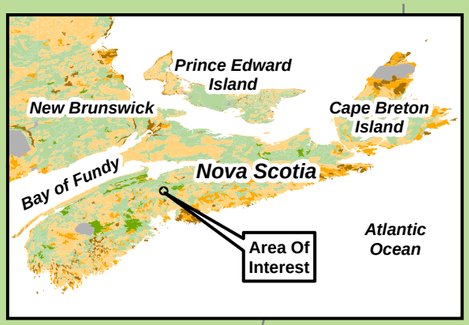
Wetland Boundary Type

- Confirmed
- Approximate
- Field Identified Wetland
- Roads
- Access Roads / Trails
- Mapped Stream
- Indefinite Stream

Wetland Assessment: Survey Results

Strum Environmental

Date: January 2013	Project #: 12-4402
Scale: 1:3000	Drawing #: **8.5D**
Drawn By: H. Serhan	
Checked By: A. Walter	



Watercourse 5

Wetland 10

Fall Brook

0 25 50 100 150 200 250 Metres

Notes:

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

Legend:

- Proposed Turbine
- Proposed Road
- Assessment Area

Watercourse Type

- Field Identified Watercourse
- Field Identified Drainage Channel

Wetland Boundary Type

- Confirmed
- Approximate
- Field Identified Wetland
- Building
- Roads
- Access Roads / Trails
- Large Structure
- Mapped Stream
- Indefinite Stream
- Water Bodies

Wetland Assessment: Survey Results

Strum Environmental

Date: January 2013	Project #: 12-4402
Scale: 1:3000	Drawing #: ***8.5E***
Drawn By: H. Serhan	
Checked By: A. Walter	

The majority of wetlands on the Project site are treed swamps, characterized by a black spruce dominated canopy with intermittent red maple coverage. The underlying shrub stratum is dominated by immature balsam fir, red maple saplings, and Canada holly. The herbaceous stratum is primarily dominated by cinnamon fern, New York fern, bunchberry and goldthread, growing in sphagnum moss. The soils are for the most part organic (A1- Histosol) or organic over a depleted mineral horizon (A2- Histic epidon). The wetlands exist as basin type landforms throughout the central and southern portions of the Project site. Drainage and/or additional narrow seepage wetlands are believed to transport water out of the wetlands either to Fall Brook to the east or Mill Lakes to the west.

Two shrub swamps exist in northern areas of the Project site. These wetlands are dominated by tolerant hardwood species such as red maple and white ash (*Fraxinus americana*), with cinnamon fern dominating the underlying herbaceous strata. The soils in these wetlands are organic (A1-Histosol). These swamps occur in basins adjacent to watercourses that both source and drain these wetlands.

Wetland Impacts

Following the completion of the field assessment, modifications were made to the preliminary road layout; therefore, additional micro-siting will need to be completed when the final layout is confirmed. Based on the current layout and assessment completed to date, it is expected that three wetlands may be directly impacted by road upgrades and new construction. Final turbine locations will avoid impacts to wetland habitat. Details of the alterations are presented in Table 8.5.

Table 8.5: Wetland Alteration Locations

Impacted Wetland ID	Wetland Type	Estimated Impact Area (m^2)[1]	Impact source	Comments
5	Treed Swamp	237	Access road	Access road bisects wetland.
9	Shrub Swamp	945	Access road	Impact to western edge of wetland (adjacent to existing access road).
10	Shrub Swamp	532	Access road	Access road bisects wetland (adjacent to existing access road).
Total Impact Area m^2		**1,714**		

[1] *Based on a total road width of 10 m*

As shown above, the majority of wetland alterations associated with access roads are located along existing road edges and represent a small area of disturbance. It is expected that the Project will have a minimal effect on wetland habitat and hydrological functions. Provincial wetland alteration permits will be sought for each of the alteration locations as required by the Nova Scotia Wetland Alteration Application process during the permitting stage of the Project. This will include completing a characterization of the functions of all impacted wetlands affected by the development footprint. Detailed mitigation measures and best management practices to reduce adverse effects on the altered wetlands, as well as the adjacent, non-altered wetlands will be outlined as part of this process. Compensation for direct impacts to wetlands will be provided in accordance with NSE requirements.

8.5 Terrestrial Vegetation

8.5.1 Desktop Review

Prior to undertaking field assessments, the ACCDC database was reviewed to compile a list of recorded observations of plant species within 100 km of the Project site. ACCDC records indicate that 307 vascular and 5 nonvascular plant species have been identified within 100 km of the Project site (ACCDC 2012). Of the 312 species identified by ACCDC, 206 vascular and 5 nonvascular plant SOCI were identified within 100 km of the Project site.

The preliminary list was then used to develop a short list of plant SOCI that may be present at the Project site (Appendix C). For the purpose of this assessment, SOCI include:

- Species listed by the COSEWIC (COSEWIC 2012) or under *SARA* (SARA 2012) as endangered, threatened or of special concern;
- Species protected under the *NSESA* (NSESA 2007); and
- Species listed in the NSDNR General Status Ranks of Wild Species in Nova Scotia as "Red" or "Yellow".

The results of the desktop review were used by botanists to determine priority habitats for the field assessment.

8.5.2 Plant Surveys

A plant survey was completed on July 18 and 19, 2012 within the Project site boundaries by an experienced botanist. A complete list of plant species identified during the survey is provided in Appendix C.

Habitat within the Project site consisted mostly of secondary mixed forest, with both upland and wetland habitats. Additional diversity was supplied by an existing access road and shoulders, where most of the recorded exotic weedy species were identified. Small clusters of conifers or hardwoods were also occasionally observed.

Common tree species within the typical forest include red maple, red spruce, and balsam fir, with occasional yellow birch, white pine, and white ash.

The treed wetlands observed tended to be flat basin features, dominated by trees such as black spruce and red maple. Scattered speckled alder and black holly (*Ilex verticillata*) were also identified within this habitat. Cinnamon ferns were the most dominant herbaceous plants and sphagnum mosses carpeted the ground.

8.5.3 Rare Plant Species

No vascular plant SOCI were observed during this survey.

8.6 Terrestrial Fauna

Information regarding terrestrial fauna in the vicinity of the Project site, including any SOCI, was obtained through a combination of desktop review and field studies. The desktop component