APPENDIX H
CBCL TECHNICAL SUMMARY REPORT - FLORA & VEGETATION INVENTORIES, PROJECT ECOLOGICAL LAND CLASSIFICATION, AND WETLAND ASSESSMENTS

Proposed Bear Lake Wind Farm Technical Summary Report

Flora & Vegetation Inventories, Project Ecological Land Classification, and Wetland Assessments

CBCL

221266.01 • June 2023

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RE: Environmental Studies at Proposed Bear Lake New Wind Site – FINAL Vegetation and Wetland Technical Summary Report

Dear Glenn:

CBCL Limited (CBCL) is pleased to provide Nova Scotia Power Incorporated (NSPI) with the final Bear Lake Vegetation and Wetlands Technical Summary Report. We trust this report meets your expectations, and we appreciate the opportunity to work with NSPI on this project.

Yours very truly,

CBCL Limited

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Project No.: 221266.01

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List of Acronyms

AC CDC	Atlantic Canada Conservation Data Centre
BENS	Barrens Ecosystems in Nova Scotia
CBCL	CBCL Limited
CHM	Canopy Height Model
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CWCS	Canadian Wetland Classification System
DEM	Digital Elevation Model
DSM	Digital Surface Model
DTW	Depth to Water
FAC	Facultative
FACU	Facultative Upland
FACW	Facultative Wetland
FEC	Forest Ecosystem Classification
GIS	Geographic Information System
GPS	Global Positioning System
LiDAR	Light Detection and Ranging
MNAP	Maine Natural Areas Program
MW	Mixedwood
NCNH	Natural Communities of New Hampshire
NDVI	Normalized Differential Vegetation Index
NR	Nitrate Removal & Retention
NS	Nova Scotia
NS ECC	Nova Scotia Environment and Climate Change
NS DNRR	Nova Scotia Department of Natural Resources
NSGC	Nova Scotia Geomatics Centre
NSPI	Nova Scotia Power Inc.
OBL	Obligate
P-ELC	Project Ecological Land Classification
RGB	Red, Green and Blue
SAR	Species at Risk
SH	Spruce-Hemlock
SoCC	Species of Conservation Concern
TH	Tolerant Hardwood
UPL	Upland
US	United States
USDA	United States Department of Agriculture
UTM	Universal Transverse Mercator
VT	Vegetation Type
WESP-AC	Wetland Ecosystem Services Protocol for Atlantic Canada
WSS	Wetlands of Special Significance

1 Introduction

CBCL Limited (CBCL) was contracted by the Nova Scotia Power Inc. (NSPI) to conduct a vegetation inventory and habitat inventory of their proposed Bear Lake Wind Farm project. As the exact project configuration (the Project Area) is still under development, CBCL assessed the entire Study Area provided by NSPI, which is depicted on Figure 1-1.

Within this Study Area, CBCL conducted desktop assessments for biodiversity including flora (vascular plants, lichens, and habitat types), fauna (mammals, birds, and listed insects), and herpetofauna (reptiles and amphibians). It is acknowledged that there may be minor overlap of desktop tasks with the efforts of others, who may be completing field evaluations for the topics identified above (wetlands, watercourses and freshwater habitat, fish, mainland moose, lichens, and birds and bats).

Field programs were conducted in 2022 for vegetation, wetlands, and watercourses, and included incidental Species at Risk (SAR) and Species of Conservation Concern (SoCC) flora and fauna. This document provides the results of the vegetation assessment conducted by CBCL for the Bear Lake Wind Farm project.

Results of the aquatic assessments conducted by CBCL for the Bear Lake Wind Farm project will be provided to NSPI as a separate Technical Summary Report.

1.1 Project Overview & Purpose

NSPI is proposing to construct a new wind farm in Lower Vaughan, in Hants County, Nova Scotia (NS). As part of baseline assessment activities for this Project, CBCL was retained to conduct a vascular plant and habitat inventory of the proposed Study Area.

The present study is specific to the flora of the Bear Lake Wind Farm Study Area. The study endeavours to document a suitable baseline of data within that Project area, as may be required for:

- Facilitating future regulatory requirements.
- Establishing conservation priorities for vegetation species (or communities) of conservation concern.
- Identifying management priorities for wetlands of special significance.
- Establishing conservation priorities for species of conservation concern, some of which co-occur with wetlands.

- Defining Project design constraints.
- Implementing mitigation measures during construction and operational phases of the Project.

1.2 Previous Studies

Previous studies conducted for the Bear Lake Wind farm include a Lichen inventory of the site conducted by Strum Consulting in 2022 (Strum Consulting, 2022).

1.3 Project Boundaries

The Project area is located approximately 12 – 35 km south of Windsor, paralleling Highway 14 and near the communities of Upper Vaughan and Smiths Corner, NS. The approximate centre of the Project area is at UTM 20T 403942 m E and 4960769 m N (Figure 1-1).

The boundaries related to the Project work are defined variously as the 'Project Area' and 'Study Area', each of which are described below. These boundaries can be seen on Figure 1-1.

1.3.1 Project Area

The 'Project area' is defined as the anticipated footprint for the proposed development; this would include any areas of vegetation clearing, grubbing, cut and fill, etc. as required for the preparation of the site for wind farm operation.

1.3.2 Study Area

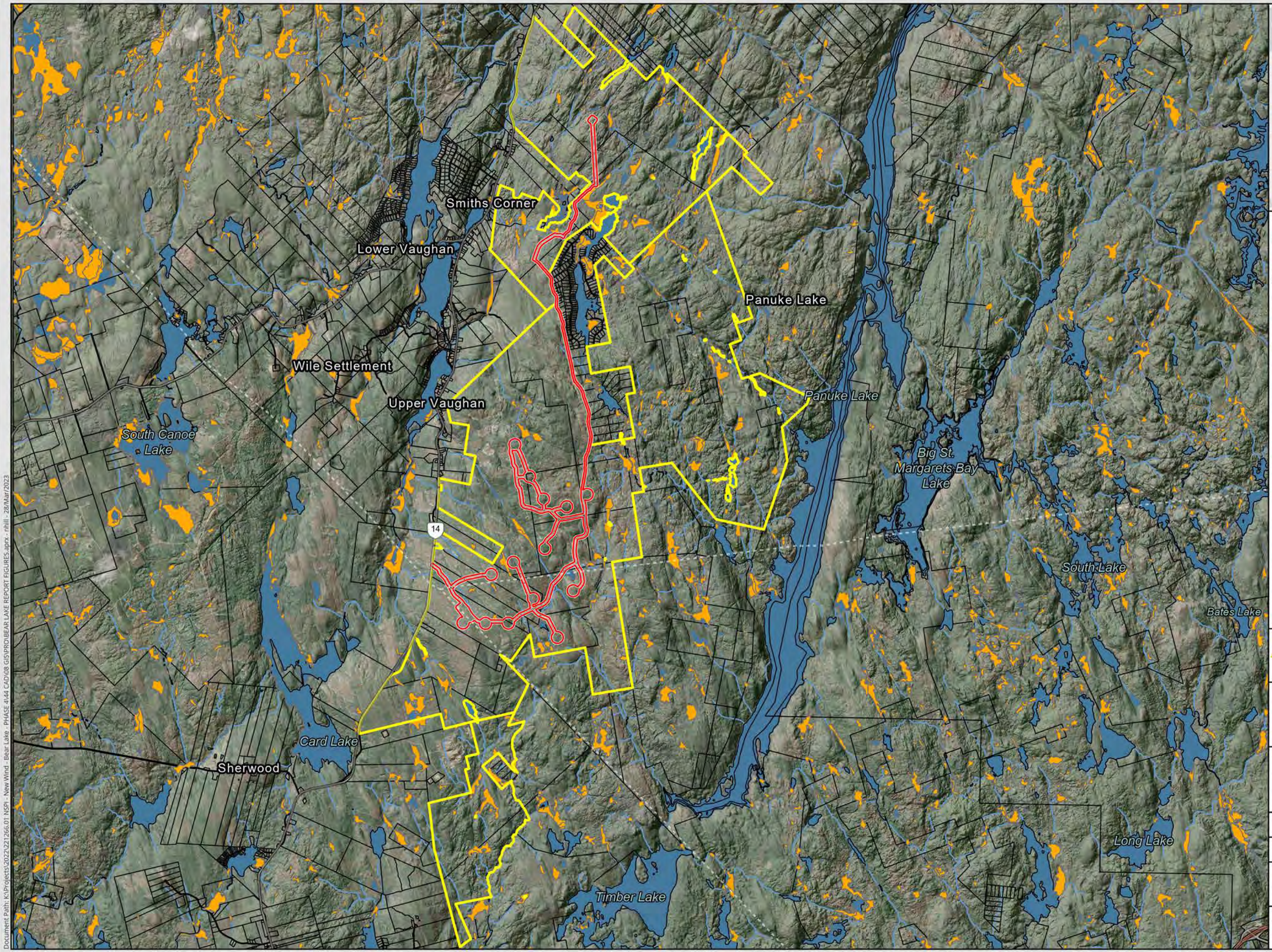
Reconnaissance Surveys: Prior to availability of a defined Project layout, vegetation surveys, vegetation community assessments, and reconnaissance-level wetland surveys were conducted within the general vicinity of the anticipated Project area, based on reasonable assumptions. For these surveys, the initial 'Study Area', was as depicted on Figure 1-1.

Detailed Surveys: Upon availability of an initial Project layout, detailed wetland surveys were initiated, within defined locations, in communication with NSPI. The 'Study Area' for detailed surveys was defined as those areas that could potentially be directly impacted by Project activities or components (e.g., roads, turbine pads, construction staging or laydown areas, stream crossings, etc.), or where indirect wetland effects of Project activities could reasonably be foreseen. These areas included the anticipated 'Project Area' plus a minimum additional distance of measured laterally from the 'Project Area' as listed below:

- Turbine sites: 150 m radius
- Roads, substations and laydown areas: 50 m

Survey coverage was expanded in some areas as deemed prudent by the assessors, for example:

- Areas deemed to contain a particular biological sensitivity (e.g., actual or potential rare species presence, or uncommon/unusual wetland conditions).
- Where connections between wetland areas were considered reasonable to determine.



- Study Area (Phase 4)
- Initial Study Area (Phases 1-3)
- Property Boundaries
- Provincially Mapped Watercourse
- Provincially Mapped Waterbody
- Provincially Mapped Wetland

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BEAR LAKE WIND
Vegetation & Wetlands

Study Boundaries

DATE: 2023-03-28	PROJ N°: 221266.01	FIGURE: 1-1
DRAWN BY: NH	CHECKED BY: BC	APPROVED: IB

NOTES:

0 500 1,000 2,000 m

SCALE: 1:92,000 @ 11 x 17

Coordinate System: NAD 1983 CSRS UTM Zone 20N
Units: Meter

Document Path: K:\Projects\2022\221266.01 NSPI - New Wind - Bear Lake - PHASE 4\44 CAD\08 GIS\PRO\BEAR LAKE REPORT FIGURES.aprx - nhill - 28/Mar/2023

2 Methodology

Methods utilized by CBCL in their assessment of the terrestrial habitats and wetlands of the Study Area are described in the following subsections.

2.1 Desktop Review

Desktop exercises conducted for the assessment of vegetation and wetland conditions at the Study Area are described in the following subsections.

2.1.1 Existing Data and Reports

In preparation for field surveys, a variety of data sources were reviewed in the context of determining potential wetlands and vegetation species and communities within the Study area. These data sources included the following:

- Nova Scotia Department of Natural Resources (NS DNRR) Wetland mapping and Wet Areas mapping
- Provincial topographic data
- Pictometry aerial imagery
- Available SAR data
- Light Detection and Ranging (LiDAR) elevation data
- Nova Scotia Geomatics Centre high resolution digital orthoimagery
- Watercourse mapping
- NS DNRR forest cover mapping
- Surficial geology mapping (for calciphilic species)
- Ecological Land Classification Guide for Nova Scotia (Neily et al., 2017)
- Committee on the Status of Endangered Species in Canada (COSEWIC) reports on individual species
- Nova Scotia Environment's Predictive habitat maps for rare species (i.e., boreal felt lichen)
- NS DNRR's Significant Species and Habitats database
- Nova Scotia Environment's Predictive habitat maps for rare species (i.e., boreal felt lichen)
- Previous site-specific reports
    - Lichen study (Strum Consulting, 2022)

2.1.2 AC CDC Database Search

The Atlantic Canada Conservation Data Centre (AC CDC) maintains linked databases that document species occurring in the Maritimes, as well as the locations at which provincially rare species are known to occur. A review of the AC CDC database was conducted and a list of flora species of conservation concern (vascular plants and lichens) that were previously identified within a 5 km buffer of the proposed Study area was obtained and evaluated. The AC CDC report is provided in Appendix A (AC CDC, 2023).

2.1.2.1 Species of Conservation Concern

Species ranks are defined by the AC CDC and are described in Table 2-1 below. Species rankings are not static; as more sightings are recorded, ranks can be changed through a process of evaluation by AC CDC.

Table 2-1 Interpretation of subnational rarity ranks (S-Ranks) after AC CDC, 2023

S-Rank	Definition
S1	Extremely rare: May be especially vulnerable to extirpation (typically five or fewer occurrences or very few remaining individuals).
S2	Rare: May be vulnerable to extirpation due to rarity or other factors (six to 20 occurrences or few remaining individuals).
S3	Uncommon, or found only in a restricted range, even if abundant at some locations (21 to 100 occurrences).
S4	Usually widespread, fairly common, and apparently secure with many occurrences, but of longer-term concern (e.g., watch list) (100+ occurrences).
S5	Widespread, abundant, and secure, under present conditions.

For the purposes of the current assessment, all species ranked S3 (including those ranked S3S4) or higher (i.e., S2, S1, S2S3, S1S2, etc.) were considered to be Species of Conservation Concern (SoCC) and were documented accordingly.

2.1.3 LiDAR Depth to Water (DTW) Map Development

In preparation for wetland field work, the best available topographic and imagery data from the NS Elevation Explorer data portal were compiled and reviewed. A 1 m resolution LiDAR digital elevation model (DEM) was acquired in order to ascertain the landforms and drainage conditions of the site that may be conducive to wetland formation. Based on the LiDAR DEM, a wet areas mapping (WAM) model was generated, consistent with techniques utilized by White et al. (2012). The result of this modeling is a cartographic depth to water index, which reflected a theoretical water table position (and in turn wetland hydrology) for the site. The LiDAR WAM was used to conduct an initial evaluation of where wetlands may exist, and to determine the extents of wetlands that extend beyond the field delineation area, upon completion of the delineation program. The LiDAR DTW was also used as an input to the Project Ecological Land Classification (P-ELC) described in subsequent sections.

2.2 Vegetation Surveys

Methods utilized for flora surveys conducted on the Study Area are described in the following subsections.

2.2.1 Vascular Flora

Vegetation surveys focused on: 1) examining habitats considered highly suitable for containing vascular plant and lichen SAR and SoCC, and 2) examining general vascular plant diversity and community composition within the Study Area. Habitats considered to be highest-priority areas for visitation generally include wetlands, floodplains, old-growth forests, and regions of calcareous geology (i.e., gypsum and limestone). The search pattern used in the field was a random meander, an accepted method for detecting presence or absence of plant species, including rare flora.

For each species sighting, the plant was identified and tabulated on an overall species inventory. Photos were taken for initial sightings where there was some doubt about identification. When necessary, specimens were collected for immediate identification (assuming the plant in question appeared abundant); voucher specimens and herbarium samples were not collected. In addition to the prior knowledge of the surveyors, the study team used keys and descriptions from various print and electronic resources, including the following:

- Roland and Smith's *Flora of Nova Scotia* (Zinck, 1998)
- *Nova Scotia Plants* (Munro et al., 2014)
- *Flora of New Brunswick* (Hinds, 2000)
- *Natural History of Nova Scotia* (Davis & Browne, 1996)
- *Flora Novae Angliae, A Manual of the Identification of Native and Naturalized Higher Vascular Plants of New England* (Haines, 2011)
- *Flora of the Northeast, A Manual of the Vascular Flora of New England and Adjacent New York* (Magee & Ahles, 1999)
- USDA PLANTS Database (USDA, 2022)
- GoBotany Digital Keys (Native Plant Trust, 2023)
- *Sedges of Maine: A field guide to Cyperaceae* (Arsenault et al., 2013)
- *Newcombs Wildflower Guide* (Newcomb, 1989)
- *Native Orchids of Nova Scotia - A Field Guide* (Munden, 2001)
- *Grasses and Rushes of Maine: A Field Guide* (Mittelhauser et al., 2019)
- *Woody Plants of the Northern Forest: A Photographic Guide* (Jenkins, 2018)
- *Sedges of the Northern Forest: A Photographic Guide* (Jenkins, 2019)
- *Grasses of the Northern Forest: A Photographic Guide* (Jenkins, 2022)

2.2.2 Non-vascular Flora

Incidental/opportunistic observations of lichen, moss, and liverwort species were also noted during the vascular plant and vegetation community surveys conducted within the

Study Area in 2022. More detailed observation of moss and lichen species were recorded as part of the habitat classification task (described in Section 2.2.3), as determination of NS Forest Ecosystem Classification (FEC) vegetation types relies on the composition of both vascular and non-vascular communities.

Non-vascular species were identified in the field based on habitat, substrate, growth form, colour (both wet and dry) of the plant/thallus, presence, form and/or colour of reproductive structures, presence and structure of rhizines (lichens only), texture, and co-occurring species. A running inventory of all species identified was kept for each survey day. When a potential non-vascular SoCC was identified, information such as geographic coordinates and a detailed habitat description was recorded. This included information on the type of substrate the specimen(s) were growing on, size of thallus, aspect, co-occurring lichen and bryophyte species, and the approximate number of specimens present. Photographs showing details of the upper and lower thallus, including rhizines and any reproductive structures such as apothecia, as well as the general habitat were taken. If the specimen appeared common in the area, a voucher sample was sometimes also taken to aid in identification. This procedure was also followed whenever a species that could not be identified in the field was encountered. In addition to the prior knowledge of the surveyors, the study team used keys and descriptions from various print and electronic resources, including the following:

- *Common mosses of the Northeast and Appalachians* (McKnight et al., 2013)
- *Mosses of the Northern Forest: A Photographic Guide* (Jenkins, 2020)
- *Lichens Of The North Woods, A Field Guide To 111 Northern Species* (Walewski, 2007)
- *The Macrolichens of New England* (Hinds and Hinds, 2007)
- *Common Lichens of northeastern North America* (McMullin and Anderson, 2014)
- *Lichens and allied fungi of the Atlantic Maritime Ecozone* (Clayden, 2010)
- *Macrolichens of Nova Scotia: a provisional checklist* (Anderson, 2014)
- *Lichens of North America* (Brodo et al., 2001)
- *Mosses, liverworts, and hornworts: a field guide to common bryophytes of the northeast* (Pope, 2016)

Incidental observations of lichen, moss, and liverwort species were also recorded by CBCL ecologists during other wetland, and watercourse surveys within the Study Area in 2022.

2.2.3 Vegetation Community Classification

The intention of this study was to document and describe occurrences of distinct vegetation communities that occur within the Study Area.

During surveys, forested ecosystems within the Study Area were identified and classified in the field using the NS DNRR Forest Ecosystems Classification (FEC) for Nova Scotia (Neily et al., 2010). For non-forested communities, several other regionally applicable vegetation classification systems were consulted; these included:

- *Maine Natural Areas Program (MNAP) – Natural Communities and Ecosystems* (Maine Department of Agriculture, Conservation & Forestry, 2021)
- *Natural Communities of New Hampshire (NCNH) - Technical Manual* (New Hampshire Natural Heritage Bureau, 2012)
- *Barrens Ecosystems in Nova Scotia (BENS): Classification of Heathlands and Related Plant Communities* (Porter et al., 2020)

Both the New Hampshire and Maine systems were chosen given their geographic proximity, similarities in climate, and similarities in overall vegetation composition, given that they are within the same temperate broadleaf and mixed-forest biome as Nova Scotia.

The vegetation communities identified within these systems were reviewed in terms of their overall applicability to our local condition. It was found that in many cases, clear parallels exist between the Maine and New Hampshire classifications, and the conditions documented here in Nova Scotia. Where applicable, the nomenclature of these systems was adapted for the present study, and this is indicated accordingly for the applicable community description. There are some cases where species presence differs notably between NH/ME classification and our local observations, but conditions were considered otherwise analogous (i.e., in terms of physical setting, landform affinity, physiognomy); in such cases, descriptions for the given communities were adjusted accordingly, with befitting species added to reflect our local condition.

Sample locations for community classifications were chosen in the field and were situated (where possible) in areas considered highly representative of a particular community. Where possible, vegetation plot data collected during the wetland delineation program were used for community classification. Survey location data were recorded using handheld GPS units.

In some cases, community classifications were considered to have characteristics intermediate to two communities and were noted as such. In many locations, owing to disturbance or early successional development, sites were unable to be discretely classified per the systems noted above.

2.3 Wetland Assessments

2.3.1 Determination and Delineation

CBCL's qualified wetland delineators conducted wetland delineations of the wetlands occurring within the Study Area. For efficiency, only the portions of wetlands that fall within the Study Area were delineated, with some exceptions. For the field delineation of wetlands, the protocols detailed in the US Army Corps of Engineers *Wetland Delineation Manual* (Environmental Laboratory, 1987) were used, key components of which are

outlined in the sections below. This procedure focuses on establishing the wetland-upland edge and is based upon the presence of positive indicators for hydrophytic vegetation, hydric soils, and wetland hydrology. In most situations, a positive indicator must be present for all three parameters to definitively identify any given site as a wetland. A sampling point for these three parameters was established at a representative location within the suspected wetland, and in the adjacent upland. Upon positive wetland determination, a wetland edge condition was established based on the three indicators identified for soils, hydrology, and vegetation, each of which are described below. This edge condition was used to navigate around the periphery of the wetlands.

Wetland inflows and outflows were georeferenced wherever encountered, as was the presence of culverts and/or ditching. Evidence of disturbance was also noted. Whenever possible, hydrological connections to other wetlands, watercourses, or waterbodies were determined. As the wetland was delineated, handheld GPS waypoints (3 to 5 m accuracy typical) were recorded along the boundary by the delineator. Areas unable to be delineated were interpreted upon completion of the field program using a combination of the LiDAR DEM and DTW models, and aerial photos.

2.3.1.1 Hydrophytic Vegetation

Hydrophytic vegetation refers to plant species that have adapted to living in saturated soils. Every vascular plant species in Nova Scotia has an associated wetland indicator status per the Nova Scotia Wetland Indicator Plant List (NS ECC, 2011). Wetland indicator status can be summarized as the probability or likelihood of a species occurring in wetland versus non-wetland habitat. Five basic categories of wetland indicator statuses exist, these are:

- **Obligate (OBL)** – Species almost always occurs in wetlands under natural conditions (estimated probability > 99%).
- **Facultative Wetland (FACW)** – Species usually occurs in wetlands (estimated probability 67% – 99%), but occasionally found in non-wetlands (estimated probability 1% – 33%).
- **Facultative (FAC**) – Species equally likely to occur in wetlands and non-wetlands (estimated probability > 33% – <67%).
- **Facultative Upland (FACU)** – Species usually occurs in non-wetlands (estimated probability 67% – 99%), but occasionally found in wetlands (estimated probability 1% – <33%).
- **Upland (UPL)** – Species almost always occurs in non-wetlands under natural conditions (estimated probability > 99%).

If the majority of plant cover (>50%) in the sample area is composed of species with FAC, FACW, or OBL statuses, then the positive indicator for hydrophytic vegetation is met. Therefore, the percent cover and wetland status indicator of plant species at each sampling location was visually assessed and recorded for varying plot sizes according to vegetative stratum (typically 10 m for trees, 5 m for shrubs, and 2 m for herb) in order to determine if hydrophytic vegetation was dominant within each of the sample locations.

2.3.1.2 Hydric Soils

Hydric soils are formed as a result of prolonged periods of saturation, flooding, or ponding during the growing season, resulting in anaerobic (oxygen-free) conditions. These anaerobic conditions may manifest themselves in a variety of ways, including the formation of reduction-oxidation (i.e., redox) features, organic soils (i.e., peat), and hydrogen sulphide (i.e., rotten egg odour), among other indicators. The presence or absence of such indicators, along with interpretation of the soil profile (i.e., colour, texture, thickness), provides the basis for determining whether or not any given soil is hydric. Hydric soil indicators were determined as per the *Field Indicators of Hydric Soils in the United States* (USDA, 2010). Soil samples were acquired using a soil auger and were visually assessed to identify conditions in the wetland and upland soils. Soil horizons were documented in terms of their texture, thickness, colour (Munsell chroma/value), and presence of hydric soil indicators (where applicable).

2.3.1.3 Wetland Hydrology

Wetland hydrology refers to the hydrologic characteristics of areas that are periodically inundated or have soils that are saturated to the surface at some point during the growing season with a focus on the frequency, timing, and duration of inundation or soil saturation as a basis for classification. Primary hydrology indicators (of which at least one must be present for wetland determination) include the presence of surface water, a high water-table, saturated soils, and sediment deposits, among others. Secondary indicators (two of which are required when a primary indicator is not present) include surface soil cracks and visible drainage patterns.

Observations were made concerning the presence of a hydrological regime that would sustain wetland processes at the wetland determination plot and throughout the wetland extents. The location of the site in general, as well as the microtopography of the wetland area, was taken into consideration.

2.3.2 Wetland GIS Processing & Mapping

Upon completion of wetland fieldwork, all GPS data points were compiled into GIS for subsequent mapping and analysis. The following key data products were produced as an outcome:

1. **Delineated Wetland Areas (Polygons)** – Areas of confirmed wetland conditions, as determined from on-the-ground delineation
2. **Predicted Wetland Areas (Polygons)** – Based upon multiple modeled landscape parameters including DTW values, percent slope, etc. and calibrated using known conditions determined during on-the-ground delineation
3. **Delineated Wetland Edges (Polylines)** – Differentiated in some areas, where boundaries were physically inaccessible due to heavy blowdown; these areas were interpreted using LiDAR/Photography/DTW model
4. **Wetland Control Points (Points)** – Areas where wetland/upland conditions were formally documented in terms of hydrology, soils and vegetation

5 **Unregulated Wetlands (Points)** – Areas where wetland conditions were encountered, but where the total of these areas was less than 100 m^2, which is the threshold below which wetlands are not technically regulated (though it should be noted that wetlands still provide ecological function, regardless of their size)

6 **Wetlands of Special Significance (Polygons)** – Areas which have been determined to be Wetlands of Special Significance (WSS) per the Nova Scotia Wetland Conservation Policy. This may be on account of containing a non-mobile Species at Risk, by scoring above certain functional thresholds on a WESP-AC functional assessment, among other reasons.

2.3.3 Wetland Functional Assessment

Functional assessments of wetlands within the Study Area were completed using the Wetland Ecosystem Services Protocol for Atlantic Canada (WESP-AC), a functional assessment technique that is requested by NS ECC as part of wetland alteration applications. This assessment has both field and desktop components. The field portion generally should occur during the growing season, as it relies considerably on plant communities, and so was conducted in the late summer and fall 2022 for this Project. In addition to assessing wetland vegetation communities, hydrology and soils, physical parameters such as water temperature, pH, and conductivity were also measured in each wetland, when surface water was present. The desktop functional assessment component was conducted after the field portion had been completed.

2.3.3.1 WESP-AC Methodology

WESP-AC determines 17 individual ecosystem functions and their associated benefits (Table 2-2) based upon input of upwards of 129 ecological characteristics (indicators) into a logic-based model. For example, the "% of Ponded Water that is Open" is but one of the indicators used to estimate Waterbird Nesting Habitat. These indicators are obtained through a combination of field observations (in this case executed during wetland delineation) and desktop research using a variety of data sources (i.e., ArcGIS, Pictometry Aerial Imagery, Google Earth Pro, Nova Scotia Provincial Landscape Viewer).

Table 2-2 Ecosystem Functions and Benefits

Function	Definition	Potential Benefit
HYDROLOGIC FUNCTIONS		
Surface Water Storage (WS)	The effectiveness for storing runoff or delaying the downslope movement of surface water for long or short periods.	Flood control and maintaining ecological systems.
Stream Flow and Temperature Support (SFTS)	The effectiveness for contributing to streamflow, and to water cooling, especially during the driest part of a growing season.	Supporting fish and other aquatic life.
WATER QUALITY MAINTENANCE FUNCTIONS		

Function	Definition	Potential Benefit
Water Cooling (WC)	The effectiveness for maintaining or reducing temperature of downslope waters.	Supporting coldwater fish and other aquatic life.
Sediment and Toxicant Retention & Stabilisation (SR)	The effectiveness for intercepting and filtering suspended inorganic sediments and toxins, thus allowing their deposition; reducing current velocity; resisting erosion; and stabilising underlying sediments or soil.	Maintaining quality of receiving waters and protecting shoreline structures from erosion.
Phosphorus Retention (PR)	The effectiveness for retaining phosphorus for long periods (>1 growing season).	Maintaining quality of receiving waters.
Nitrate Removal & Retention (NR)	The effectiveness for retaining particulate nitrate and converting soluble nitrate and ammonium to nitrogen gas while generating little or no nitrous oxide (a potent greenhouse gas).	Maintaining quality of receiving waters.
Carbon Stock (CS)	The effectiveness of a wetland both for retaining incoming particulate and dissolved carbon, and converting carbon dioxide gas to organic matter (particulate or dissolved) through photosynthesis. The effectiveness to then retain that organic matter on a net annual basis for long periods while emitting little or no methane (a potent "greenhouse gas").	Maintaining quality of receiving waters.
Organic Nutrient Export (OE)	The effectiveness for producing and subsequently exporting organic nutrients (mainly carbon), either particulate or dissolved. It does not include exports of carbon in gaseous form or as animal matter.	Supporting food chains in receiving waters.
ECOLOGICAL (HABITAT) FUNCTIONS		
Aquatic Primary Productivity (APP)	The capacity to support aquatic primary productivity and provide nutrients and energy to higher trophic levels and organisms.	Supporting aquatic food webs and contributing to local biodiversity.
Anadromous Fish Habitat (FA)	The capacity to support an abundance and diversity of native anadromous fish for functions other than spawning.	Supporting recreational and ecological values.
Resident and Other Fish Habitat (FR)	The capacity to support an abundance and diversity of native non-anadromous fish.	Supporting recreational and ecological values.
Amphibian & Reptile Habitat (AM)	The capacity to support or contribute to an abundance and diversity of native amphibians (e.g. frogs, toads, salamanders) and turtles.	Maintaining regional biodiversity.
Waterbird Feeding Habitat (WBF)	The capacity to support an abundance and diversity of waterbirds that migrate or winter but do not breed in the region.	Supporting hunting and ecological values; and maintaining regional biodiversity.
Waterbird Nesting Habitat (WBN)	The capacity to support an abundance and diversity of waterbirds that nest in the region.	Maintaining regional biodiversity.

Function	Definition	Potential Benefit
Raptor & Wetland Songbird Habitat (RSB)	The capacity to support an abundance and diversity of native raptors and wetland songbirds.	Maintaining regional biodiversity.
Keystone Mammal Habitat (KMH)	The capacity to support keystone mammals in the region.	Maintaining regional biodiversity.
Native Plant Habitat (PH)	The capacity to support a diversity of native vascular and non-vascular species and functional groups, especially those that are most dependent on wetlands and water.	Maintaining regional biodiversity and food chains.

2.4 Project Ecological Land Classification

2.4.1 P-ELC Objectives

A component of the vegetation studies for the Project was the development of a Project Ecological Land Classification (P-ELC). The purpose of the P-ELC was to provide a landscape-level analysis of major vegetation communities and habitat within the defined P-ELC study area. It is intended that the P-ELC serve as an over-arching component of the vegetation baseline information to be used in the Environmental Assessment (EA) process.

- Conduct a rigorous field assessment of the terrestrial environment.
- Generate a remote-sensing-based mapped inventory of ELC Units, which represent umbrella categories for the major vegetation communities encountered during the field surveys and other non-vegetated areas; and the provision of Geographic Information System (GIS) map layers of same.
- Provide a product which serves as the basis for other studies reliant on habitat mapping, i.e., avifauna, mammals, wetlands and rare vegetation.
- Provide an effects assessment tool for quantifying interactions between the Project and the natural environment, as required for various taxa, including SoCC and SAR.
- Assessing availability of alternate habitat for SoCC and SAR beyond the footprint of the Project.

The actual execution of any such specific habitat studies using the P-ELC are excluded from the present study.

The ELC units generated in the present study represent a range of conditions which are equally identifiable both through field surveys and remote sensing. These conditions are:

1. Major vegetation associations,
2. Vegetation structure, and
3. Potential wetland status.

2.4.2 Remote Sensing Image Classification

2.4.2.1 General Concepts

The purpose of image classification is to iteratively organize imagery pixels into land-cover information classes, which in this instance are related directly to vegetation communities sampled on the ground. Imagery pixels are placed into these defined classes based on their spectral signature, which is derived from the multiple bands contained in the image. These spectral signatures are generated through the delineation of training areas within a GIS, which are polygons of known vegetation characteristics, as determined during field surveys (whether for vegetation inventory, wetland assessment, watercourse assessment, etc.) or other reference data. Using the spectral signature data, the image classification algorithm in turn performs a pixel-by-pixel analysis of the remaining portions of the imagery to assign these remaining pixels to the defined land-cover classes.

2.4.2.2 Data Sources and Image Processing

The primary sources of data for the P-ELC were conventional Aerial Imagery in the visible spectrum (i.e., RGB images), and a variety of LiDAR-derived datasets as described in Table 2-3.

LiDAR Digital Elevation products were downloaded from the Nova Scotia Geomatics Centre Elevation Explorer (NSGC, 2022). All LiDAR data for the site was acquired in 2019, on behalf of the Province of Nova Scotia. All LiDAR data were downloaded as point cloud files in .LAS format, from which a series of seamless raster datasets were generated along the entire length and breadth of the Study Area. A variety of data were produced in support of the P-ELC.

Table 2-3 P-ELC Input Dataset Descriptions

Data Type	Description
Elevation Products	**Digital Surface Model (DSM):** An elevation surface derived from interpolation of all ground, and above ground elevation features.
	Digital Elevation Model (DEM): An elevation surface derived from interpolation of ground elevation features only.
	Canopy Height Model (CHM): Defined as the arithmetic difference between the DSM and DEM, and representing the height of all above ground features (predominantly vegetation).
Spectral Data	**RGB Imagery:** A three-band imagery product containing Red, Green and Blue.
	LiDAR Intensity Raster: A surface describing the intensity of the return from the object (e.g., vegetation, ground surface, water, etc.) struck by the laser pulse from LiDAR sensor. LiDAR sensors employ lasers that are typically within the near-infrared spectrum; hence, for this analysis LiDAR intensity was used as a surrogate source of infrared imagery data which the RGB imagery was lacking.

Data Type	Description
Derivative Data	**LiDAR Depth to Water (DTW):** Defined as surface describing a modelled height of the LiDAR DEM above a theoretical channel network (as defined by surface topography); for the purposes of this assessment, this output assists in the definition of potential wetland areas or drainage paths through the landscape.
	Normalized Differential Vegetation Index (NDVI): layer was generated using the LiDAR intensity (NIR) and Red band from the RGB imagery, per the following equation: NDVI = (NIR – Red) / (NIR + Red).

All LiDAR and RGB imagery derivatives were generated and saved as ESRI file geodatabase rasters at a spatial resolution of 1 m, with all elevations referenced using the CGVD2013 vertical datum.

The three RGB spectral bands, plus the NDVI were composited into a multiband raster for the purposes of a 'supervised' image classification. 'Training areas' for this classification were developed using the network ecosystem classification field sample locations, and visual interpretation of high-resolution imagery. The ecosystem classification points assisted in identifying major vegetation groups such as coniferous, deciduous, and mixed forest, as well as vegetated and un-vegetated non-forest areas (e.g., low herbaceous vegetation, gravel, asphalt, water, etc.). These training areas were in turn used to generate class signatures for each of the defined land-cover classes in the training area dataset. These class signatures are statistical clusters based on the spectral attributes of the various input layers in the multiband raster being classified (ESRI, 2023a). Using the class signature files, a Maximum Likelihood image classification algorithm (ESRI, 2023b) was performed, wherein each cell in the multiband raster is placed into one of the land-cover classes defined in the signature file. Upon execution of the land-cover classification, a focal majority filter (ESRI, 2023c) was applied to reduce noise within the classification and to generalize the habitat regions. During this process, each classified image pixel was assigned the majority value found in its immediate 3x3 pixel neighbourhood.

The various component layers were reclassified into categories as described below, and stored as 16-bit raster images with a horizontal resolution of 1 m. These reclassified component layers were summed using ArcGIS 'Raster Calculator' to form the final 'Composite P-ELC'. Subsequently, the raster P-ELC was converted to polygon format, and assigned descriptive attribution related to the P-ELC codes.

2.4.3 P-ELC Outputs

The 'Composite P-ELC' output layer comprise three-digit codes describing the various permutations of the component layers as follows in Table 2-4.

Table 2-4 P-ELC Component Layers – Value ranges and descriptions

WETNESS CLASS – '100' Level Codes			
DTW CODE	**Range**	**Description**	**Wetland Potential**
100	<10 cm	Very Poorly Drained	Very High
200	10-50 cm	Poorly Drained	High
300	50 cm - 2 m	Imperfectly Drained	Moderate
400	2-5 m	Well Drained	Low
500	5-15 m	Very Well Drained	Low
600	>15 m	Excessively Well Drained	Low
HEIGHT CLASS – '10' Level Codes			
CHM CODE	**Range**	**Description**	
10	< 1cm	Groundcover	
20	1-10 cm	Low Growth	
30	10-25 cm	Low Growth	
40	25-50 cm	Low Shrub	
50	50 cm - 2 m	Low Shrub	
60	2-7 m	High Shrub	
70	7-15 m	Forest (Young to Immature)	
80	15-30 m	Forest (Immature to Mature)	
90	>30 m	Forest (Mature to Very Mature)	
LANDCOVER CLASS – '1' Level Codes			
LC CODE	**Description**		
1	Bare Ground/Moss		
2	Broadleaf/Graminoid		
3	Broadleaf Dominant		
4	Mixed		
5	Coniferous Dominant		
6	Water		

Due to the high number of permutations of three-digit codes, discrete mapping of the individual P-ELC codes can be challenging to visually interpret. This P-ELC does, however, enable the extraction of very specific landscape parameters and is well suited to analytical mapping within a GIS environment. Using the P-ELC as a foundation, further derivative products and models are able to be generated in support of specific habitat studies, or effects assessments in the context of an Environmental Assessment.

A description of possible P-ELC codes is provided in Appendix B.

2.5 Field Survey Phases and Dates

For planning and costing purposes, CBCL conducted the assessments required by NSPI in 4 phases. These are outlined in the following subsections, and were as follows:

- Phase 1 – Flora Inventory
- Phase 2 – Community Classification
- Phase 3 – Wetland Reconnaissance Surveys
- Phase 4 – Wetland Delineation and Functional Assessment

2.5.1 Phases 1-3 – Flora Inventory, Community Classification and Wetland Reconnaissance Surveys

Vascular flora inventories and community classification surveys were conducted by CBCL Biologists and Technicians specializing in terrestrial ecology during late summer and fall, due to the timing of project initiation. Reconnaissance surveys for wetlands potentially needing delineation once the Project Area was determined were conducted simultaneously with the vegetation surveys. These surveys occurred on the following dates in 2022:

- September 1, 7, 8, 9, 14, 15, 16, 22, 29
- October 5, 8, 12, 14, 17, 18, 20, 21, 24, 26, 27
- November 4 and 8

Incidental surveys for lichen and bryophyte SoCC, which are generally identifiable year-round, were conducted simultaneously with the vascular plant surveys throughout the survey program, as an efficiency measure.

2.5.2 Phase 4 – Wetland Delineation and Functional Assessment

Once the Project Area was established, delineation and functional assessments of wetlands occurring within the Project Area were conducted by CBCL Biologists and Technicians specializing in wetland delineation and assessment during the fall of 2022, due to the timing of project initiation and the completion of the wetland reconnaissance surveys.

Wetland delineation and functional assessment surveys were conducted as part of Phase 4 of this Project. In 2022, Phase 4 surveys were conducted on the following dates:

- November 4, 8, 9, 16, 17, 18, 23, 24, 25
- December 2 and 16

Additional vascular and non-vascular species SoCC data were collected incidentally during Phase 4. Community classification and P-ELC field data collection was also ongoing for the duration of the program.

2.5.3 Special Considerations

Due to the required Project schedule, wetland delineations and functional assessments were not initiated until October and continued until early December 2022. While such assessments should technically be conducted within the accepted growing season in NS (June 1 to Sept 30), CBCL received prior approval for NS ECC to conduct these wetlands assessments out of season (John Gallop, NS ECC, pers. comm.), as most of the wetlands had already been identified and photographed by CBCL during the reconnaissance surveys in August, September, and October.

3 Results: Desktop Study

Results of the desktop reviews of available vascular plant, vegetation community, and wetland data pertaining to the Study Area are provided in the following subsections.

3.1 Existing Species and Habitat Information

3.1.1 Ecological Land Classification

The Study Area lies with the South Mountain Ecodistrict, as defined by The Ecological Land Classification system for Nova Scotia (Neily et al., 2017). The following description of terrestrial habitats with this ecodistrict is summarized from Neily et al. (2017). The South Mountain ecodistrict is a rugged upland of pine and spruce dominated forests, shallow and coarse textured soils, granite boulders, and bedrock exposures. It is characterized by abundant lakes, rivers and wetlands, and includes the highest elevations in western Nova Scotia, with a mean elevation of 175 m above sea level. Headwaters of some of Nova Scotia's longest rivers originate here, including the Medway, Mersey, LaHave, Jordan and Roseway. Drumlins with coarse, gravelly soils are scattered throughout the ecodistrict. Forests in the South Mountain ecodistrict have been strongly influenced by several factors including a long history of forest harvesting and uncontrolled wildfires. Eastern White Pine (*Pinus strobus*) is a typical component of most stands, and Red Oak (*Quercus rubra*) is also prevalent. The Spruce-Hemlock Forest Group is typical on well to moderately well drained soils of medium fertility, with Red Spruce (*Picea rubens*), Eastern White Pine, and Eastern Hemlock (*Tsuga canadensis*) occupying most slope positions where these conditions exist. Balsam Fir (*Abies balsamea*) is often present in all stands at some stage of development. The shrub layer is mainly regenerating overstory species, but may include Sheep Laurel (*Kalmia angustifolia*) and Late Lowbush Blueberry (*Vaccinium angustifolium*). Typical woodland flora includes Bunchberry (*Cornus canadensis*), Wild Lily-of-the Valley (*Maianthemum canadense*), Bluebead Lily (*Clintonia borealis*), Sarsaparilla (*Aralia nudicaulis*) and Starflower (*Lysimachia borealis*), with Bracken Fern (*Pteridium aquilinum*) also found on poorer sites. Schreber's Moss (*Pleurozium schreberi*) and Stair-step Moss (*Hylocomium splendens*) are abundant, and Bazzania liverwort (*Bazzania trilobata*) is common in areas with abundant decaying wood.

Spruce-Pine vegetation types will be found on a range of slope positions. The understory is dominated by a variety of shrubs and herbs tolerant of acidic (nutrient poor) soils. Ericaceous shrubs (e.g., Sheep Laurel, Late Lowbush Blueberry, Huckleberry (*Gaylussaccia baccata*)), Witch-hazel (*Hamamelis virginiana*) and Black Spruce (*Picea mariana*) regeneration (often through layering), are typical. Bracken Fern and Eastern Teaberry (*Gaultheria procumbens*) are common along with Prince's Pine (*Chimaphila umbellata*) and Round-Leaved Pyrola (*Pyrola americana*).

The Tolerant Hardwood Forest Group is not abundant but can be found on drumlins and a few crests and upper slopes. Sugar Maple (*Acer saccharum*), Yellow Birch (*Betula alleghaniensis*), Red Maple (*Acer rubrum*), American Beech (*Fagus grandifolia*), and Red Oak (*Quercus rubra*), are representative species. Regenerating tree species, Striped Maple (*Acer pennsylvanicum*), and a dense layer of several fern species create the understory.

Open uplands are limited to small rocky outcrops and cliffs adjacent to rounded summits, boulder plains left after glaciation, outwash deposits, and the tops of sandy eskers and kames. Rock bluffs are characterized by low growing heathland or ground lichens. These lichen dominated ecosystems can be quite striking with extensive areas of snow lichens (*Stereocaulon* spp.), reindeer lichens (*Cladonia* spp.), and rock tripes (*Umbilicaria* spp.). Where sites have been repeatedly burned and impoverished, barrens of woody ericaceous shrubs, scrubby Black Spruce, White Pine, Red Oak and Red Maple with reindeer lichens are typical (Neily et al., 2017).

3.2 Existing SAR and SoCC Information

3.2.1 Atlantic Canada Conservation Data Centre (AC CDC)

An AC CDC listing of rare and endangered species sightings was acquired for an area within a 5 km radius of the Study Area (AC CDC, 2023). An AC CDC search was conducted to determine if SAR or SoCC occur in or near the Study Area.

The full AC CDC report is provided in Appendix A – AC CDC Rare Taxa Report. Map 2 in the AC CDC report depicts locations of all flora and fauna SAR and SoCC reported from within the Study Area. The present report discusses the vascular and non-vascular flora SAR and SoCC records listed in the AC CDC report.

A total of six rare flora species (two vascular and four non-vascular) were identified within a 5 km radius of the Study Area. None of the flora species are federally or provincially listed as SAR (see Table 3-1). Flora observations from the AC CDC report are shown on Figure 3-1.

Table 3-1 Flora Species of Conservation Concern Reported by AC CDC (2023) within 5 km of the Study Area

Common Name Vascular Plant Species	Scientific Name	NS S-Rank	# of Records and Location (Closest in Km)
Vascular Flora Species			
Hooker's Orchid	*Platanthera hookeri*	S3	1 (7.6 ± 0.0)
Daisy-leaved Moonwort	*Botrychium matricariifolium*	S3S4	1 (3.1 ± 10.0)
Non-vascular Flora Species			
Black Rock-wafer Lichen	*Phylliscum demangeonii*	S2?[1]	1 (9.0 ± 0.0)
Eastern Candlewax Lichen	*Ahtiana aurescens*	S2S3	1 (9.1 ± 2.0)
Mixed-up Pixie-cup	*Cladonia mateocyatha*	S2S3	1 (9.5 ± 6.0)
Salted Shell Lichen	*Coccocarpia palmicola*	S3S4	1 (9.1 ± 0.0)

[1] S-Rank is considered somewhat questionable by AC CDC due to lack of population data or recent taxonomic changes

Cladonia mateocyatha

Ahtiana aurescens

Coccocarpia palmicola

Phylliscum demangeonii

Platanthera hookeri

Botrychium matricariifolium

- Vascular Flora - SoCC
- Non Vascular Flora - SoCC
- Study Area (Phase 4)
- Property Boundaries
- Provincially Mapped Watercourse
- Provincially Mapped Wetland
- Provincially Mapped Waterbody

MCODE: Vascular Species
BOTRmatr - ***Botrychium matricariifolium*** (Daisy-leaved Moonwort)
PLAThook - ***Platanthera hookeri*** (Hooker's Orchid)

MCODE: Non-Vascular Species
CLADmate - ***Cladonia mateocyatha*** (Mixed-up Pixie-cup)
AHTlaure- ***Ahtiana aurescens*** (Eastern Candlewax Lichen)
COCCpalm- ***Coccocarpia palmicola*** (Salted Shell Lichen)
PHYLdema- ***Phylliscum demangeonii*** (Black Rock-wafer Lichen)

Nova Scotia POWER An Emera Company

CBCL

BEAR LAKE WIND
Vegetation & Wetlands

ACCDC Data Report 7546
Vascular & Non-Vascular Flora
SoCC Observations

DATE: 2023-03-28	PROJ N°: 221266.01	FIGURE: 3-1
DRAWN BY: NH	CHECKED BY: BC	APPROVED: IB

NOTES:

0 500 1,000 2,000 m

SCALE: 1:65,000 @ 11 X 17

Coordinate System: NAD 1983 CSRS UTM Zone 20N
Units: Meter

3.2.2 Strum Lichen Report

Strum Consulting, during their 2022 targeted lichen surveys, detected a total of seven lichen SoCC within the Study Area. SAR/SoCC lichens detected by Strum are summarized in Table 3-2.

Table 3-2 Lichen Species of Conservation Concern Detected by Strum at Bear Lake (Strum 2022) (SAR species in Bold)

Common Name	Scientific Name	COSEWIC	SARA	NS ESA	NS S-Rank	# of Locations Onsite
Blue Felt Lichen	***Pectenia plumbea***	SC	SC	V	S3	2
Frosted Glass-whiskers	***Sclerophora peronella***	SC	SC	-	S1S2	5
Acadian Jellyskin Lichen	*Leptogium acadiense*	-	-	-	S3S4	1
Blistered Jellyskin Lichen	*Leptogium corticola*	-	-	-	S3S4	2
Blistered Tarpaper Lichen	*Collema nigrescens*	-	-	-	S3	3
Crumpled Bat's Wing Lichen	*Collema leptaleum*	-	-	-	S2S3	3
Eastern Candlewax Lichen	*Ahtiana aurescens*	-	-	-	S2S3	1

T= Threatened
Sc= Special Concern
V= Vulnerable

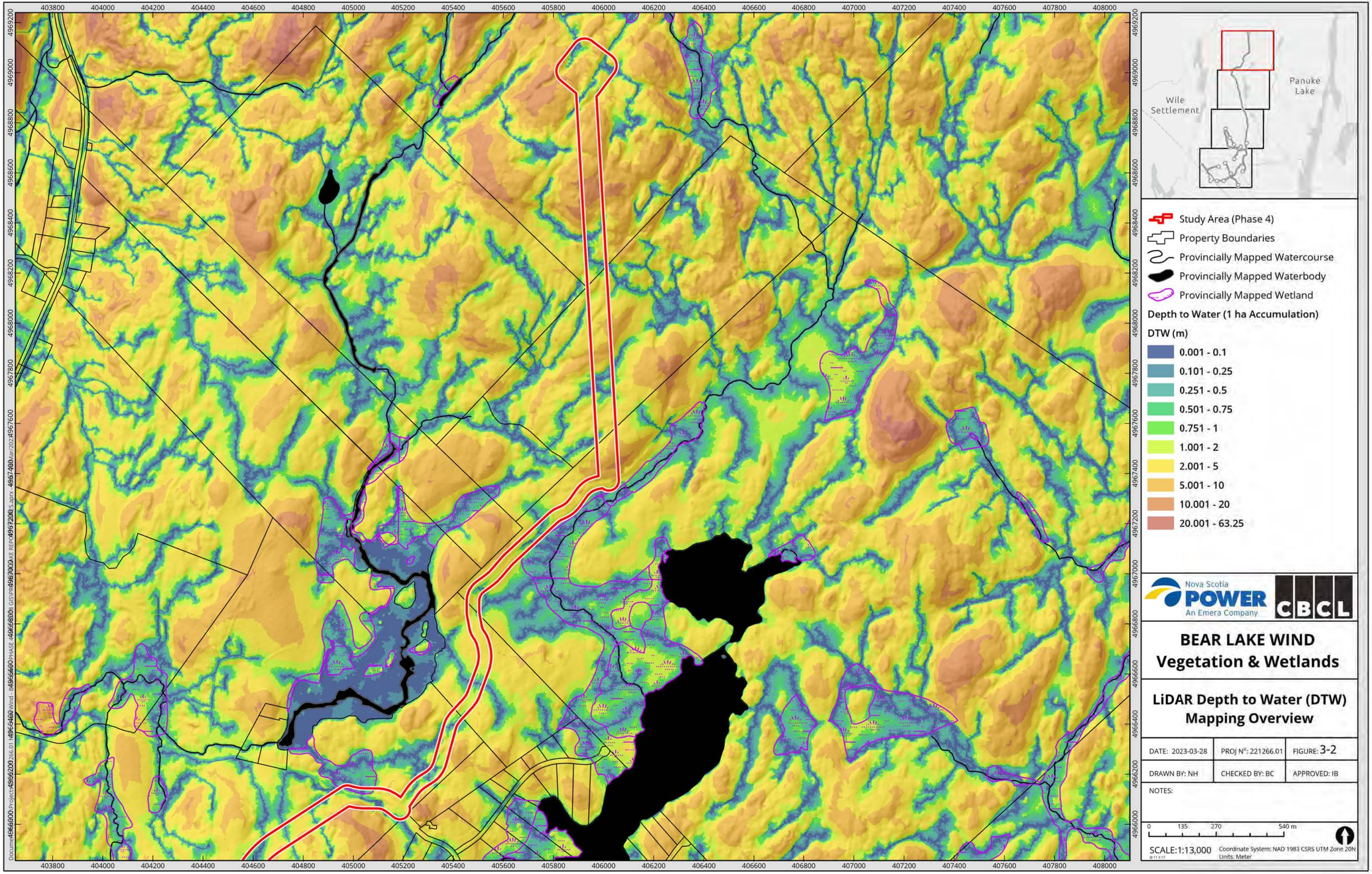
3.2.2.1 Ecological Land Classification

The Ecological Land Classification Guide for Nova Scotia (Neily et al., 2017) states that some rare Atlantic Coastal Plain Flora occur in the South Mountain ecodistrict, including the rare Plymouth Gentian (*Sabatia kennedyana*), Slender Blue Flag (*Iris prismatica*), Smooth Alder (*Alnus serrulata),* and Swamp Loosestrife (*Decodon verticillatus*), all of which occur on lakeshores and open peatlands.

3.3 Known and Suspected Wetland Areas

The Ecological Land Classification Guide for Nova Scotia (Neily et al., 2017) states that wetlands are abundant within the South Mountain Ecodistrict, with most non-forested ecosystems consisting of wetland habitat. Similar to most of the other ecodistricts in this ecoregion, shrub swamps and open peatlands occupy the majority of wetland area. Shrublands of Leatherleaf (*Chamaedaphne calyculata*), Rhodora (*Rhododendron canadense*), Sheep Laurel, and Labrador Tea (*Rhododendron groenlandicum*) are found next to slow moving water and streams. These shrubland areas have poorly drained organic and mineral soils with water levels at or near the surface. Fens of Red Maple are also typical along these stillwaters. On upland sites with poor soil drainage, Black Spruce, Tamarack and Red Maple dominate the forest vegetation (Neily et al., 2017).
Upon review of the Provincial wetlands inventory, a number of previously mapped wetlands were identified within the Study Area defined for the Project. In addition, many

more potential wetland locations were identified using the LiDAR DTW product. These areas are shown on Figure 3-2 through Figure 3-5. Many of the previously mapped wetlands in the Provincial inventory were verified on the ground during field studies; and indeed, many were determined to be larger than depicted in the inventory. The majority of 'high potential' areas for wetland presence based on the DTW model were also verified on the ground. As a general observation, the DTW performed well at predicting the presence of wetlands; although the model may be considered excessively conservative in some landscape settings, and may overpredict wetland conditions (i.e., errors of commission) more often than underpredict (errors of omission). The exception to this is for bogs with a convex profile, which are consistently under-represented in the model.



- Study Area (Phase 4)
- Property Boundaries
- Provincially Mapped Watercourse
- Provincially Mapped Waterbody
- Provincially Mapped Wetland

Depth to Water (1 ha Accumulation)

DTW (m)

- 0.001 - 0.1
- 0.101 - 0.25
- 0.251 - 0.5
- 0.501 - 0.75
- 0.751 - 1
- 1.001 - 2
- 2.001 - 5
- 5.001 - 10
- 10.001 - 20
- 20.001 - 63.25

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BEAR LAKE WIND
Vegetation & Wetlands

LiDAR Depth to Water (DTW) Mapping Overview

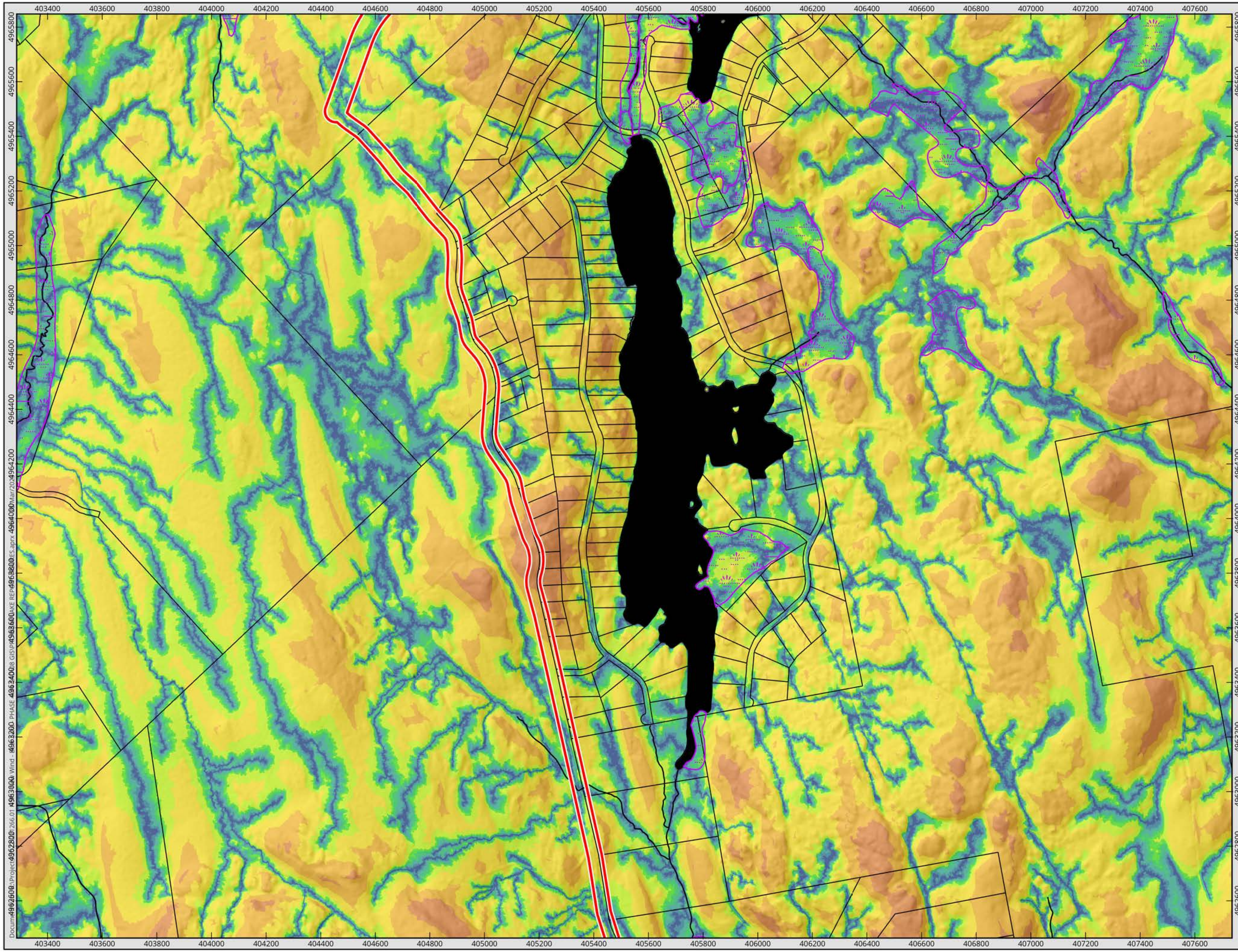
DATE: 2023-03-28	PROJ N°: 221266.01	FIGURE: 3-2
DRAWN BY: NH	CHECKED BY: BC	APPROVED: IB

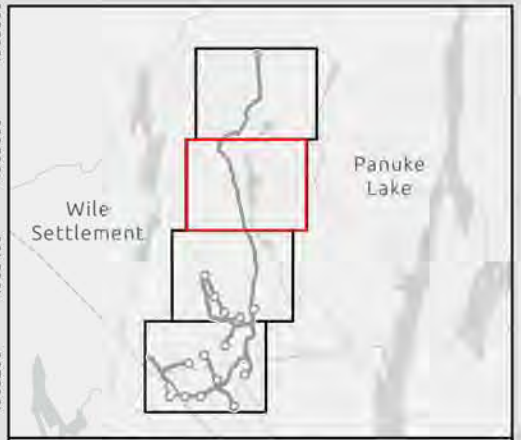
NOTES:

0 135 270 540 m

SCALE:1:13,000 @ 11 X 17

Coordinate System: NAD 1983 CSRS UTM Zone 20N
Units: Meter





Study Area (Phase 4)
Property Boundaries
Provincially Mapped Watercourse
Provincially Mapped Waterbody
Provincially Mapped Wetland

Depth to Water (1 ha Accumulation)

DTW (m)

- 0.001 - 0.1
- 0.101 - 0.25
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- 5.001 - 10
- 10.001 - 20
- 20.001 - 63.25

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LiDAR Depth to Water (DTW) Mapping Overview

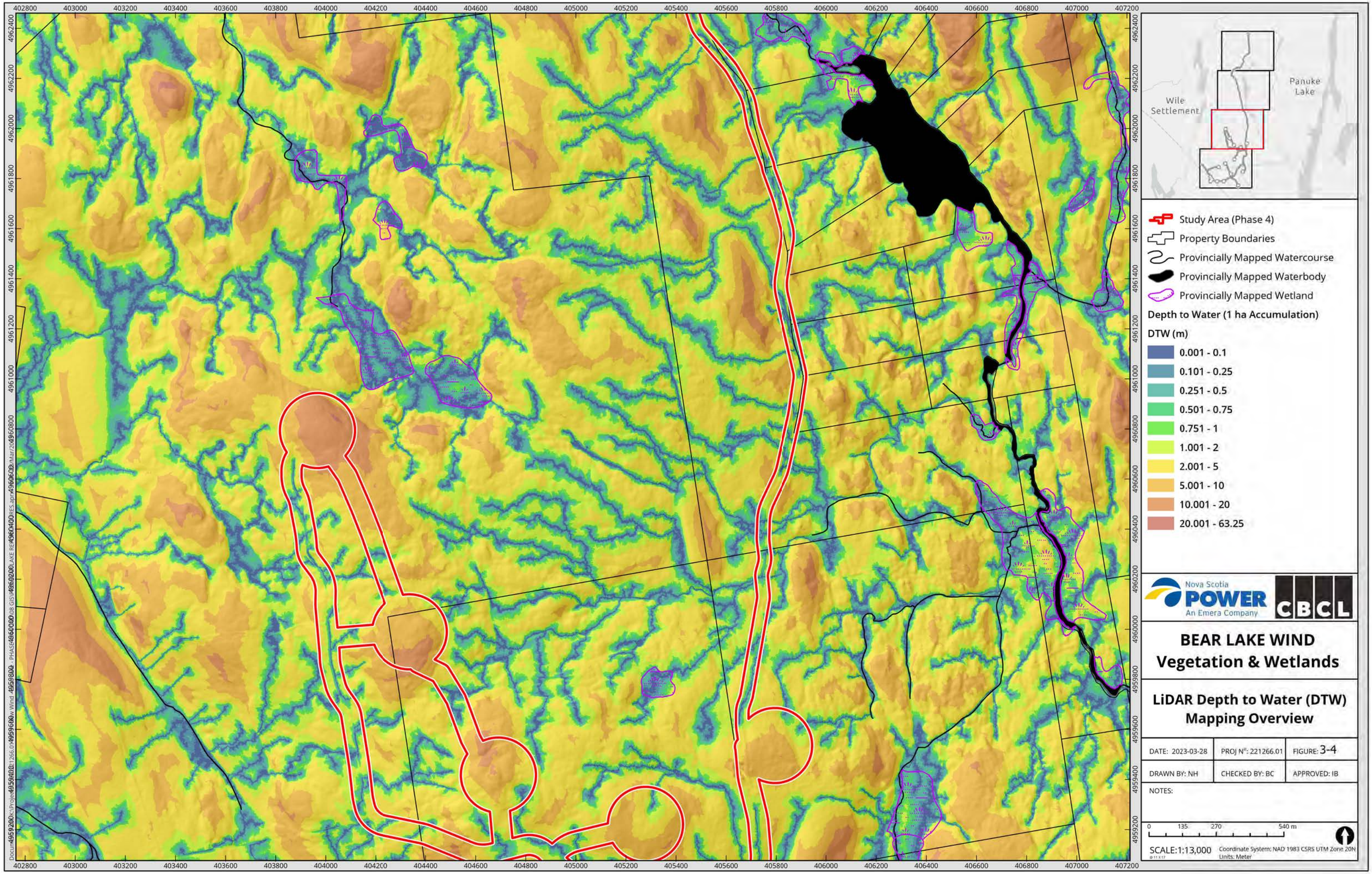
DATE: 2023-03-28	PROJ Nº: 221266.01	FIGURE: 3-3
DRAWN BY: NH	CHECKED BY: BC	APPROVED: IB

NOTES:

0 135 270 540 m

SCALE:1:13,000
@ 11 X 17

Coordinate System: NAD 1983 CSRS UTM Zone 20N
Units: Meter



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BEAR LAKE WIND
Vegetation & Wetlands

LiDAR Depth to Water (DTW) Mapping Overview

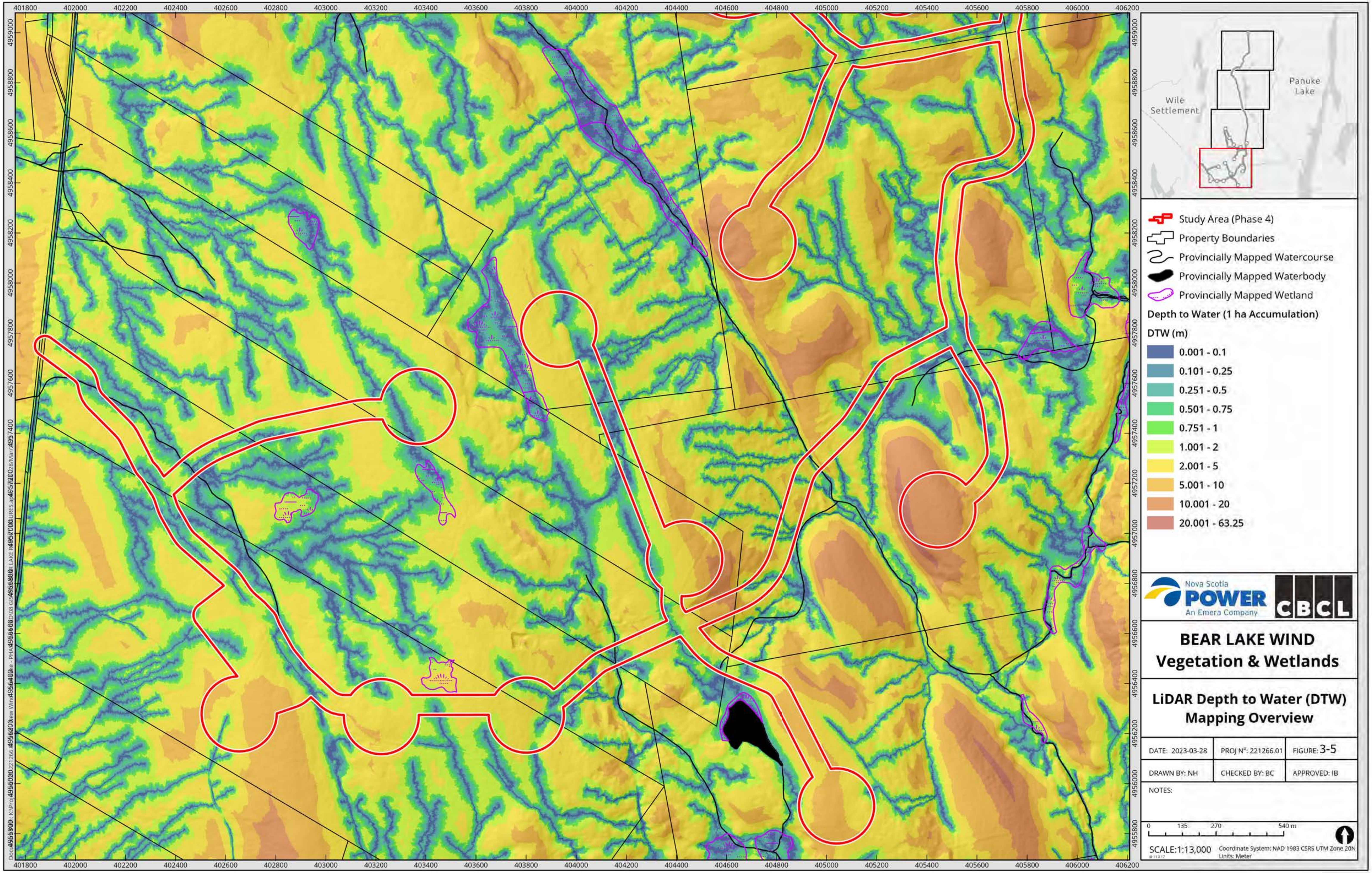
DATE: 2023-03-28	PROJ N°: 221266.01	FIGURE: 3-4
DRAWN BY: NH	CHECKED BY: BC	APPROVED: IB

NOTES:

0 135 270 540 m

SCALE:1:13,000 @ 11 x 17

Coordinate System: NAD 1983 CSRS UTM Zone 20N
Units: Meter


Wile Settlement
Panuke Lake
Study Area (Phase 4)
Property Boundaries
Provincially Mapped Watercourse
Provincially Mapped Waterbody
Provincially Mapped Wetland
Depth to Water (1 ha Accumulation)
DTW (m)
0.001 - 0.1
0.101 - 0.25
0.251 - 0.5
0.501 - 0.75
0.751 - 1
1.001 - 2
2.001 - 5
5.001 - 10
10.001 - 20
20.001 - 63.25
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BEAR LAKE WIND
Vegetation & Wetlands
LiDAR Depth to Water (DTW)
Mapping Overview
DATE: 2023-03-28
PROJ N°: 221266.01
FIGURE: 3-5
DRAWN BY: NH
CHECKED BY: BC
APPROVED: IB
NOTES:
0 135 270 540 m
SCALE:1:13,000
Coordinate System: NAD 1983 CSRS UTM Zone 20N
Units: Meter
401800 402000 402200 402400 402600 402800 403000 403200 403400 403600 403800 404000 404200 404400 404600 404800 405000 405200 405400 405600 405800 406000 406200
4959000 4958800 4958600 4958400 4958200 4958000 4957800 4957600 4957400 4957200 4957000 4956800 4956600 4956400 4956200 4956000 4955800

4 Wetland Field Surveys

4.1 Delineated Wetland Inventory Summary

A total of 81 regulated wetlands (i.e., those > 100 m^2) were confirmed within, or immediately adjacent to, the Study Area during the field studies (Figure 4-1 through Figure 4-4). Several general wetland classification types (i.e., swamp, bog, fen, and marsh) comprised the assessed wetlands; many of which were complexes that contained mosaics of one or more wetland types (see Table 4-1). A general description of the wetland classification types encountered within the Study Area is presented in subsequent sections.

Detailed wetland plot information is provided in Appendix C; functional assessment results are provided in Appendix D; and a photo log of individual wetland sites is provided in Appendix E.

Table 4-1 Summary of Study Area Wetland Delineation Results

#	Wetland ID	Dominant / Sub-Dominant Wetland Classification	Total Assessed Area		Inside Study Area	
			ha	sq m	ha	sq m
1	BL-WL-001	Shrub Swamp / Fen	0.273	2730	0.199	1990
2	BL-WL-002	Shrub Swamp	0.455	4548	0.302	3024
3	BL-WL-003	Shrub Swamp / Forested Swamp	0.071	708	0.070	703
4	BL-WL-004	Forested Swamp / Shrub Swamp	0.056	555	0.028	279
5	BL-WL-005	Forested Swamp	0.395	3954	0	0
6	BL-WL-006*	Shrub Swamp	0.036	356	0	0
7	BL-WL-007	Forested Swamp / Shrub Swamp	0.330	3297	0.282	2819
8	BL-WL-008	Forested Swamp / Shrub Swamp	0.118	1179	0.098	980
9	BL-WL-009	Shrub Swamp / Forested Swamp	0.077	769	0.077	768
10	BL-WL-010	Forested Swamp	0.908	9083	0.618	6183
11	BL-WL-011	Forested Swamp / Shrub Swamp	0.066	660	0.012	123

#	Wetland ID	Dominant / Sub-Dominant Wetland Classification	Total Assessed Area		Inside Study Area	
			ha	sq m	ha	sq m
12	BL-WL-012	Shrub Swamp / Forested Swamp	0.088	881	0.032	322
13	BL-WL-013	Forested Swamp	0.083	827	0.017	166
14	BL-WL-014	Shrub Swamp / Forested Swamp	6.824	68241	0.042	423
15	BL-WL-016	Shrub Swamp / Forested Swamp	0.445	4450	0.137	1373
16	BL-WL-019	Shrub Swamp / Forested Swamp	3.305	33054	0.640	6402
17	BL-WL-020	Shrub Swamp / Bog / Fen	0.173	1730	0.159	1593
18	BL-WL-021	Forested Swamp / Shrub Swamp	0.050	501	0	0
19	BL-WL-022	Forested Swamp / Shrub Swamp	0.054	544	0.054	542
20	BL-WL-023	Forested Swamp	0.081	812	0.081	806
21	BL-WL-024	Forested Swamp	0.213	2132	0.180	1803
22	BL-WL-025	Forested Swamp	0.036	362	0.036	362
23	BL-WL-026	Forested Swamp	0.054	540	0.054	539
24	BL-WL-027	Forested Swamp / Shrub Swamp	1.585	15846	1.094	10936
25	BL-WL-028	Forested Swamp / Shrub Swamp	0.034	335	0	0
26	BL-WL-029	Fen / Shrub Swamp	0.022	217	0.022	216
27	BL-WL-030	Bog / Fen / Shrub Swamp	0.051	512	0.052	521
28	BL-WL-031	Shrub Swamp	0.005	49	0.010	96
29	BL-WL-032	Shrub Swamp	0.106	1062	0.023	227
30	BL-WL-033	Shrub Swamp / Forested Swamp	0.751	7509	0.221	2208
31	BL-WL-034	Shrub Swamp / Forested Swamp	0.084	838	0.072	718
32	BL-WL-035	Forested Swamp / Shrub Swamp	0.036	364	0.034	340
33	BL-WL-036	Forested Swamp	0.175	1754	0	0
34	BL-WL-037	Forested Swamp / Shrub Swamp	0.034	339	0.034	340
35	BL-WL-038	Forested Swamp	0.108	1075	0.047	467
36	BL-WL-039	Shrub Swamp / Fen	0.051	512	0.051	514
37	BL-WL-040	Shrub Swamp	0.134	1340	0.061	607

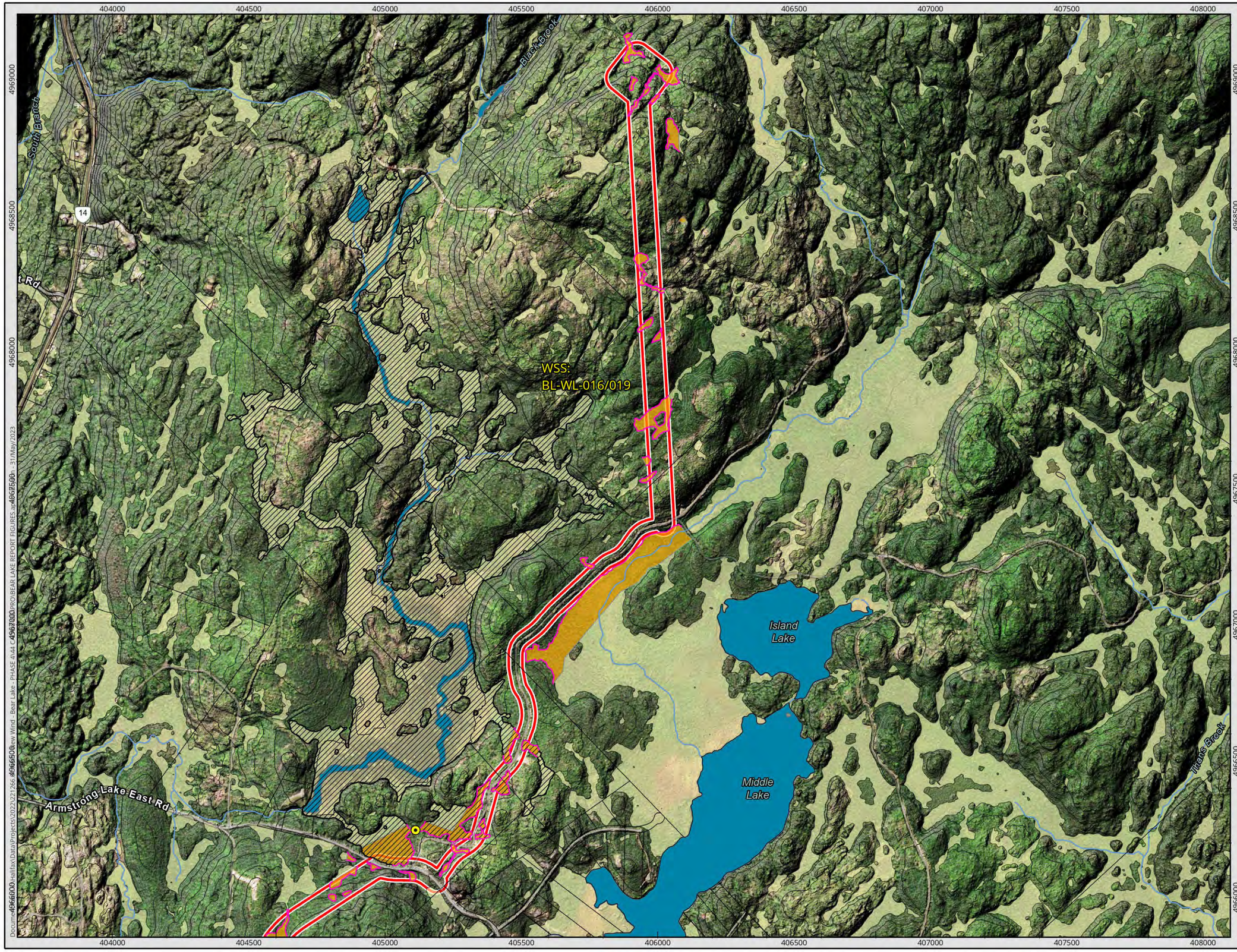
#	Wetland ID	Dominant / Sub-Dominant Wetland Classification	Total Assessed Area		Inside Study Area	
			ha	sq m	ha	sq m
38	BL-WL-041	Shrub Swamp / Cutover Forested Swamp	0.101	1007	0.101	1009
39	BL-WL-042*	Forested Swamp / Shrub Swamp	0.022	218	0	0
40	BL-WL-043	Shrub Swamp	0.035	351	0.011	114
41	BL-WL-045	Forested Swamp / Shrub Swamp	2.385	23846	0.667	6669
42	BL-WL-046	Shrub Swamp	0.124	1243	0.113	1125
43	BL-WL-047	Shrub Swamp	1.065	10654	0.776	7762
44	BL-WL-048	Shrub Swamp / Disturbed Marsh	0.028	277	0.035	349
45	BL-WL-049	Forested Swamp / Shrub Swamp	0.122	1216	0.052	521
46	BL-WL-050	Shrub Swamp	0.092	915	0.012	120
47	BL-WL-051	Forested Swamp / Shrub Swamp	0.040	399	0.024	241
48	BL-WL-052	Shrub Swamp	0.015	147	0.015	146
49	BL-WL-053	Shrub Swamp / Forested Swamp	0.626	6255	0.376	3762
50	BL-WL-054***	Shrub Swamp / Disturbed Marsh (Anthropogenic)	0.020	196	0.020	197
51	BL-WL-055	Shrub Swamp	0.102	1019	0.104	1043
52	BL-WL-056	Shrub Swamp	0.281	2805	0.119	1188
53	BL-WL-058	Shrub Swamp	0.061	614	0.034	339
54	BL-WL-059	Forested Swamp / Shrub Swamp	1.799	17991	0.115	1152
55	BL-WL-060	Shrub Swamp	0.174	1736	0.122	1218
56	BL-WL-061**	Forested Swamp / Shrub Swamp	0.460	4604	0.038	383
57	BL-WL-062	Shrub Swamp	0.126	1258	0.120	1199
58	BL-WL-063	Forested Swamp / Shrub Swamp	0.016	158	0	0
59	BL-WL-064	Shrub Swamp	0.034	339	0.034	341
60	BL-WL-065	Shrub Swamp	0.086	855	0.081	813
61	BL-WL-066	Forested Swamp / Shrub Swamp	3.519	35190	3.018	30177
62	BL-WL-068**	Shrub Swamp / Forested Swamp	4.127	41266	1.982	19820
63	BL-WL-069	Shrub Swamp / Bog	0.209	2086	0.194	1944

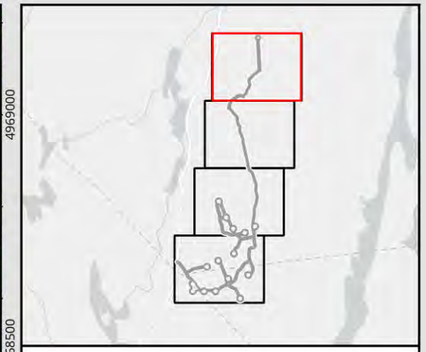
#	Wetland ID	Dominant / Sub-Dominant Wetland Classification	Total Assessed Area		Inside Study Area	
			ha	sq m	ha	sq m
64	BL-WL-070**	Shrub Swamp	0.365	3646	0.364	3640
65	BL-WL-071	Shrub Swamp / Forested Swamp	1.314	13137	1.264	12637
66	BL-WL-072**	Shrub Swamp	0.614	6143	0.526	5256
67	BL-WL-073	Shrub Swamp	0.373	3734	0.395	3953
68	BL-WL-075	Shrub Swamp	0.065	651	0.065	647
69	BL-WL-076	Shrub Swamp	0.101	1013	0.087	871
70	BL-WL-077**	Shrub Swamp	0.663	6626	0.594	5936
71	BL-WL-079	Shrub Swamp / Forested Swamp	0.646	6457	0.430	4297
72	BL-WL-080	Shrub Swamp	0.253	2527	0.253	2527
73	BL-WL-081	Shrub Swamp	0.028	284	0.028	285
74	BL-WL-082	Forested Swamp / Shrub Swamp	0.165	1648	0.165	1646
75	BL-WL-083	Shrub Swamp / Forested Swamp	0.081	809	0.065	647
76	BL-WL-084	Shrub Swamp	0.236	2364	0.155	1546
77	BL-WL-085	Shrub Swamp	0.037	368	0.036	363
78	BL-WL-086	Shrub Swamp / Forested Swamp	0.504	5040	0.261	2608
79	BL-WL-088	Shrub Swamp	0.028	281	0	0
80	BL-WL-089	Shrub Swamp	1.293	12934	1.296	12961
81	BL-WL-090	Shrub Swamp	0.094	941	0	0

* Wetlands BL-WL-006 and BL-WL-042 were delineated but not assessed with WESP-AC as they were too far outside the Study Area

**Some wetlands were delineated separately, but complexed (on basis of hydrological contiguity) for purposes of WESP-AC, as follows. Complex 1: BL-WL-061-068-072; Complex 2: BL-WL-070-077

*** BL-WL-054 was considered to be entirely anthropogenic in origin, likely within the past 10-15 years, and is therefore unregulated.





- Unregulated Wetland (<100 sq m)
- Provincially Mapped Watercourse
- Wetland Edge (CBCL 2022)
- Study Area (Phase 4)
- Property Boundaries
- Provincially Mapped Waterbody
- Delineated Wetland Area (CBCL 2022)
- Predicted Wetland Area (CBCL 2022)
- Wetland of Special Signifcance (WSS)

SAR Lichen Observations in Weland (Invoking WSS)

- Blue Felt Lichen
- Frosted Glass-whiskers Lichen

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BEAR LAKE WIND
Vegetation & Wetlands

Wetland Assessment Results Overview (Page 1 of 4)

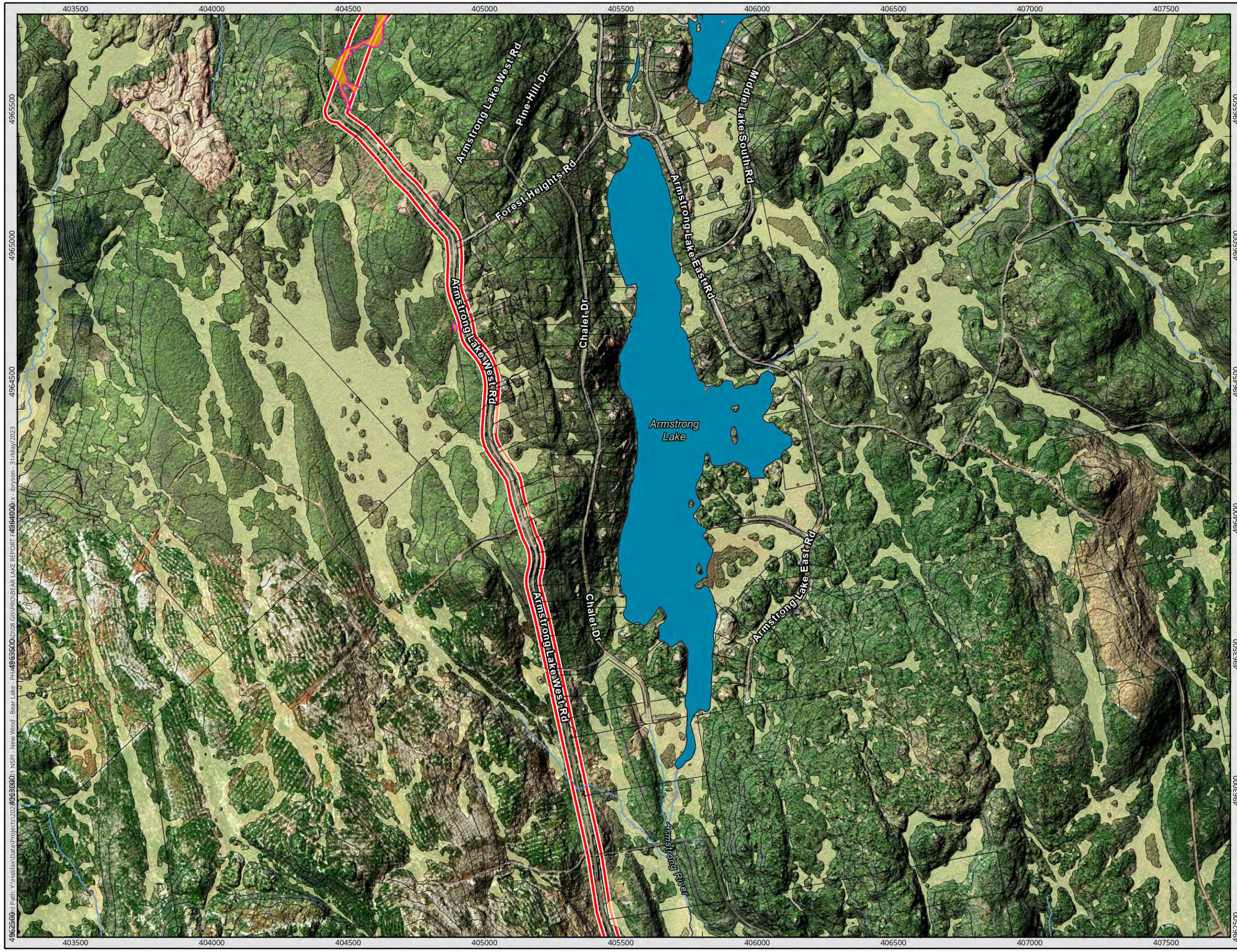
DATE: 2023-05-31	PROJ N°: 221266.01	FIGURE: 4-1
DRAWN BY: NH	CHECKED BY: BC	APPROVED: IB

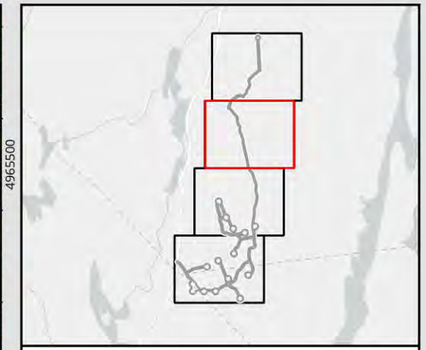
NOTES: Contour Interval = 1 m

0 135 270 540 m

SCALE: 1:13,000 @ 11 X 17

Coordinate System: NAD 1983 CSRS UTM Zone 20N
Units: Meter





- Unregulated Wetland (<100 sq m)
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BEAR LAKE WIND
Vegetation & Wetlands

Wetland Assessment Results Overview (Page 2 of 4)

DATE: 2023-05-31	PROJ N°: 221266.01	FIGURE: 4-2
DRAWN BY: NH	CHECKED BY: BC	APPROVED: IB

NOTES: Contour Interval = 1 m

0 135 270 540 m

SCALE: 1:13,000 @ 11 X 17

Coordinate System: NAD 1983 CSRS UTM Zone 20N
Units: Meter

403000 403500 404000 404500 405000 405500 406000 406500 407000

4962000 4961500 4961000 4960500 4960000 4959500

Little Armstrong Lake

WSS: BL-WL-036

WSS: BL-WL-045

- Unregulated Wetland (<100 sq m)
- Provincially Mapped Watercourse
- Wetland Edge (CBCL 2022)
- Study Area (Phase 4)
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BEAR LAKE WIND
Vegetation & Wetlands

Wetland Assessment Results Overview (Page 3 of 4)

DATE: 2023-05-31	PROJ N^{O}: 221266.01	FIGURE: 4-3
DRAWN BY: NH	CHECKED BY: BC	APPROVED: IB

NOTES: Contour Interval = 1 m

0 135 270 540 m

SCALE: 1:13,000 @ 11 X 17

Coordinate System: NAD 1983 CSRS UTM Zone 20N
Units: Meter