ENVIRONMENTAL IMPACT ASSESSMENT FOR RENEWABLE ENERGY AGREEMENT AT 5 CDSB GAGETOWN, NB

PUBLIC SERVICE AND PROCUREMENT CANADA

PROJECT NO.: TE211443
DATE: DECEMBER 2023

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QUALITY MANAGEMENT

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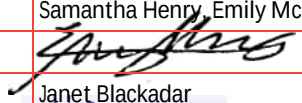
Signature		
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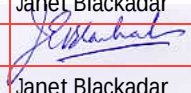
Signature		
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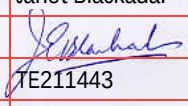
Signature		
Project number	TE211443	
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1 INTRODUCTION

The Government of Canada has committed to purchasing 100% clean electricity for all federal facilities through the purchase of new renewables by 2025, where available. New Brunswick (NB) has been identified as one of the five target provinces for a Green Power Purchase Agreement (PPA) based on the provincial electricity grid's carbon intensity.

1.1 PROJECT DESCRIPTION

DND is proposing to construct an up to 9.1 megawatt (MW) solar farm at the 5th Canadian Division Support Base (5 CDSB) Gagetown (the Project). The chosen site (Figure 1.1) consists of one land parcel of approximately 33.29 ha (PID#60058690) of developable area, within the 5 CDSB Range and Training Area (RTA) south of Shirley Road and the Trans-Canada Highway (TCH) near Oromocto, NB.

The solar farm will be connected directly to the 5 CDSB electrical system and all power produced by the installation will be consumed by the base. A 20 MW battery storage by banks of Lithium-ion batteries and associated infrastructure (any energy storage facility will likely be on a concrete slab and equipped with secondary containment) will be included as part of Project scope by the independent power producer to regulate voltage or to manage off-peak production. The solar farm will comprise a fixed tilt, ground mounted field of Photovoltaic arrays comprised of multiple monocrystalline solar panels. The system will require inverters to transform DC power to AC power, the balance of the system will include wiring, monitoring equipment and structural components. The solar farm is expected to have a design life of about 25 years. The solar field will be laid out to minimize cable runs and associated electrical losses. It will provide adequate distance between arrays, clusters, and other structures to prevent shading and will also incorporate access routes throughout for maintenance staff and vehicles.

DESIGN COMPONENTS

The proposed solar field is still subject to detailed design, therefore the number of arrays and their distribution, as well as mounting details, have not been determined yet. The arrays will be installed facing south, fixed at a specific tilt, and will be adequately spaced apart in order to eliminate overshadowing any time of the year. The modules will possibly be mounted on aluminum or galvanized steel racks on vertical steel posts driven into the ground at a depth of 1 m or more (depth subject to the orientation, weight, wind load, snow load, etc.) or fixed in concrete footings/foundations. Multiple inverter units, along with control/monitoring panels, will be installed outside if they are weatherproof or indoor inside small, insulated wood/steel huts (with proper ventilation since inverters reject a lot of heat). All wiring will be installed underground, within PVC conduits and in trenches meeting the Canadian Electrical Code and DND design Guideline requirements. Several power poles (class 3 utility poles) will be installed to interconnect the solar farm to 5 CDSB's existing electrical infrastructure.

The Project Area can currently be accessed via Shirley Road within the RTA. A perimeter road and maintenance pathways, approximately 3 m wide, will be constructed around and between clusters of PV arrays. Topsoil will be removed along those pathways and crushed rocks/pit run gravel with possibly vegetation control (e.g., geotextile) will be placed on the subsoil. The roadway network will allow vehicle access directly to electrical equipment (i.e., inverters, arrays) and for general maintenance of the solar farm. While no parking lot and/or storage building

should be required for the long-term operation and maintenance of the Project Area, a storage shed could be installed. During construction, and within the Project boundaries, a temporary storage/laydown area and temporary parking area will be designated for materials, equipment and construction trailers. A permanent chain link security fence, with possibly a gate at the access road from Shirley Road, will be erected along the perimeter of the Project Area.

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7425000.000000 7425000.000000

7424000.000000 7424000.000000

Lindsay Brook

Shirley Road

Route 2 Highway

Shirley Road

Maidstone Road

Reichmald Small Arms Range Road

WL1

WL2

WL3

WL4

OUTSET

Sheffield
Maugerville
Burton
Oromocto
Lincoln
Rusagonis
Haneytown
Woodside
MAP EXTENT
0 2.5 5 km

BASEMAP IMAGERY: ESRI 2020

LEGEND:

- Trail
- Major Road
- Minor Road
- Resource Road
- Streams/Creeks
- Lakes
- Wetlands
- Field Verified Wetlands
- Project Area
- Municipal Area
- 5CDSB

KEYMAP

CLIENT:

PUBLIC SERVICES AND PROCUREMENT CANADA

wsp

TITLE:

SITE LOCATION

PROJECT:

ENVIRONMENTAL IMPACT ASSESSMENT FOR RENEWABLE ENERGY AGREEMENT AT 5 CDSB GAGETOWN, NB

PROJECT NO:	DATE:
TE211443	SEPT 2023
REV NO: 0	DWN BY: CM
DATUM: NAD83 CSRS 2010	PROJECTION: NB DBL STEREO

FIGURE:

FIGURE 1-1

SCALE: 1:8,000

0 75 150 300

Metres

Path: D:\PROJECTS\TE211400_PSPC_NB_PE_SOA_EP897_220109_001\Projects TE211401 -\TE211443_EIA_Renewable_Energy_Gagetown\GIS\MXD\TE211443_FIGURE_1_1_SITE_LOCATION.mxd User: candace.macdonald Date: 9/22/2023

2 APPROACH AND METHODOLOGY

This Project is listed as an undertaking (i.e., is required to undergo review) under Schedule A of the NB Environmental Impact Assessment (EIA) Regulation and therefore under Section 88 of the IAA, and the activity is not in relation to an emergency, the Project cannot be excluded from the preparation of an environmental effects determination is required. Guidelines and requirements for the NB EIA process, as well as information resources, are described in "A Guide to Environmental Impact Assessment in NB" (NBDELG, 2018).

This activity meets the definition of a Project under s.82 or 83 of the *Impact Assessment Act* (IAA) as it is a physical activity to be carried out on federal lands or outside Canada and is in relation to a physical work. The Government of Canada's Department of National Defence (DND) is the landowner and the Project proponent. Therefore, an Environmental Effects Determination is required under s.82 or 83 before it can proceed.

The Project will also be registered on the Canadian Impact Assessment Registry (CIAR).

To facilitate the review of identified issues, an understanding and description of the environment within which the activities will occur, or potentially have an influence on, was developed from a review of existing information as well as our experience from a similar Project EIA recently competed on 5 CDSB. Potential positive and negative interactions between Project activities and the environment were identified. Where negative interactions were anticipated, and potential effects were a concern, methods for mitigating the potential effects were proposed. For the purposes of impact assessment, the interactions (effects) between Project outputs, or activities, and Valued Environmental Components (VECs) are described as either positive or negative, their significance of potential interactions is determined, and the likelihood of the interactions are also considered.

Generally, the literature presents the EIA as a complete process, which should begin at the earliest stages of planning and remain in force throughout the life of a Project, moving through a series of stages:

- Describing the Project and establishing environmental baseline conditions.
- Scoping the issues and establishing the boundaries of the assessment.
- Assessing the potential environmental effects of the Project, including residual and cumulative effects.
- Identifying potential mitigative measures to eliminate or minimize potential adverse effects.
- Monitoring and follow-up programs.

The impact assessment focused on the evaluation of potential interactions between Project components and activities, and VECs that were identified through an issues scoping process. Issues scoping was used to identify important issues of the development and focuses the EIA on high-priority issues (Kennedy and Ross, 1992). As suggested by Beanlands and Duinker (1983), VECs were determined on the basis of perceived public concerns related to environmental, social, cultural, economic, or aesthetic values. They were also chosen to reflect the scientific concerns of the professional community.

The EIA approach includes a number of steps as described in the sections below.

2.1 ASSEMBLING PROJECT BASELINE INFORMATION

A Project description was developed and includes construction and operation activities. A description of existing environmental conditions was prepared to allow assessment of the potential effects of the various Project activities on the environment as well as the potential effects of the environment on the Project.

Geographic information system (GIS) data layers of DND information were supplied to WSP for desktop review prior to initiation of field reconnaissance. Data acquired in the field were reconciled with data layers provided by 5 CDSB following the field visit.

WSP personnel, subcontracted personnel and local Indigenous communities with experience in wetlands, archaeology, and aquatic habitats walked the candidate site and adjacent areas (the Project Area) to document any constraints to its use for the proposed Project. The objective of the field visual surface survey was to obtain first-hand exposure to the Project site. The archaeological survey paid particular attention to subsurface exposures, watercourse shorelines and erosional faces, and other areas indicated as having elevated potential from the archaeological desktop research.

All data with relevance was recorded digitally and appropriate photographs were taken. Any other potential constraints noted during the field reconnaissance were also recorded. The results of field investigations are detailed in subsequent sections of this report.

Data on species-at-risk potentially within the Project Area boundaries was reviewed via a report from the Atlantic Canada Conservation Data Centre (ACCDC). Buffers of one and five kilometres (km) around a point in the center of the Project Area were applied to the ACCDC database.

A review of applicable legislation was completed by contacting appropriate federal and provincial regulators. A comparison between additional studies required by regulators and available information informed the scope and costs of the Project.

2.2 ISSUES SCOPING

Issues were identified during the development of the EIA document and comments were received from regulatory bodies. As a result of this "social scoping" effort (Beanlands and Duinker, 1983), environmental issues or Environmental Components of Concern (ECC) that may be affected by the Project were identified, by professionals in the field, and pathways between the ECCs and Project activities are identified. Where pathways cannot be identified, the ECC or issue was deemed not to be affected by the Project and, therefore, was no longer part of the analysis.

2.3 SELECTING VECS

A critical element of any EIA is the delineation of the Project Area through identification of spatial and temporal bounds. The approach to identification of VECs and the approach to bounding are described below.

2.3.1 IDENTIFICATION OF VECS

Consideration is given to the possibility of Project activities to interact with each VEC. The determination that significant effects may be possible is based upon regulatory requirements, previous experience with similar Projects and our professional judgment.

Two approaches are taken for identifying VECs, upon which the assessment focuses. First, those parameters for which provincial and federal regulations are in place are identified. Second, a scoping exercise is conducted, based upon previous EIA experience with similar Project components, consultation, and available information related to the environment near the Project Area.

2.3.2 APPROACH TO BOUNDING

Temporal bounds delineate the time period(s) over which Project-related impacts / effects can be expected. Spatial bounds delineate the physical area(s) in which VECs may be affected by Project activities.

The temporal bounds of this Assessment include the construction (including clearing and grubbing) and operations phases of the Project and any proposed monitoring programs.

Spatial bounds for the Project effects on most VECs typically include the immediate environs of the Project Footprint, access roads and areas potentially affected by down-gradient movement of groundwater, surface water, and air. For socio-economic components of the environment, bounding extends to communities that have a stake in the potential effects resulting from the proposed Project.

The spatial bounds of this Project include the immediate site area and communities bordering 5 CDSB (Figure 1.1).

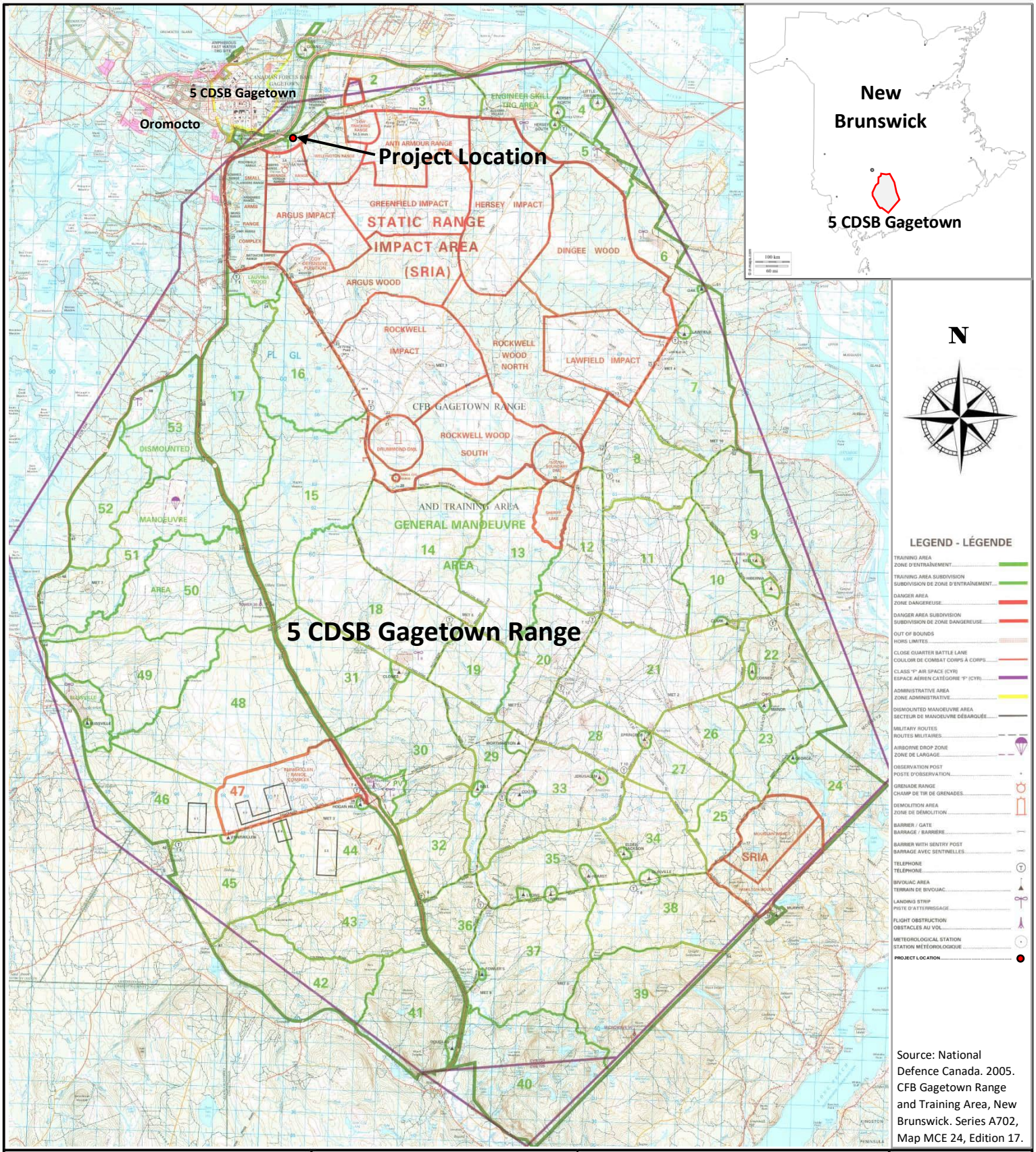
2.4 APPROACH TO DETERMINATION OF SIGNIFICANCE

The assessment or determination of the significance of potential effects is based on the framework/criteria provided in Impact Assessment Agency of Canada (the Agency, IAAC) guidance document Responsible Authority's Guide (1994) which summarizes the requirements that have been applied to similar Projects in the past, and which have been widely accepted by government and regulatory agencies in Canada.

The Reference Guide entitled "Characterizing extent of significance of adverse federal effects" included in the Practitioner's Guide to Federal Impact Assessments (IAAC, 2023) was used as the basis for determining the significance of identified potential effects. This determination consists of the following steps:

- determine whether the environmental effect is adverse;
- determine whether the adverse environmental effect is significant; and
- determine whether the significant environmental effect is likely.

For the purposes of the EIA, an effect is defined as the change effected on a VEC(s) as a result of Project activities. A Project-induced change may affect specific groups, populations, or species, resulting in modification of the VEC(s) in terms of an increase or decrease in its nature (characteristics), abundance, or distribution. Effects will be categorized as either negative (adverse) or positive. Any adverse effects will be determined to be significant or non-significant in consideration of assessment criteria discussed above. The Assessment will focus on those interactions between the VECs and Project activities which are significant or likely.



CLIENT: **Public Services and Procurement Canada / Department of National Defence**	SCALE: 0 1 2 4 8 km	PROJECT: **Renewable Energy Agreement Project, 5 CDSB Gagetown**	DWN BY: DJD
	DATUM: NAD 1983		CHK'D BY: DJD
	PROJECTION: Universal Transverse Mercator	TITLE: **Project Location**	DATE: 31/07/2023
	PROJECT NO: TE211443		REV. NO: 02
			FIGURE NO: 2.1

The map shown here has been created with all due and reasonable care and is strictly for use with the Amec Foster Wheeler Project Number identified in the title bar. This map has not been certified by a licensed land surveyor, and any third party use of this map comes without warranties of any kind. Amec Foster Wheeler assumes no liability,direct or indirect, whatsoever for any such third party or unintended use.

3 ENVIRONMENTAL AND SOCIO-ECONOMIC SETTING

This section provides a description of the environmental and the socio-economic setting for the Project and includes those components of the environment potentially affected by the proposed Project. The Project location (the Project Area) and the surrounding area (proposed Project Area) are depicted in Figure 1.1.

The description of the environmental setting encompasses the Project Area and the habitat adjacent to it. The environmental setting description has been prepared to provide information on environmental and socio-economic components which may potentially be affected by the Project, or which may influence or place constraints on the execution of Project-related activities.

3.1 ATMOSPHERIC ENVIRONMENT

Air quality is influenced by the concentrations of air contaminants in the atmosphere. Air contaminants are emitted by both natural and anthropogenic sources and are transported, dispersed or concentrated by meteorological and topographical conditions. Air contaminants eventually settle or are washed out of the atmosphere by rain and are deposited back to the earth. In some cases, contaminants may be redistributed into the atmosphere by wind. The information in this section is based on the most up-to-date results available from the monitoring station operated by the Air Quality Branch of the NBDELG nearest the Project Area. The Needham Street station is located in Fredericton, approximately 20 km northeast of the Project Area.

3.1.1 AIR QUALITY REGULATIONS

Air quality in NB is routinely monitored by the provincial and federal governments at various stations, usually located in or near population centres. Both the air quality standards under Schedule B of the NB *Clean Air Act* and the NB Air Quality Objectives (NBAQOs) established by the province under the same Act provide Guidelines and Objectives that apply to various components, including Total Suspended Particulate (TSP): 120 micrograms per cubic metre (µg/m^3) per 24 hour averaging period and 70 µg/m^3 per 1-year averaging period. Table 3.1 lists the NBAQOs established under the provincial *Clean Air Act*.

Table 3.1 Air Quality Guidelines in NB

POLLUTANT	AVERAGING PERIOD			
	1-HOUR	8-HOUR	24-HOUR	1 YEAR
Carbon monoxide (CO)	30 ppb*	13 ppb		
Hydrogen sulphide (H_2S)	11 ppb		3.5 ppb	
Nitrogen dioxide (NO_2)	210 ppb		105 ppb	52 ppb
Sulphur dioxide (SO_2)***	339 ppb		113 ppb	23 ppb
Total Suspended Particulate			120 µg/m^3	70 µg/m^3

Source: NBDELG, 2020
*ppb – parts per billion
** The standards for SO_2 are 50% lower in Saint John, Charlotte, and Kings Counties.

Carbon Monoxide (CO)

CO is formed from the incomplete combustion of carbon compounds. The NBDELG has set an air quality guideline for CO of 30 parts per billion (ppb) for a 1-hour averaging period. Carbon monoxide is not monitored by the Fredericton station.

Hydrogen Sulphide (H_2S)

This component is used by the Provincial mobile air quality trailer to measure Total Reduced Sulphur (TRS) in industrial areas such as Saint John and the AV Nackawic Mill, where TRS odour is a concern. TRS is not monitored by the Fredericton station nor is it a concern for the Project.

Nitrogen Oxides (NO and NO_2)

Nitric oxide (NO) is released in the exhaust of internal combustion engines and furnaces. NO is an unstable compound and is readily converted to NO_2, which contributes to the formation of acid rain and is a primary precursor pollutant in the formation of smog. NBDELG has set an air quality guideline of 210 ppb, 105 ppb and 52 ppb per 1-hour, 24-hour and 1-year averaging periods, respectively. There were no exceedances of the NBAQOs for NO_2 at the Fredericton monitoring station in 2021.

Sulphur Dioxide (SO_2)

Sulphur dioxide is produced by burning oil and coal for energy production and space heating; each containing sulphur as an impurity in various concentrations. Other potential sources of SO_2 to the environment include oil refineries, pulp and paper mills, and vehicles. Industries in NB are responding by using lower or near-zero sulphur fuels as well as reducing production and electricity-generation rates. SO_2 is not monitored by the Fredericton station (NBDELG, 2020).

Particulate Matter (PM)

Particulate matter (PM) refers to those particulates in the air, such as smoke, soot, and dust that do not settle readily and thereby remain suspended. PM is a broad class of chemically and physically diverse substances that can either be in a solid or liquid state, or in a combination of these two states. PM greater than 10 micrometres (µm) in size creates problems such as visibility reduction, soiling, material damage, and vegetation damage.

Particulate matter becomes a potential human health hazard when the particle size is equal to, or less than, 10 µm in diameter (PM_{10}) (NBDELG, 2020). These particles are typical of dust granules that are invisible to the naked eye as individual specks. Such particles are commonly generated from building materials, combustion, human activities and outdoor sources, including atmospheric dust and combustion emissions from mobile and stationary sources. PM_{10} data for Moncton is not monitored.

Particles of 2.5 µm or less ($PM_{2.5}$) are small enough to inhale into the lungs and are believed to cause respiratory and cardiovascular problems. These particles are visible as clouds of smoke and are typically high in sulphates, nitrates, carbon and heavy metals, being produced by fossil fuel combustion, vehicle exhaust and industrial emissions (NBDELG, 2020).

In 2012 all Canadian provinces, with the exception of Quebec, agreed to participate in a new federal air quality management system adopted by the Canadian Council of Ministers of the Environment (CCME) as part of the revised *Canadian Environmental Protection Act* (CEPA). The Air Quality Management System is a comprehensive approach for improving air quality in Canada and is the product of collaboration by the federal, provincial and

territorial governments and stakeholders and replaces the Canada-Wide Standards (CWS) that had been in place since 2000. It includes:

- New Canadian Ambient Air Quality Standards (CAAQs) to set the bar for outdoor air quality management across the country.
- Industrial emissions requirements that set a base of performance for major industries in Canada.
- A framework for air zone management within the provinces and territories that enables action tailored to specific sources of air emissions in a given area.
- Regional airsheds that facilitate coordinated action where air pollution crosses a border.
- Improved intergovernmental collaboration to reduce emissions from the transportation sector.

Standards for fine PM and ground-level ozone have been developed, which are illustrated in Table 3.2. CAAQs are currently in development for NO_2 and SO_2.

Table 3.2 CAAQ Standards for Fine Particulate Matter ($PM_{2.5}$) and Ozone

POLLUTANT	AVERAGING TIME	STANDARDS (NUMERICAL VALUES)		METRIC
		2015	2020	
$PM_{2.5}$	24-hour (calendar day)	28 µg/m^3	27 µg/m^3	The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations.
$PM_{2.5}$	Annual (calendar year)	10 µg/m^3	8.8 µg/m^3	The 3-year average of the annual average concentrations.
Ozone	8-hour	63 parts per billion (ppb)	62 ppb	The 3-year average of the annual 4th highest daily maximum 8-hour average concentrations.

The new federal Air Quality Management System is designed to address the challenges of air quality management, including cross-jurisdictional issues, and deliver a Canada-wide approach that provides flexibility to deal with regional differences in air quality issues while, at the same time, ensuring a level of consistency so that Canadians can be assured of good air quality outcomes. As part of this approach, CCME has also created an Air Zone Management Framework (AZMF) which categorizes provincial regions by existing air quality and management goals. The Project Area lies within the Central Air Zone of NB, which is considered "orange" and whose mandate is to retain low $PM_{2.5}$ levels (CCME, 2012). In this Zone, threshold values of 0 to 10 µg/m^3 for daily average and 0 to 4 µg/m^3 for annual average $PM_{2.5}$ have been established, which are much lower than the CAAQs (NBDELG, 2020). The Fredericton station had a daily average of 13 µg/m^3 and annual average of 5.7 µg/m^3 (NBDELG, 2020).

3.2 ACOUSTIC ENVIRONMENT

Sound is mechanical energy transmitted by pressure waves through a medium such as air. Physically, there is no distinction between sound and noise. It is common practice to define noise simply as unwanted sound, thus, the terms sound and noise are often used interchangeably.

The proposed solar farm is to be located on immature mixed forested land within the Range and Training Area (RTA). The Project Area is immediately adjacent to Shirley Road, the primary road to the RTA. Shirley Road sees considerable traffic from military and contractor trucks and military specific vehicles. The TCH, the primary thoroughfare between Fredericton and both Saint John and Moncton is situated north of the Project Area.

The nearest non-military receptors are residential homes on Robert Street, approximately 3 km west of the Project Area. A highway interchange and the Broad Road are located between the Project Area and Robert Street.

3.3 CLIMATOLOGY

The climate of the Project Area is described below. The information is based upon climate normals using the latest data gathered from 1981 to 2023 at the Environment Canada weather station nearest the Project Area. The Fredericton Airport station is located approximately 6.5 km northeast of the Project Area (Environment and Climate Change Canada, 2023).

The climate of NB is typically continental. This is due to the westerly air flows, dominant in the region, having passed over the interior of the continent and not over a temperature-moderating ocean. The annual average for temperature in 2022 was 6.6°C and ranges between an average low of -21.8°C in January and an average high of 25.4°C in July. The extreme maximum and minimum temperatures recorded were 37.2°C (August 1975) and -37.2°C (February 1994), respectively (Environment and Climate Canada, 2020).

The total precipitation at the Fredericton Airport Station was 1141.5 mm in 2022 (Environment and Climate Change Canada, 2023).

Winds are predominantly from the south or southwest from May to October and predominantly from the west or northwest from November to April (Environment and Climate Canada, 2023).

3.4 SURFICIAL BEDROCK GEOLOGY

5 CDSB Gagetown is found within the Grand Lake Ecoregion which encompasses the Grand Lake basin, the Oromocto River Watershed and the floodplains surrounding the mid-section of the lower Saint John River between Prince William and Evandale. This ecoregion is composed almost entirely of Carboniferous, non-calcareous sedimentary rocks, ranging from fine siltstones through sandstones to coarse conglomerates (DNR, 2007).

The landscape in this ecoregion is mainly covered with compact loams to clay loams derived from the easily weathered red mudstone and grey sandstone. These acidic, poorly drained soils are part of the Stony Brook and Harcourt units. Floodplains in this area are known to possess thick beds of alluvial sand and gravel overlain by silt or fine sand of the Interval Unit (DNR, 2007). Soil characterization and a Soil Management Plan will be done by the contractor.

3.5 GROUNDWATER AND SURFACE WATER

The following section describes the hydrological and hydrogeological conditions of the Project Area, including water quality for both surface and groundwater resources.

The search of the NB Online Well Log System (OWLS) well data base for a radius of 1 km from the proposed Project Area provided information for sixteen wells reported for drinking water use. Using the reported well log

information, the wells were all sedimentary (stratified bedrock such as sandstone) with some shale and clay interspersed. Wells drilled in sedimentary rocks yielded a minimum of 1.5 igpm (Imperial gallons per minute), a maximum of 15 igpm. The average well depth was 82.01 m, with a range from 24.99 to 152.4 m. No wells were identified within a 500 m radius of the proposed Project Area.

Surface runoff from the Project Area drains into the Oromocto River, which eventually drains into the Saint John River and then into the Bay of Fundy. There are no protected watersheds located within the Project Area (NBDELG, 2021).

3.5.1 WATERCOURSES

The Project Area has three unnamed watercourses within it's bounds (Figure 3.1) which flow downstream of Lindsay Brook south of the TCH and Shirley Road.

3.6 TERRESTRIAL HABITAT

Terrestrial habitat is depicted in Figure 3.2. Habitats present within the Project Area are described below and a comprehensive overview of the terrestrial habitat, including a species list, can be found in Appendix A.

Two distinctive floral habitats were observed during the field surveys conducted in June 2023. The eastern section of the Project Area was defined by past disturbances and is mostly secondary succession vegetation dominated by Birch and Willow with a mostly colonized understory. The western section of the Project Area was observed to have signs of old growth red pine (*Prunus resinosa*), eastern hemlock (*Tsuga canadensis*), and eastern white cedar (*Thuja occidentalis*) with an almost bare understory. Primary succession with a medium to thick understory was common within the western section of the Project Area. No SAR were observed during the vegetation surveys; however, purple loosestrife (*Lythrum salicara*) was found in WL1 and along the edge at the northern boundary of the Project Area. Purple loosestrife is a highly invasive species.

3.7 WETLANDS

Detailed physical delineations were carried out for all wetlands affected by the Project in June 2023 and the full report can be found in Appendix A. Four wetlands were identified and are described in Table 3.3.

Table 3.3 Size, Location and Type of Identified Wetlands

WETLAND	SIZE (HA)	LOCATION	TYPE
WL1	1.28	-66.419828, 45.526851	Herbaceous drainage swamp
WL2	0.11	-66.421783, 45.825964	Forested drainage swamp
WL3	0.96	-66.421188, 45.823927	Forested drainage swamp
WL4	0.26	-66.4297250, 45.8223470	Forested drainage swamp

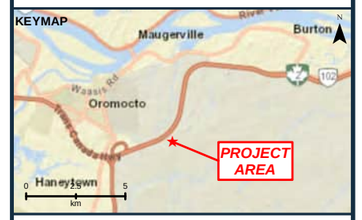
A total of four wetlands were delineated in the field covering a total area of 2.61 ha. The wetlands delineated were all of non-tidal types as seen in Table 3.3. All wetlands identified presented evidence of past disturbances from previous anthropogenic, or beaver activity. The WESP-AC assessment scores for these wetlands generally showed a moderate to high wetland functionality, meaning they are considered to support water quality, aquatic habitat and organisms, and transition habitat.

LEGEND:

- Sample Location

Other Project Infrastructure

- 1953 Roads
- Major Road
- Minor Road
- Resource Road
- Streams/Creeks
- Lakes
- Wetlands
- Watercourse 80 m Archaeological Buffer
- Project Area
- Municipal Area



CLIENT:

PUBLIC SERVICES AND PROCUREMENT CANADA

TITLE:

WATER FEATURES

PROJECT:

ARCHAEOLOGICAL IMPACT ASSESSMENT: RENEWABLE ENERGY AGREEMENT AT 5 CDSB GAGETOWN, NB

PROJECT NO:	DATE:
TE211443	OCT 2023
REV NO: 0	DWN BY: JA
DATUM: NAD83 CSRS 2010	PROJECTION: NB DBL STEREO

FIGURE:

FIGURE 3-1

SCALE: 1:15,000

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2503500 2505000 2506500 2508000

7426000

7424500

Lindsay Brook

Kinney Creek

BASEMAP IMAGERY: ESRI 2020

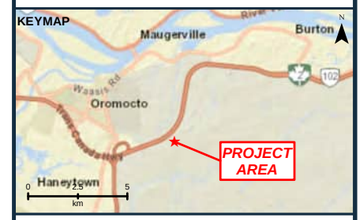
LEGEND:

Habitat

- Immature Grey Birch
- Mature Hemlock-Cedar Forest
- Old Field Immature Pine Plantation
- Shrub-Forested Wetland

Other Project Infrastructure

- 1953 Roads
- Major Road
- Minor Road
- Resource Road
- Streams/Creeks
- Lakes
- Wetlands
- Watercourse 80 m Archaeological Buffer
- Project Area
- Municipal Area



CLIENT:

PUBLIC SERVICES AND PROCUREMENT CANADA

TITLE:

TERRESTRIAL HABITAT

PROJECT:

ARCHAEOLOGICAL IMPACT ASSESSMENT: RENEWABLE ENERGY AGREEMENT AT 5 CDSB GAGETOWN, NB

PROJECT NO:	DATE:
TE211443	OCT 2023
REV NO: 0	DWN BY: JA
DATUM: NAD83 CSRS 2010	PROJECTION: NB DBL STEREO

FIGURE:

FIGURE 3-2

SCALE: 1:15,000

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Wetlands in NB have been given specific protection under both the *Clean Environment Act* and the *Clean Water Act*. The NB EIA Regulation requires registration of "all enterprises, activities, Projects, structures, works, or programs affecting two ha or more of bog, marsh, swamp, or other wetland". NBDELG requires a permit under the Watercourse and Wetland Alteration (WAWA) Regulation for any alteration within 30 m of the bank of a watercourse or wetland.

Federally wetlands are protected under the Federal Policy on Wetland Conservation and have, as a cornerstone of the policy, the requirement of "no net loss" of wetland habitat. As the landowner the federal government is responsible for maintaining the quality of and managing impact to wetlands. As outlined in the Federal Policy on Wetland Conservation (FPWC) (Government of Canada, 1991), the government's objective with respect to wetland conservation is to promote the conservation of Canada's wetlands to sustain their ecological and socio-economic functions, now and in the future.

3.8 AVIFAUNA

The Project Area is located within the Lower St. John River (Sheffield/Jemseg) IBA (IBA, 2021). Repeated, extensive historical spring flooding within much of the IBA has resulted in the creation of a unique hardwood and flora combination creating the single largest wetland complex in Atlantic Canada. Habitats include marshy islands, backwaters, creeks and marshes that extend 2 to 5 km beyond the main riverbanks. The IBA provides breeding habitat for the nationally vulnerable Yellow Rail (*Coturnicops noveboracensis*); has the largest breeding concentration of Black Terns (*Chlidonias niger*) in the northeast and supports Atlantic Canada's only breeding population of Greater Scaup (*Aythya marila*). Additionally, thousands of waterfowl use this site during migration.

The MBBA divides each province up into 10 km squares based on the Universal Transverse Mercator (UTM) grid. A review of the MBBA Atlas square (19FL97) that encompassed the Project Area identified 230 species of migratory birds including 205 confirmed species, 9 probable species, 9 possible species and another 7 species that were not categorized (MBBA, 2008).

Breeding bird surveys were completed within the Project Area in June 2023 and the full report can be found in Appendix A. A total of 45 avian species and 296 individuals were observed in the Project Area (Table 3.5). No SAR or SOCC were found within the Project Area boundaries. One Eastern Wood Pewee was recorded just outside the Project Area on the northern side of the Shirley Road. There were no Schedule 1 protected nests under the *Migratory Birds Convention Act* and Migratory Birds Regulations (2022) present. Suitable nesting habitat for species listed under Schedule 1 such as Pileated Woodpecker (*Dryocopus pileatus*) and Great Blue Heron (*Ardea herodias*) were sparse or not present with the exception of the mature cedar/hemlock habitat. This area was searched for evidence of pileated woodpecker activity, but no recent activity was found, and no pileated woodpeckers were recorded during the survey.

The Project Area shows extensive evidence of past human disturbance, including several wood roads, an abandoned armored vehicle-launched (AVL) bridge, old agricultural fields, excavations, and white pine (*Pinus strobus*) plantations. Most of the Project Area is comprised of immature pine plantation (25 ha), with lesser amounts of shrub/forested wetland (3 ha) and mature hemlock/cedar forest. The mature hemlock-cedar forest is an uncommon habitat type in New Brunswick and is possibly home to a breeding pair of broad-winged hawks as they were recorded within the proposed Project Area, though no nest was observed during the field surveys.

There is a small (3 ha) area of nearly pure gray birch (*Betula populifolia*) that was likely once part of the pine plantation, but the plantings failed. Gray birch is scattered throughout much of the plantation habitat, particularly

in the east where the soil is more poorly drained and less suited to white pine. The shrub/forested wetland habitat was mostly speckled alder (*Alnus incana*) dominated, with open blue-joint reedgrass (*Calamagrostis canadensis*)-dominated beaver meadow in the middle along the associated watercourses (Lindsey Brook). The habitat available within the Project Area is summarized in the table below (Table 3.4).

Table 3.4 Summary of Avian Habitat Types and Area

HABITAT TYPE	AREA (HA)
Immature Grey Birch	3
Mature Hemlock-Cedar Forest	13
Old Field Immature Pine Plantation	25
Shrub-Forested Wetland	3
Total	44

Table 3.5 Results of Migratory and Breeding Bird Survey Conducted on 30 June 2023

COMMON NAME	SCIENTIFIC NAME	SARA STATUS	ACCDC RANK	COUNT
Alder Flycatcher	*Empidonax alnorum*		S5B	3
American Crow	*Corvus brachyrhynchos*		S5B	3
American Goldfinch	*Spinus tristis*		S5B	4
American Redstart	*Setophaga ruticilla*		S5B	22
American Robin	*Turdus migratorius*		S5B	10
American Woodcock	*Scolopax minor*		S5B	1
Black-and-white-Warbler	*Mniotilta varia*		S5B	17
Blackburnian Warbler	*Setophaga fusca*		S5B	4
Black-capped Chickadee	*Poecile atricapillus*		S5	8
Black-throated Blue Warbler	*Setophaga caerulescens*		S5B	5
Black-throated Green Warbler	*Setophaga virens*		S5B	9
Blue Jay	*Cyanocitta cristata*		S5	7
Blue-headed Vireo	*Vireo solitarius*		S5B	8
Broad-winged Hawk	*Buteo platypterus*		S5B	3
Brown Creeper	*Certhia americana*		S5	3
Cedar Waxwing	*Bombycilla cedrorum*		S5B	3
Chestnut-sided Warbler	*Setophaga pensylvanica*		S5B	18
Common Yellowthroat	*Geothlypis trichas*		S5B	6
Dark-eyed Junco	*Junco hyemalis*		S5	1
Downy Woodpecker	*Dryobates pubescens*		S5	1
Eastern Wood Pewee	*Contopus virens*	Special Concern	S3B	1
Golden-crowned Kinglet	*Regulus satrapa*		S5	11
Gray Catbird	*Dumetella carolinensis*		S4B	2
Hairy Woodpecker	*Dryobates villosus*		S5	1
Hermit Thrush	*Catharus guttatus*		S5B	2
Least Flycatcher	*Empidonax minimus*		S4S5B	5
Magnolia Warbler	*Setophaga magnolia*		S5B	6
Nashville Warbler	*Leiothlypis ruficapilla*		S4S5B,S5M	5
Northern Flicker	*Colaptes auratus*		S5B	3
Northern Parula	*Setophaga americana*		S5B	10

COMMON NAME	SCIENTIFIC NAME	SARA STATUS	ACCDC RANK	COUNT
Ovenbird	*Seiurus aurocapilla*		S5B	25
Philadelphia Vireo	*Vireo philadelphicus*		S5B	1
Pine Warbler	*Setophaga pinus*		S5B	9
Purple Finch	*Haemorhous purpureus*		S4S5B,SUN,S5M	1
Red-breasted Nuthatch	*Sitta canadensis*		S5	1
Red-eyed Vireo	*Vireo olivaceus*		S5B	20
Song Sparrow	*Melospiza melodia*		S5B	3
Swainson's Thrush	*Catharus ustulatus*		S4S5B	3
Swamp Sparrow	*Melospiza georgiana*		S5B	1
Veery	*Catharus fuscescens*		S4B	19
White-throated Sparrow	*Zonotrichia albicollis*		S5B	16
Wild Turkey	*Meleagris gallopavo*		SNA	1
Yellow Warbler	*Setophaga petechia*		S5B	10
Yellow-rumped Warbler	*Setophaga coronata*		S5B	3

A desktop exercise utilizing available data (Important Bird Areas (IBA) of Canada; ACCDC, and the Maritimes Breeding Bird Atlas (MBBA)) were also reviewed for this report.

3.9 FISH AND FISH HABITAT

Fish population surveys have recorded 28 species of fish within the waters of 5 CDSB (Table 3.6). Another three species; American shad (*Alosa sapidissima*), blueback herring (*Alosa aestivalis*) and alewife (*Alosa pseudoharengus*) have been observed in Base waters and there are unconfirmed reports of shortnose sturgeon (*Acipenser brevirostrum*). Recreational fishing is permitted within the Range and Training Area (RTA), when compatible with military training activities. The main species targeted by recreational anglers is brook trout. The only commercial fishery in Base waters is for gaspereau (blueback herring and alewife) on Swan Creek Lake. There is no organized Indigenous fishery, but there are likely Indigenous anglers fishing recreationally within base waters.

Table 3.6 Aquatic SAR and SOCI within 5 km of the Project Area

COMMON NAME	SCIENTIFIC NAME
Alewife	*Alosa pseudoharengus*
American Eel	*Anguilla rostrata*
Atlantic Salmon	*Salmo salar*
American Shad	*Alosa sapidissima*
Blueback Herring	*Alosa aestivalis*
Brown Bullhead	*Ameiurus nebulosus*
Burbot	*Lota lota*
Banded Killifish	*Fundulus diaphanous*
Blacknose Dace	*Rhinchthys atratulus*
Blacknose Shiner	*Notropis heterolepis*
Brook Trout	*Salvelinus fontinalis*
Creek chub	*Semotilus atromaculatus*
Chain Pickerel	*Esox niger*
Common Shiner	*Notropis cornutus*
Fallfish	*Semotilus corporalis*
Finescale Dace	*Chrosomus neogaeus*
Fourspine Stickleback	*Apeltes quadracus*
Golden Shiner	*Notemigonus crysoleucas*
Lake Chub	*Couesius plumbeus*
Northern Redbelly Dace	*Chrosomus eos*
Ninespine Stickleback	*Pungitius pungitius*
Pumpkinseed Sunfish	*Lepomis gibbosus*
Redbreast Sunfish	*Lepomis auritus*
Sea Lamprey	*Petromyzon marinus*
Smallmouth Bass	*Micropterus dolomieui*
Slimy Sculpin	*Cottus cognatus*
Striped Bass	*Morone saxatilis*
Threespine Stickleback	*Gasterosteus aculeatus*
White Perch	*Morone americana*
White Sucker	*Catostomus commersoni*
Yellow Perch	*Perca flavescens*

In association with various Projects and fish rescues conducted at two locations on Kinney Creek in 2005 and 2006 downstream of the Project Area blacknose dace, brook trout, creek chub, sea lamprey and threespine stickleback were collected.

Seven species of freshwater mussel have been identified in 5 CDSB waters. These include the alewife floater (*Anodonta implicata*), Eastern elliptio (*Elliptio complanata*), Eastern floater (*Pyganodon cataracta*), Eastern lampmussel (*Lampsilis radiata*), pearl mussel (*Margaritifera margaritifera*), tidewater mucket (*Leptodea ochracea*), and triangle floater (*Alasmidonta undulata*). None of these species are expected to be found in the Project Area as suitable habitat for host fish species is not likely. The host fish species are anadromous and require salt water for a portion of their life cycle. As no stream is connected to the ocean in the Project Area, the host species are not likely.

3.10 SPECIES-AT-RISK

The following section focuses on Species-at-Risk (SAR) and Species of Conservation Interest (SOCI). These species include those that have been listed as endangered, threatened, of special concern (NRED, 2023) or identified as rare species by ACCDC. Available information on the known occurrence of floral and faunal SAR and SOCI in the

Project Area was compiled and reviewed to determine their presence relative to the Project Footprint. Sources included published and unpublished listings of occurrences of such species, and these are described below.

The federal *Species at Risk Act* (SARA) establishes Schedule 1, as the official list of wildlife SAR. It classifies those species as being either extirpated, endangered, threatened, or a special concern. Once listed, the measures to protect and recover a listed wildlife species are implemented. Under the SARA, the listing process begins with a species assessment that is conducted by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). SARA uses the COSEWIC scientific assessment when making the listing decision. Once a species is added to Schedule 1 it benefits from all the legal protection afforded, and the mandatory recovery planning required under SARA. The Act provides federal legislation to prevent wildlife species from becoming extinct and to provide for their recovery. The status of species protected under SARA can be found at the Species at Risk Public Registry (Government of Canada, 2021).

The province of NB provides additional species protection through its own NB *Species at Risk Act* (NBSRA), which was adapted from the repealed *Endangered Species Act* in 2012. Under this Act, an endangered species (or sub-species) is defined as any indigenous species of fauna or flora threatened with imminent extinction or imminent extirpation throughout all, or a significant portion, of its range and designated by regulation as endangered. This Act prohibits the killing of, or interference with, any member of an endangered species, or the habitat of an endangered or regionally endangered species.

The ACCDC is part of the NatureServe network, a non-government agency which maintains conservation data for the Atlantic provinces. ACCDC information on rare and endangered flora and fauna within and near the Project Area was supplied to WSP on September 28, 2023. S1, S2, and S3 ranked species are considered to be extremely rare to uncommon within its range in the province. S4 and S5 ranked species are considered to be widespread and their occurrences are fairly common to abundant.

The ACCDC report identified 40 records of 13 animal species and 5 plant species within a 5 km radius of the Project Area. No species listed were noted within 1 km of the Project Area, however, suitable habitat for several of these species was observed within the surveyed area, including Wood Turtle (*Glyptemys insculpta*). There have been 17 observations of Wood Turtle within a 5 km radius of the Project Area (ACCDC, 2023). Critical habitat at 5CDSB has been identified for wood turtle, Eastern whip-poor-will and bank swallow, however, none are located within the Project site. Other SARA species could make incidental use of the Project Area although the habitat is not ideal. It should be noted that no avian SAR were observed within the project area during the avian survey (see Section 3.8), but Eastern wood pewee (*Contopus virens*, Special Concern) has previously been heard outside of the Project Area.

No aquatic SAR were identified in the ACCDC report. Six species with a designation under COSEWIC or SARA can be found in 5 CDSB waters. SARA and SOCI within 5 km of Project Area found in Table 3.7 below.

Table 3.7 SAR and SOCI within 5 km of the Project Area

COMMON NAME	SCIENTIFIC NAME	SARA	COSEWIC	NBESA ACCDC*	POTENTIAL OCCURENCE IN PROJECT AREA
BIRDS					
Chimney Swift	*Chaetura pelagica*	Threatened	Threatened	S2S3B, S2M	Moderate
Evening Grosbeak	*Coccothraustes vespertinus*	Special Concern	Special Concern	S3B, S3S4N, SUM	Low
Olive-sided Flycatcher	*Contopus cooperi*	Threatened	Special Concern	S3B	High
Greater Yellowlegs	*Tringa melanoleuca*			S1?B,S4S5M	Low

COMMON NAME	SCIENTIFIC NAME	SARA	COSEWIC	NBESA	ACCDC*	POTENTIAL OCCURENCE IN PROJECT AREA
Purple Martin	*Progne subis*			S1B		Moderate
Cliff Swallow	*Petrochelidon pyrrhonota*			S2B		Low
American Three-toed Woodpecker	*Picoides dorsalis*			S2S3		High
Baltimore Oriole	*Icterus galbula*			S2S3B		Moderate
Brown-headed Cowbird	*Molothrus ater*			S3B		Low
Killdeer	*Charadrius vociferus*			S3B		Low
Rose-breasted Grosbeak	*Pheucticus ludovicianus*			S3B		High
Warbling Vireo	*Vireo gilvus*			S3S4B		Moderate
REPTILES						
Wood turtle	*Glyptemys insculpta*	Threatened	Threatened	S2S3		Moderate
PLANTS						
Columbian Watermeal	*Wolffia columbiana*			S1?		Low
Sandbar Willow	*Salix interior*			S3		Low
Bog Willow	*Salix pedicellaris*			S3S4		Moderate
Ditch Stonecrop	*Penthorum sedoides*			S3S4		Moderate
River Bulrush	*Bolboschoenus fluviatilis*			S3S4		Low

*B=breeding; M=mating; U=unknown

Table 3.8 Aquatic SAR in 5 CDSB Waters

COMMON NAME	SCIENTIFIC NAME	COSEWIC	SARA	NB ESA	PRESENCE	POTENTIAL OCCURRENCE IN PROJECT AREA
American Eel	*Anguilla rostrata*	Threatened	No status	Threatened	Confirmed	High
Atlantic Salmon	*Salmo salar*	Endangered	No status	Endangered	Confirmed	Low
Atlantic Sturgeon	*Acipenser oxyrinchus*	Threatened	No status	Threatened	Unconfirmed (potential in Swan Creek Lake)	Low
Redbreast Sunfish	*Lepomis auritus*	Data Deficient	Special Concern (Schedule 3)	No status	Confirmed	High
Shortnose Sturgeon	*Acipenser brevirostrum*	Special Concern	Special Concern	No status	Unconfirmed (potential in	Low

COMMON NAME	SCIENTIFIC NAME	COSEWIC	SARA	NB ESA	PRESENCE	POTENTIAL OCCURRENCE IN PROJECT AREA
					Swan Creek Lake)	
Striped Bass	*Morone saxatilis*	Endangered	No status	Endangered	Confirmed	Low

3.11 EXISTING LAND USE

The Project Area is located within the Range and Training Area (RTA) which is used exclusively for the training of military personnel. Access to the area is controlled by Range Control which can issue passes to the RTA. Satellite checkpoints are maintained at several gates. In certain areas of the RTA where live ammunition is used (known as impact areas) visitors must be accompanied by Military personnel.

3.12 LAND USE FOR TRADITIONAL PURPOSES

The Wolastoqiyik have had a special relationship and bond with the Saint John River (Wolastoq) for thousands of years, as it has been their life source (Perley, 2005; Perley *et al*., 2000). There is extensive evidence, in oral histories, historical texts, and the archaeological record, that demonstrate the long-time use of the Wolastoq, and its tributaries for transportation, resource procurement, and settlement (Perley *et al*., 2000; Perley, 2005). Historical Indigenous land use of this area is further detailed in the following sections.

An Indigenous Knowledge Study is being conducted for the whole Base by others. It is, however, unlikely that the results will be ready for this EIA. Should any information relevant to this EIA be revealed through Indigenous Consultation, it will be included in an addendum report.

3.13 HERITAGE AND ARCHAEOLOGICAL RESOURCES

An Archaeological Impact Assessment (AIA) is one component of an EA. The objectives of an AIA are to identify, inventory, and evaluate all sites of archaeological, historical, and architectural significance within the Project Area as well as areas with elevated potential for heritage and archaeological resources. The primary focus of the AIA is on the Project Footprint, to assess the potential effects of the Project on these identified and potential resources. The present investigations include a background desktop review and a visual field survey of the Project Area.

3.13.1 BACKGROUND AND DESKTOP REVIEW

The archaeological desktop research included the following elements:

- Reviewing the 5 CDSB GIS Heritage Data for the Base, which includes the following data elements: identified historic “ruins”, identified historic cemeteries, 1953 communities (pre-5 CDSB), historic pre-1953 road locations, provincially registered archaeological sites, and previously defined elevated potential areas for Indigenous and Historic archaeological resources (Washburn & Gillis, 1994).
- Reviewing present day and historic aerial photographs and topographic maps.
- Reviewing previous archaeological surveys conducted in the area.

- Reviewing documentation on existing identified heritage sites in the vicinity.
- Conducting a review of archaeological literature sources.
- Conducting a review of historical literature sources.
- Reviewing geological surficial and bedrock mapping of the area.
- Procuring and reviewing the requisite GIS archaeological mapping from the province, for the Project Area.

The Project Area is located within the watersheds of the Nerepis and St. John Rivers and is flanked on the west by the Oromocto River. These latter two watercourses are, respectively, the primary and secondary watercourses that bound 5 CDSB. All three rivers were used as transportation routes in both prehistoric times (Washburn & Gillis, 1994; Ganong, 1899) and historic times (Raymond, 1943; Reicker, 1984). These rivers are also situated within Maliseet territory, and bear names in or derived from the Maliseet language. For thousands of years, Indigenous peoples have inhabited this area and used the watercourses as transportation routes. The nearest First Nation is Oromocto First Nation. As identified on Figure 3.3, areas near watercourses are considered to have potential for Indigenous archaeological resources ("Precontact Archaeological Potential" and "Watercourse 80 m Archaeological Buffer"). Thus, the shores of any watercourses, in the vicinity of the Project have potential for Indigenous archaeological resources. While there are dozens of registered Indigenous archaeological sites identified by the shores of the St. John and Oromocto Rivers, (and associated lakes), to the north, west, and east of the Project Area, there is only one registered Indigenous site (Site BkDo-1) located within 4 km of the Project Area (Figure 3.3). Site BkDo-1 is 335 m to the north of the west end of the Project Area, on the north side of Route 2. This site is an isolated surface find that was identified "within a secondary glacial till deposit" …"road fill" materials (MARI, 2002). Therefore, it is posited that these few artifacts were anthropogenically deposited in this area from another location (Ibid.). It is also postulated that the lithic artifacts associated with Site BkDo-1 may date back to the Palaeoindian cultural period (11,000 to 9,000 radiocarbon years before present (BP)). If the Project Area BkDo-1 artifacts are from that early cultural period, this makes it even more unlikely that they were identified in situ, since geological texts indicate that this area would have been underwater at that geological time (Shaw *et al.,* 2002; Seaman, 2006; Rampton, 1984). AHBNB GIS mapping for the Project Area indicates that it is not located within their mapped "Marine Palaeo-shoreline", which is based on elevation data. Regardless of the cultural affiliation of the artifacts identified at Site BkDo-1, there remains potential for Indigenous archaeological resources in the vicinity of watercourses by the Project Area.

Historically, this general area of the St. John River valley was settled by the Acadians in the late 1600s (Washburn & Gillis, 1994). There was permanent British settlement in this area along the St. John River by 1763, following the 1755 expulsion of the French (Ibid.). The Loyalists, from New England, began arriving in the area in 1783 (Reicker, 1984; Raymond, 1943) and, like their predecessors, settled on waterways and "soon spread out over most of the good farmland [sic]… particularly in the interval lands along the St. John River and its tributaries" (Reicker, 1984:3). In the early 1800s, many Irish and Scottish immigrants came to the area, with most arriving before 1819, and the peak of Irish immigration occurring between 1834 and 1842 (Reicker, 1984:7). In the 1830s, a large wave of Irish immigrants feeling the famine in Ireland came to the area and formed settlements within the boundaries of present-day 5 CDSB (Reicker, 1984:3). In the early 1950s the Canadian Government created 5 CDSB Gagetown, which resulted in the expropriation of hundreds of properties in 1954-5 by DND (Reicker, 1984). Many settlements in Queens County, and a few in Sunbury County, were expropriated for this purpose. These historic communities were connected via historic "1953 Roads". The Project is located in the immediate vicinity of one of these historic communities, Shirley Settlement (Figure 3.3).

Shirley Settlement, a small farming community, was settled circa 1815 by James Shirley (PANB, 2020). The community had approximately 14 residents in 1866, but in 1904 had 60 residents, along with a church (and cemetery), a post office, and a schoolhouse (Ibid.). While the building structures once located in these areas have long since been removed, there are remnants ("Ruins") of some of these structures that have been identified throughout the Base. While the buildings associated with this historic settlement were demolished in the 1950s, remnants of these historic structures are still located along the sides of the 1953 historic roadsides, particularly those located within named settlements. As indicated on Figure 3.3, the 1953 roads were located immediately north and west of the Project Area. Historical aerial photographs of the Project Area, dating back to the 1940s, indicate that the Project Area was not "settled", nor were there any building structures visible on the property.

As indicated on Figure 3.3, there is one identified historic "Ruin" located on the north side of Shirley Road, approximately 850 m east of the Project Area. While not registered with the province,[1] these identified structural remnants are likely associated with pre-1953 historic habitation in Shirley Settlement, possibly as early as the mid-1800s. In addition, the historic Shirley Settlement cemetery is located 2.5 km east of the Project Area, on the south side of Shirley Road. The closest provincially registered Historic archaeological site to the Project Area is Site BkDo-4 which was identified in 2020 during field investigations for a separate solar energy Project for the Base (WSP, 2022). Site BkDo-4 is a late 20th century military site (remnants of five "fox holes") located 1.3 km east of the Project Area, which was registered with the province, at their request.

While research does not indicate any historic structural remnants located within the Project Area, there is potential for such remains adjacent to Shirley Road, which is indicated by the "Pre-1850 Historic Resources Potential" mapped on Figure 3.3.

As a result of the archaeological desktop review, no registered archaeological sites or known archaeological or heritage resources were identified within the Project Area. The areas identified as having potential for archaeological resources are those areas within 80 m of a watercourse ("Watercourse 80 m Archaeological Buffer" and "Precontact Archaeological Potential") and in the immediate vicinity of Shirley Road (Post-contact Historic) (Figure 3.3).

[1] These "Ruins" are identified within 5 CDSB Gagetown heritage data provided to the WSP research team.

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Precontact Archaeological Potential

Pre-1850s Historic Resources Potential

Lindsay Brook

Kinney Creek

Shirley Settlement

BkDo-1

BkDo-4

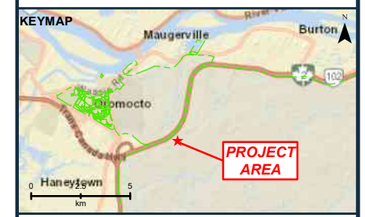
Tank Ramp

BASEMAP IMAGERY: ESRI 2020

LEGEND:

- Cemetery
- Ruin
- Registered Archaeological Site
- Field Identified Military Feature
- 1953 Communities
- 1953 Roads
- Major Road
- Minor Road
- Resource Road
- Streams/Creeks
- Lakes
- Wetlands
- Watercourse 80 m Archaeological Buffer
- Project Area
- Municipal Area
- 5CDSB
- Precontact Archaeological Potential
- Pre-1850s Historic Resources Potential

KEYMAP



CLIENT:

PUBLIC SERVICES AND PROCUREMENT CANADA

wsp

TITLE:

ARCHAEOLOGICAL DESKTOP RESEARCH RESULTS AND FIELD IDENTIFIED MILITARY FEATURE

PROJECT:

ENVIRONMENTAL IMPACT ASSESSMENT FOR RENEWABLE ENERGY AGREEMENT AT 5 CDSB GAGETOWN, NB

PROJECT NO:	DATE:
TE211443	SEPT 2023
REV NO: 0	DWN BY: CM
DATUM: NAD83 CSRS 2010	PROJECTION: NB DBL STEREO

FIGURE: **FIGURE 3.3**

SCALE: 1:15,000

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Metres

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3.13.2 FIELD RECONNAISANCE

On August 10, 2023, an archaeological walkover was completed by a provincially permitted WSP archaeologist, who was accompanied by a second experienced WSP archaeologist and an Indigenous Archaeological Field Technician (IAFT) from the Wolastoqey Nation in New Brunswick (WNNB). The survey comprised numerous north-south transects by the three surveyors, walking abreast and spaced approximately 25-50 m apart. In accordance with provincial regulatory permitting requirements, all accessible areas of the Project Area were visually surveyed. The field examination focused primarily on trails/roadways, subsurface exposures, watercourse shorelines and erosional faces, and other areas indicated as having elevated potential from the desktop research and archaeological potential modelling. The field data collected during the pedestrian survey included Global Positioning System (GPS) Track logs, photographs of points of interest, and field notes of observations and assessments.

During the visual survey, numerous 20th century trails and vehicle tracks were observed crisscrossing the Project Area. All these trails/tracks are observable in historical aerial photographs. However, they are now overgrown, with approximately 30-50-year-old growth. The trails were not viable survey paths due to the vegetation growth and the fact that they were often "filled" with water. Therefore, rather than following the trails, the visual survey systematically traversed the Project property through regularly spaced north-south transects.

As a result of the visual surficial field survey, two historic cultural features were identified, in addition to numerous locations where 20th century debris was observed. The two cultural features were:

1 A linear stone and earthen "ridge" feature (45.822686°N, 66.430314°W, DD, WGS84); and

2 A concrete and steel "ramp" structure (45.824700°N, 66.424346°W, DD, WGS84) (Figure 3.3).

The linear stone and earthen feature alignment coincides with a late 20th land boundary/trail and is not visually apparent in the 1945 aerial imagery of the property. This appears to be a past boundary between hardwood growth to the west and softwood to the east. 1985 aerial imagery depicts a clear boundary of this location, with cleared land to the west and forested land to the east. This feature is interpreted as likely part of another overgrown late 20th century 5 CDSB Gagetown trail/track or boundary, rather than an earlier historic agricultural rock pile or rock fence line. Therefore, it is not considered to be an archaeological resource.

The observed an intact concrete and steel ramp structure is located on a past-used 5 CDSB Gagetown trail/track, which is now overgrown. The concrete ramp runs west to east for approximately 35 metres, and ramps up from both directions, with the peak in the middle. The peak has steel plates at the centre, where the west and east sections join, as well as an observed steel plate at the western extreme. As was the case with a number of the observed tracks/trails in the Project Area, the width of the ramp was approximately four m wide. The ramp does not cross a watercourse. It has been preliminarily interpreted as a possible military tank ramp, from the mid-20th century. It is anticipated that AHBNB will request that this feature be registered as a Military archaeological resource. Therefore, this cultural feature should be avoided during Project construction. Should this feature need to be moved or removed during construction a site alteration permit will likely be required from the regulator.

Cultural debris was observed at many locations across the Project Area. There were no concentrations (i.e., dump sites) and all the observed debris was interpreted as being associated with late 20th century 5 CDSB Gagetown activities and are not considered to be archaeological resources. The observed cultural debris included:

- scattered pieces of broken concrete (discarded rather than structural);

- rifle “training rounds” (inert replica of live ammunition);
- green plastic cases (possible ammunition cases);
- an aluminum lawn chair; and
- various pieces of metal debris (sheet metal, water tanks).

None of the minor watercourses observed had potential for archaeological resources, as they were very small, intermittent, and/or former trails/roadways. A dammed beaver pond (dam at 45.824904°N, 66.421740°W, DD, WGS84) and a marsh area (45.826688°N, 66.420023°W, DD, WGS84) were observed during the visual field survey. Both these areas are recently flooded (post-2011) and have low potential for archaeological resources.

The Project Area has been assessed to have Low Potential for both Indigenous and Historic archaeological and heritage resources. However, there remains very limited potential (still “low”) for the presence of Military resources, which were not encountered during the visual field survey. While this potential is low, it remains a possibility, as is the case for undiscovered archaeological resources and human remains across the province.

3.14 VISUAL LANDSCAPE

The Project Area for the proposed solar farm is located in a predominantly forested area. The Project Area is surrounded by 5 CDSB property and is adjacent to Shirley and Maidstone Roads on DND lands. The Project will require the clearing of forested land that will result in permanent changes in the visual landscape.

3.15 HUMAN HEALTH AND SAFETY

The Project Area for the proposed solar farm is located in a predominantly forested area away from busy compounds. The Project Area is surrounded by 5 CDSB property and is adjacent to Shirley and Maidstone Roads on DND lands. The Project will require the clearing of forested land and other construction activities that could result in a risk to human health and safety. Although the area does not get a lot of traffic, the Shirley and Maidstone Roads are used by 5 CDSB personnel. The potential for a risk to human health and safety is low if all safety precautions are followed.

4 ENVIRONMENTAL EFFECTS ASSESSMENT AND MITIGATION

Temporal bounds delineate the time period(s) over which Project-related impacts / effects can be expected. Spatial bounds delineate the physical area(s) in which VECs may be affected by Project activities.

The temporal bounds of this Assessment include the construction and operations phases of the Project and any proposed monitoring programs. Decommissioning has not been considered in this document; however, impacts are considered to be similar to those presented for the construction phase. The spatial bounds of this Project include the area in and immediately adjacent to the Project Area.

The analysis of the identified ECCs and the list of VECs within the Projects spatial and temporal bounds are presented in Table 4.1. As per the EIA methodology described in Section 2.0, VECs were determined on the basis of potential public concerns related to environmental, social, cultural, economic or aesthetic values as well as the scientific concerns of the professional community.

These VECs and pathways were further analyzed against potential interactions with Project components resulting in a summary of potential environmental impacts. Table 4.2 is a summary of these potential impacts, coupled with associated mitigation activity.

Gender-based Analysis Plus (GBA+) provides a framework to describe the full scope of potential positive and negative effects under the *Impact Assessment Act*. The application of GBA+ to impact assessment seeks to understand, describe and, where possible, mitigate adverse impacts on diverse populations. GBA+ is an analytical tool that will be utilized during the undertaking of this assessment as per the guidance provided by the IAA on Gender-based Analysis Plus in Impact Assessment. As such, the intention is to ensure that, as applicable, multiple community relevant, diverse subgroups have been considered and proposed mitigation, where relevant, clearly addresses any issues identified.

Assessment for each VEC involves considerations for defining significance, examination of potential effects that may occur at each phase of the Project's completion (construction, operations, and maintenance), mitigation measures and potential residual effects.

Table 4.1 Issues Scoping / Pathway Analysis Summary Matrix – VECs: Construction and Operation of a Solar Farm

ENVIRONMENTAL RESOURCES	ENVIRONMENTAL COMPONENTS OF CONCERN (BIOPHYSICAL AND SOCIO-ECONOMIC)	PATHWAY OF CONCERN		POSSIBLE PATHWAY	VEC		PROJECT PHASE		RATIONALE FOR INCLUSION/EXCLUSION AS VALUED ENVIRONMENTAL COMPONENT (VEC)
		YES	NO		YES	NO	CONSTRUCTION	OPERATION AND MAINTENANCE	
Physical Environment	Air Quality	X		Soil disturbance. Equipment operation. Removal of trees. Accidental release of hazardous materials.	X		X		Included as a VEC – Potential effect on air quality. Protected by statute/regulation.
	Acoustic Environment		X	Equipment operation.		X			Excluded as a VEC – No pathway of concern identified.
	Surficial and Bedrock Geology		X	No possible pathway identified.		X			Excluded as a VEC – No pathway of concern identified.
	Surface Water	X		Excavation near existing watercourses. Site run-off. Accidental release of hazardous materials.	X		X	X	Included as a VEC – Potential effect on water quality.
	Groundwater		X	Equipment operation Accidental release of hazardous materials		X	X		Excluded as a VEC – No pathway of concern identified.
Biological Environment	Terrestrial Habitat	X		Clearing, grubbing, and excavation activities. Accidental release of hazardous materials.	X		X		Included as a VEC – Potential alteration of habitat, soil erosion, physical disturbance of wildlife, and introduction of invasive species.
	Wetland Resources	X		Excavation in or near existing wetland resources. Accidental release of hazardous materials/ contaminant migration.	X		X	X	Included as a VEC – Potential alteration of habitat, soil erosion, effects on water quality, physical disturbance of wildlife, and introduction of invasive species.
	Avifauna	X		Clearing, grubbing, and excavation activities.	X		X	X	Included as a VEC – Protected by statute/regulation.

ENVIRONMENTAL RESOURCES	ENVIRONMENTAL COMPONENTS OF CONCERN (BIOPHYSICAL AND SOCIO-ECONOMIC)	PATHWAY OF CONCERN		POSSIBLE PATHWAY	VEC		PROJECT PHASE		RATIONALE FOR INCLUSION/EXCLUSION AS VALUED ENVIRONMENTAL COMPONENT (VEC)
		YES	NO		YES	NO	CONSTRUCTION	OPERATION AND MAINTENANCE	
				Accidental release of hazardous materials.					
	Fish and Fish Habitat	X		Construction activities in or adjacent to watercourses. Accidental release of hazardous materials/contaminant migration.	X		X	X	Included as a VEC – Protected by statute/regulation.
	Species at Risk	X		Clearing, grubbing, and excavation activities. Accidental release of hazardous materials/contaminant migration.	X		X	X	Included as a VEC – Protected by statute/regulation.
Socio-Economic Setting	Existing Land Use		X	No possible pathway identified.		X			Excluded as a VEC – No pathway of concern identified.
	Physical and Cultural Heritage and Structures, sites, or things of Historical, Archaeological, palaeontological or architectural concern		X	Excavation activities.	X		X		Included as a VEC – Identified military structure (tank ramp) within Project Area. Protected by provincial regulation.
	Visual Landscape		X	Alteration of the existing visual landscape.		X			Excluded as a VEC – No pathway of concern identified.
	Sustainability		X	Reduction in greenhouse gases for energy use		X		X	Excluded as a VEC – No pathway of concern identified. Overall benefit of the Project

Table 4.2 Summary of Potential Environmental Effects

ENVIRONMENTAL COMPONENTS OF CONCERN (ECC)	POSSIBLE PATHWAY	POTENTIAL IMPACT	MITIGATION
Air Quality	Construction Activities Equipment Operation Accidental release of hazardous materials	Fugitive dust Equipment/vehicle emissions Loss of CO_2 sequestering due to removal of trees	Enforce speed limits for on-site vehicles during construction. Stabilize exposed erodible material. Ensure proper truck loading and tarping when appropriate. Minimize drop height for material transfer points. Apply water for dust suppression. Ensure vehicles and equipment are maintained as per manufacturer specifications. Minimize vehicle idling.
Surface Water	Sedimentation from construction activities and equipment operation Accidental release of hazardous materials	Effects on surface water quality	Develop a soil management plan in accordance with the Contaminated Sites Instruction (CSI.004.001) Soil Management for exportation and importation of soils. Install sediment and erosion control measures as required by Site Supervisor to be maintained for the life of the Project. Educate all construction personnel about the Project and importance of erosion and sediment control (ESC) measures and plans. Runoff shall be controlled, and sediment will be prevented from leaving the Project Area at all times. All installed ESC measures will be periodically inspected (especially before and after a rainfall event) and any exposed soil will be protected with either temporary or permanent covers after grading. Divert clean water from undisturbed areas around the Project Area using berms or lined channels, or carry the water across the Project Area in lined channels or pipes. Suspend construction activities during high water flow periods and extreme weather events. Maintain sufficient staff and equipment to manage erosion and sediment control during storm events and other emergencies. Erodible soils will be stabilized using slope roughening, riprap and filter fabric, or by re-establishing vegetation through native seeding and rehabilitation by means of mulching, erosion control blankets, or sod, immediately after grading. Preserve existing vegetation to the extent possible. Minimize the use of heavy equipment within 30 m of any wetland or watercourse; and Adhere to federal and provincial approval conditions. Ensure that machinery arrives on-site in a clean condition and is maintained free of fluid leaks.

ENVIRONMENTAL COMPONENTS OF CONCERN (ECC)	POSSIBLE PATHWAY	POTENTIAL IMPACT	MITIGATION
			Biodegradable fluids should be considered in place of petroleum products whenever possible as a standard for best practices. Do not dispose of petroleum products or any other deleterious substances on ground. Be diligent and take all necessary precautions to avoid spills and contamination of the soil (both surface and subsurface) when handling petroleum products onsite and during fueling and servicing of vehicles and equipment. All on-site chemicals and POLs should also be stored at a designated fueling and material storage site with secondary containment at least 100 m from any surface waters. No washing, fueling, or maintenance of vehicles or equipment in the vicinity of a watercourse without secondary containment. Refueling on Base property not to occur within 100 m of watercourse, wetland, waterbody or catch basin. Ensure pumps operating within 100 m of a watercourse or wetland utilize an appropriate secondary containment system. Provide for training, equipment, and implementation of response procedures-based spill contingency response. Please see the *5 CDSB Emergency Response Procedures* for further information.
Terrestrial Habitat	Sedimentation; dust; stormwater Accidental release of hazardous materials Clearing / grubbing activities	Indirect loss of plants due to fugitive dust, erosion, sedimentation, and / or contamination Loss of CO_2 sequestering due to loss of trees Loss of habitat Potential introduction of invasives	Minimize Project footprint. Minimize impacts to site boundaries. Minimize lay-down area. Consider runoff, erosion and sediment controls to be maintained for the life of the Project. Control dust with the use of water. Construction vehicles and equipment should be cleaned of vegetation and soil residues before entering the Project site. Maintenance of ESC measures. Proper use and storage of chemicals and POLs.

ENVIRONMENTAL COMPONENTS OF CONCERN (ECC)	POSSIBLE PATHWAY	POTENTIAL IMPACT	MITIGATION
Wetlands	Sedimentation from construction activities and equipment operation Introduction of invasive species Accidental release of hazardous materials	Effects on surface water quality	Suspend construction activities during high water flow periods and extreme weather events. Preserve existing vegetation to the extent possible. Adhere to 30 m buffer zone around watercourses/wetlands. Be aware of any possibilities for species introduction from equipment and personnel. Consider runoff, Erosion and Sediment Control (ESC) measures to be maintained for the life of the Project. Proper use and storage of chemicals and POLs. Have spill kits available and training in their use. Please see the *5 CDSB Emergency Response Procedures* for further information.
Avifauna	Construction activities Equipment presence Presence of people	Alteration / displacement of habitat Noise / physical disturbance of wildlife Behavioural changes Mortality	Report the discovery of any nests of any SAR encountered during clearing/grubbing to the 5 CDSB Gagetown Environmental Services Branch and the Environmental Authority of the Service Provider. Schedule tree clearing to occur outside the sensitive nesting window of May to September. Nest searches to be done if grubbing/clearing activities are to occur during the nesting season. Abide by all relevant timing constraints for wildlife as identified by regulatory agencies. No on-site employees will harass wildlife. Adhere to *Migratory Birds Convention Act* (MBCA) stipulations.
Fish and Fish Habitat	Sedimentation from construction activities and equipment operation Accidental release of hazardous materials	Alteration / displacement of habitat Indirect loss of habitat due to erosion, sedimentation, and / or contamination Mortality	Adherence to mitigation presented for surface water.

ENVIRONMENTAL COMPONENTS OF CONCERN (ECC)	POSSIBLE PATHWAY	POTENTIAL IMPACT	MITIGATION
Species at Risk	Construction activities Equipment presence Presence of people	Alteration / displacement of habitat Noise / physical disturbance of wildlife Behavioural changes Mortality	Report the discovery of any nests of any SAR encountered during clearing/grubbing activities to the 5 CDSB Gagetown Environmental Services Branch and the Environmental Authority of the Service Provider. Schedule tree clearing to occur outside the sensitive nesting window of May to September. Nest searches to be done if grubbing/clearing activities are to occur during the nesting season. Abide by all relevant timing constraints for wildlife as identified by regulatory agencies. No on-site employees will harass wildlife. Adhere to *Migratory Birds Convention Act* (MBCA) stipulations.
Cultural and Archaeological Structures	Construction activities	Direct negative impact on field identified military cultural/archaeological feature (tank ramp) Loss of possible unidentified military features and/or other archaeological resources	Identify location of cultural/archaeological feature (tank ramp) in the field (45.824700°N, 66.424346°W, DD, WGS84) prior to Project design. The on-site construction crew are to be made aware that there is potential for archaeological resources within the Project Area. Project archaeological resources protocols to be in place and adhered to during construction activities, should possible archaeological resources, Military resources, or human remains be discovered.
Accidental Spills and Malfunctions	Accidental release of hazardous materials and contaminant migration	Contamination of local and downstream environment	Adherence to maintenance schedules and daily pre-work inspection for vehicles and equipment on-site. Adequate training must be provided for personnel responsible for transportation, storage, handling, or use of hazardous material.

4.1 ATMOSPHERIC ENVIRONMENT

4.1.1 SIGNIFICANCE DEFINITION

A significant adverse effect on air quality is defined as a condition where regulatory objectives are routinely exceeded. Contaminants of concern include TSP, $PM_{2.5}$, NO_2, and SO_2 as regulated under the NB Air Quality Regulations. Current provincial and federal guidance documents on assessing Project-related impacts on climate change do not provide guidelines for determining significance. The construction's effects on GHG and climate change is considered negligible in context to the surrounding environment. The operation of the solar farm would be considered a positive effect on the atmospheric environment as it would offset other types of fuel used to generate power and will not emit GHGs.

4.1.2 POTENTIAL INTERACTIONS AND EFFECTS

CONSTRUCTION PHASE

The use of equipment during Project construction will result in temporary, short-term emissions of air pollutants during the construction phase, with associated emissions terminating once construction has been completed. Emissions will be generated during the following construction activities:

- use of heavy construction equipment such as excavators, earth movers, dump trucks and graders to prepare the Project Area;
- use of heavy construction equipment to handle fill material including dumping, grading and compaction;
- movement of construction vehicles over unpaved roads that will generate dust; and
- operation of construction equipment that will generate exhaust emissions containing TSP, CO, CO_2, NO_2, and SO_2.

These emissions are not anticipated to result in significant adverse effects on the air quality within the vicinity of the Project. Fugitive dust control measures are to be implemented, if required.

4.1.3 MITIGATION MEASURES

The following mitigation measures will be implemented to minimize potential adverse effects on the airshed during Project construction:

- enforce speed limits for on-site vehicles during construction;
- stabilize exposed erodible material;
- ensure proper truck loading and tarping when appropriate;
- minimize drop height for material transfer points;
- apply water for dust suppression;
- ensure vehicles and equipment are maintained as per manufacturer specifications; and
- minimize vehicle idling.

4.1.4 RESIDUAL EFFECTS AND DETERMINATION OF SIGNIFICANCE

The effects on the atmospheric environment in and near the Project Area caused by the construction and operation of the Project are not expected to be significant. Impacts on air quality from the construction of the Project will occur on a localized basis during construction. The Project is implementing a renewable resource which will offset GHG, creating a positive impact. Table 4.3 summarizes the residual environmental effects assessment for the atmospheric environment.

Table 4.3 Residual Effects – Atmospheric Environment

PROJECT-ENVIRONMENT INTERACTION	POTENTIAL POSITIVE (P) OR ADVERSE (A) EFFECT	MITIGATION	SIGNIFICANCE CRITERIA FOR RESIDUAL ENVIRONMENTAL EFFECTS					SIGNIFICANCE**
			MAGNITUDE*	GEOGRAPHIC EXTENT	DURATION / FREQUENCY	REVERSIBILITY (R=REVERSIBLE NR=NON-REVERSIBLE)	ECOLOGICAL / SOCIAL-CULTURAL AND ECONOMIC CONTEXT	
CONSTRUCTION								
Particulate emissions	A	Minimize particulates (e.g., onsite speed limits, minimizing loading drop height, use of dust suppressants). If possible, schedule activities when weather conditions (winds) are favourable. Adhere to idling restrictions. Maintain all equipment as per manufacturer specifications.	Low	Project Area	Construction phase	R	Impacts negligible in context to daily activities at 5 CDSB	Minimal, not significant
Contribution to GHG emissions and climate change	A	Adhere to idling restrictions. Maintain all equipment as per manufacturer specifications.	Low	Project Area	Construction phase	NR	Impacts negligible in context to daily activities at 5 CDSB Project is implementing a renewable resource and will offset GHG	Minimal, not significant

Notes:
*For definition of levels of magnitude (high, moderate, low, nil, unknown) refer to Section 2.0.
** For definition of levels of significance (major, medium minor, minimal) refer to Section 2.0.

4.2 SURFACE WATER

Surface water was identified as a VEC based on the effects that construction and operation may have on watercourses, and wetlands within and adjacent to the Project Area.

The principal interactions between the Project activities and surface waters are associated with effects to:

- surface water quality (total suspended solids (TSS) due to land disturbance during construction and effects during operation and maintenance activities (site run-off).

4.2.1 SIGNIFICANCE DEFINITION

The CCME Freshwater Aquatic Life (FAL) Guidelines (CCME, 2007) recommend the following:

- TSS concentration in surface waters should not increase by more than 25 milligrams per litre (mg/L) for any short-term exposure (i.e., 24-hour period) with a maximum average increase of 25 mg/L from background levels for longer term exposures (i.e., inputs lasting between 24 hours and 30 days).
- TSS concentration in surface waters should not increase by more than 25 mg/L from background levels at any time when background levels are between 25 and 250 mg/L. When background levels are greater than or equal to 250 mg/L, TSS concentration should not increase more than 10% of background levels.

Section 36(3) of the *Fisheries Act* states that "no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water".

The NB *Clean Water Act* promotes the protection and prudent use of the environment and includes the goal of maintaining the principles of sustainable development. The Watercourse and Wetland Alteration Program pursuant to the *Clean Water Act* has an objective to protect aquatic habitat from unmitigated works in or near watercourses and wetlands.

Based on the above, a significant adverse residual environmental effect on the aquatic environment is defined as a Project-related environmental effect that:

- results in the deposition of a deleterious substance (under Section 36(3) of the *Fisheries Act*) into the aquatic environment; and
- results in the exceedance of water quality guidelines outlined in the conditions of approval.

A positive effect is one that enhances the quality or area of habitat or increases species diversity.

4.2.2 POTENTIAL INTERACTIONS AND EFFECTS

The construction and operation of the Project may result in adverse effects on surface water quality. Fisheries and Oceans Canada (DFO) has developed Pathways of Effects (PoE) diagrams (DFO, 2014) to identify stressors which ultimately lead to effects in the aquatic environment. PoEs that may be relevant to the proposed Project include:

- addition or removal of aquatic or riparian vegetation; and
- use of industrial equipment.

The relevant effects identified by these PoEs are discussed below in context of the construction, operation and maintenance phases of the Project.

CONSTRUCTION PHASE

The principal interactions between construction activities and surface waters are associated with:

- the clearing of vegetation and earthworks including grubbing and stripping topsoil;
- the placement of excess material in temporary stockpiles which may be susceptible to erosion and result in sedimentation of watercourses adjacent to the Project Area; and
- use of heavy equipment adjacent to watercourses.

The primary effects of these interactions on surface water quality are the introduction of excess sediment and contaminants such as POLs to the watercourse. Sedimentation resulting from erosion of the stream bank as well as riparian zone soils and rocks can affect physical processes, structural attributes, and ecological conditions such as water clarity (by reducing visibility and sunlight as well as damaging fish gills) and reducing the availability and quality of spawning / rearing habitat (through infilling) (DFO, 2014). Sources of sedimentation include the use of mechanized equipment in or near the watercourse, the removal of vegetation in the riparian zone and the disturbance of substrate during culvert installation.

An increase in concentrations of contaminants in sediments and waters can result in exceedance of the ranges of chemical parameters that support healthy aquatic communities. Effects on fish and fish habitat can include direct fatality to organisms; alteration of the ecosystem structure through changes in the abundance, composition, and diversity of communities and habitats; and persistence and progressive accumulation in sediments or biological tissues. Deformities, alterations in growth, reproductive success, and competitive abilities can result (DFO, 2014). Contaminant sources include accidental releases from equipment used during construction and POLs stored onsite to fuel and service that equipment.

OPERATION PHASE

The principal interactions between operation and maintenance activities and surface waters are associated with site run-off.

The primary effects of these interactions on surface water quality are the introduction of contaminants to the watercourse. Sources of potential contamination include the release of POLs from equipment used for maintenance at the Project Area.

4.2.3 MITIGATION MEASURES

The following mitigation measures will be implemented to minimize potential adverse effects on surface water during Project construction.

SEDIMENTATION

During construction, erosion and sedimentation control measures will be used, including but not limited to the following actions:

- Develop a soil management plan in accordance with the Contaminated Sites Instruction (CSI.004.001) Soil Management for exportation and importation of soils.

- Install sediment and erosion control measures as required by Site Supervisor to be maintained for the life of the Project.
- Educate all construction personnel about the Project and importance of erosion and sediment control (ESC) measures and plans.
- Runoff shall be controlled, and sediment will be prevented from leaving the Project Area at all times.
- To maintain ESC measures during construction, all installed ESC measures will be periodically inspected (especially before and after a rainfall event) and any exposed soil will be protected with either temporary or permanent covers after grading.
- Suspend construction activities during high water flow periods and extreme weather events.
- Maintain sufficient staff and equipment to manage erosion and sediment control during storm events and other emergencies.
- Erodible soils will be stabilized using slope roughening, riprap and filter fabric, or by re-establishing vegetation through native seeding and rehabilitation by means of mulching, erosion control blankets, or sod, immediately after grading.
- Preserve existing vegetation to the extent possible.
- Minimize the use of heavy equipment within 30 m of any wetland or watercourse; and
- Adhere to federal and provincial approval conditions.

CONTAMINATION

- Ensure that machinery arrives on-site in a clean condition and is maintained free of fluid leaks.
- Biodegradable fluids should be considered in place of petroleum products whenever possible as a standard for best practices.
- Do not dispose of petroleum products or any other deleterious substances on ground.
- Be diligent and take all necessary precautions to avoid spills and contamination of the soil (both surface and subsurface) when handling petroleum products onsite and during fueling and servicing of vehicles and equipment.
- All on-site chemicals and POLs should also be stored at a designated fueling and material storage site with secondary containment at least 100 m from any surface waters. All spills or leaks such as those from machinery or storage tanks must be promptly contained, cleaned up and reported to the DELG's Fredericton Regional Office at 506-444-5149 or if the spill occurs after regular business hours, then the Canadian Coast Guard's 24-hour environmental emergencies reporting system must be contacted at 1-800-565-1633.
- No washing, fueling, or maintenance of vehicles or equipment in the vicinity of a watercourse without secondary containment.
- Ensure pumps operating within 100 m of a watercourse or wetland utilize an appropriate secondary containment system.
- Provide for training, equipment, and implementation of response procedures-based spill contingency response. Please see the *5 CDSB Emergency Response Procedures* for further information.

4.2.4 RESIDUAL EFFECTS AND DETERMINATION OF SIGNIFICANCE

The effects on surface water quality in and near the Project Area caused by the construction and operation of the Project are not expected to be significant. Table 4.4 summarizes the residual environmental effects for surface water.

Table 4.4 Residual Effects – Surface Water Resources

PROJECT-ENVIRONMENT INTERACTION	POTENTIAL POSITIVE (P) OR ADVERSE (A) EFFECT	MITIGATION	SIGNIFICANCE CRITERIA FOR RESIDUAL ENVIRONMENTAL EFFECTS					SIGNIFICANCE**
			MAGNITUDE*	GEOGRAPHIC EXTENT	DURATION / FREQUENCY	REVERSIBILITY (R=REVERSIBLE NR=NON-REVERSIBLE)	ECOLOGICAL / SOCIAL-CULTURAL AND ECONOMIC CONTEXT	
CONSTRUCTION								
Introduction of excess sediment into watercourses	A	Implementation and inspection of sediment and erosion control measures Adherence to federal and provincial regulations Develop a soil management plan in accordance with the Contaminated Sites Instruction (CSI.004.001) Soil Management for exportation and importation of soils.	Low	Downstream of sediment introduction; full extent depends on water volume and flow	Construction phase / Short term	R	Three watercourses and four wetlands within the Project Area boundaries	Minimal, not significant
Introduction of contaminants into watercourses	A	Proper use and storage of chemicals and Petroleum, oils, ore lubricants (POLs) Spill kits must be available on-site Workers should be trained in spill clean-up. Adherence to federal and provincial regulations	Low	Downstream of contaminant introduction; full extent depends on water volume and flow	Construction phase / Short term	R	No watercourses within the Project Area boundaries	Minimal, not significant
OPERATION								
Introduction of contaminants into watercourses	A	Adherence to federal and provincial regulations Proper use and storage of chemicals and Petroleum, oils, ore lubricants (POLs) Spill kits must be available on-site and workers properly trained	Low	Downstream of contaminant introduction; full extent depends on water volume and flow	Operation phase / Short term	R	No watercourses within the Project Area boundaries	Minimal, not significant

Notes: *For definition of levels of magnitude (high, moderate, low, nil, unknown) refer to Section 2.0. **For definition of levels of significance (major, medium, minor, minimal) refer to Section 2.0.

4.3 TERRESTRIAL HABITAT

4.3.1 SIGNIFICANCE DEFINITION

A significant adverse effect on terrestrial habitat and vegetation would be one which results in contravention of SARA or NBSRA provisions; or for non-SARA or non-NBSRA listed priority species, a decline in abundance and/or change in distribution beyond which natural recruitment (reproduction and immigration from unaffected areas) would not return the population to its pre-Project level within several (three to five) generations. A significant adverse effect on sensitive / critical habitat would be a permanent net loss of habitat function. A positive effect is one that may enhance the quality of habitat, increase species diversity, or increase the area of valued habitat.

4.3.2 POTENTIAL INTERACTIONS AND EFFECTS

CONSTRUCTION PHASE

Construction activities associated with the Project may result in temporary or permanent adverse effects on terrestrial flora that can result from site preparation (e.g., clearing, grubbing, grading), as well as associated dust, erosion and sedimentation, and possible introduction of invasive species. Potential effects on terrestrial flora, habitat, communities and individuals during construction may also occur as a result of accidental events. Effects can be limited to the footprint of the Project or may extend to adjacent lands as indicated below.

During construction, potential adverse effects on vegetation and habitat include:

- direct and indirect mortality of plants;
- temporary or permanent loss or alteration of habitat and habitat availability;
- impairment from changes to wind exposure and microclimatic conditions;
- impairment or displacement from introduction of invasive species; and
- mortality or impaired growth due to accidental events (discussed in Section 4.8).

HABITAT LOSS AND ALTERATION

Site clearing, grubbing and grading will result in loss of vegetation habitat, as well as direct mortality of the vascular and non-vascular plants in the area affected. For the purposes of this assessment, it is assumed that all the vegetation in the Project Area will be lost for the lifetime of the Project as a result of site clearing, grubbing and grading.

Clearing may also change wind exposure and microclimatic conditions in adjacent forests, resulting in some die-off and reduced growth of forest species until edge vegetation matures.

Given the common nature of the habitat and vegetation affected and the previous disturbance through human activities, the effects are not expected to adversely impact floral populations, habitat diversity, quality and availability.

Erosion / Sedimentation

Clearing and grubbing required for all Project components, results in disturbed soil surfaces without vegetative cover. Site clearing will be completed early in the construction phase. Grubbing is performed later to minimize the exposure time of the underlying soil. Exposed soil is vulnerable to erosion, and the resulting sedimentation may smother vegetation or impair plant growth in adjacent terrestrial and aquatic habitats. These potential effects can be effectively mitigated and avoided through standard sediment and erosion control measures.

Fugitive Dust

Earthwork, movement of construction and transportation machinery, and storage of soil and construction materials may result in emissions of fugitive dust. The deposition of dust on the leaf surfaces of nearby vegetation may cause temporary inhibition of photosynthesis and transpiration in the affected plants, potentially resulting in slower growth rates (Farmer, 1993). However, dust deposition that could have such effects on plant growth are not expected to occur beyond a few metres from the source. Standard dust abatement measures and measures for the protection of air quality as outlined in Section 5.1 will mitigate the potential effects of dust on vegetation in all habitats.

Introduction of Alien and Invasive Species

Clearing, grading and construction activities will result in disturbed areas without cover of natural vegetation. Open soil surfaces encourage the establishment of non-native and potentially invasive species of plants. As the plant inventory indicates, several alien plant species have already been detected in the footprint of the Project, which may be the result of previous disturbance from forest harvesting or other human use.

Seeds, roots or “rootable” fragments of invasive species may stick to construction equipment, transportation vehicles or shoes of workers. Introduction of non-native or invasive species may lead to alteration of nearby habitat and may have an adverse effect on the abundance and diversity of native flora.

4.3.3 MITIGATION MEASURES

The following mitigation measures will be implemented to minimize potential adverse effects on terrestrial habitat during Project construction.

Site Preparation

<u>During construction:</u>

- Mark Project boundaries to prevent accidental impacts outside the work area.
- Dust prevention and abatement measures will also protect local flora and habitats.
- Stabilize and rehabilitate areas of temporary disturbance as soon as practical.
- Maintain surface water paths through culvert placement and appropriate structure sizing.
- Construction and transportation equipment should be cleaned of vegetation and soil residues and inspected before entering the Project site. Areas of exposed soil should be revegetated as soon as practical, following completion of work activities.
- Use only non-invasive plant species for restoration.

Sedimentation

During construction:

- Develop a soil management plan in accordance with the Contaminated Sites Instruction (CSI.004.001) Soil Management for exportation and importation of soils.
- Install sediment and erosion control measures as outlined in guidance documents and/or permit approvals.
- Undertake regular inspection of sediment and erosion control measures to ensure they have remained in place and are working properly.
- The Project Area should be inspected prior to, during, and after a rainfall event.
- Promote growth of vegetation in areas adjacent to wetlands following disturbance. Use temporary measures (e.g., jute mats or mulch) until permanent cover has been established.
- Limit removal of riparian zone vegetation.
- Adhere to federal and provincial approval conditions.

Contamination

During construction phase:

- Ensure that machinery arrives onsite in a clean condition and is maintained free of fluid leaks.
- Biodegradable fluids should be considered for use in place of petroleum products whenever possible, as a standard for best practices.
- Do not dump petroleum products or any other deleterious substances on ground.
- Be diligent and take all necessary precautions to avoid spills and contamination of the soil (both surface and subsurface) when handling POLs onsite and during fueling and servicing of vehicles and equipment.
- All on-site chemicals and POLs should also be stored at a designated fueling and material storage site with secondary containment at least 100 m from any surface waters. All spills or leaks such as those from machinery or storage tanks must be promptly contained, cleaned up and reported to the DELG's Fredericton Regional Office at 506-444-5149 or if the spill occurs after regular business hours, then the Canadian Coast Guard's 24-hour environmental emergencies reporting system must be contacted at 1-800-565-1633.
- Workers should be trained in spill clean-up. Please see the *5 CDSB Emergency Response Procedures* for further information.
- Spill clean-up kits must be available.

4.3.4 RESIDUAL EFFECTS AND DETERMINATION OF SIGNIFICANCE

With the implementation of the recommended mitigation measures, Project activities are not likely to result in significant adverse residual effects on flora (including priority species) and terrestrial habitats.

Table 4.5 provides a summary of mitigation measures and residual environmental effects after successful implementation of the mitigation measures described above.

Table 4.5 Residual Effects – Terrestrial Habitat

PROJECT-ENVIRONMENT INTERACTION	POTENTIAL POSITIVE (P) OR ADVERSE (A) EFFECT	MITIGATION	SIGNIFICANCE CRITERIA FOR RESIDUAL ENVIRONMENTAL EFFECTS					RESIDUAL EFFECTS, SIGNIFICANCE**
			MAGNITUDE*	GEOGRAPHIC EXTENT	DURATION/FREQUENCY	REVERSIBILITY (R=REVERSIBLE NR=NON-REVERSIBLE)	ECOLOGICAL/SOCIAL-CULTURAL AND ECONOMIC CONTEXT	
CONSTRUCTION								
Direct plant mortality, habitat removal or alteration due to site preparation, clearing and grubbing.	A	Minimize Project footprint. Minimize lay-down areas. Comply with regulatory approvals.	Low	Limited to Site boundaries	Permanent loss; occurring once.	NR	Similar habitat and priority plants in the region. Site within an active military base.	Minor, not significant
Indirect plant mortality as a result of habitat changes through potential erosion, sediment loading, stormwater discharges, and spills.	A	Temporarily disturbed surfaces to be rehabilitated as soon as possible. Implement erosion and sediment control plans.	Low	Project Area	Construction phase.	R	See above	Minimal, not significant
Plant displacement or loss of suitable habitat due to the introduction of invasive species.	A	Revegetate or stabilize disturbed surfaces as soon as possible. Equipment to be cleaned from vegetation and soil residues before entering the Project site. Discourage workers from entering off-site areas.	Low	Local; depends on size of affected area.	Project lifetime; Infrequent.	R	See above	Minimal, not significant
Impairment of plant growth as result of fugitive dust emissions.	A	Implement dust abatement measures and sediment control measures.	Low	Local	Construction phase; frequent.	R	See above	Minimal, not significant

Notes:
* For definition of levels of magnitude (high, moderate, low, nil, unknown) refer to Section 2.0.
** For definition of levels of significance (major, medium, minor, minimal) refer to Section 2.0.

4.4 WETLANDS

4.4.1 SIGNIFICANCE DEFINITION

A significant adverse effect from the Project on wetlands is defined as an effect that is likely to cause a permanent net loss of flora and wetland function as established during the wetland evaluation.

A complete effects assessment will be completed following the scheduled wetland delineation work and summarized in Table 4.6.

4.4.2 MITIGATION MEASURES

The following mitigation measures will be implemented to minimize potential adverse effects on wetlands during Project construction.

Site Preparation

<u>During construction:</u>

- Mark Project boundaries to prevent accidental impacts outside the work area.
- Mark 30 m buffer around watercourses / wetlands to prevent accidental impacts.
- Dust prevention and abatement measures will also protect local flora and habitats.
- Stabilize and rehabilitate areas of temporary disturbance as soon as practical.
- Maintain surface water paths through culvert placement and appropriate structure sizing.
- Construction and transportation equipment should be cleaned of vegetation and soil residues and inspected before entering the Project site. Areas of exposed soil should be revegetated as soon as practical, following completion of work activities.
- Use only non-invasive plant species for restoration.

Sedimentation

<u>During construction:</u>

- Install sediment and erosion control measures as outlined in guidance documents and/or permit approvals.
- Undertake regular inspection of sediment and erosion control measures to ensure they have remained in place and are working properly.
- The Project Area should be inspected prior to, during, and after a rainfall event.
- Promote growth of vegetation in areas adjacent to wetlands following disturbance. Use temporary measures (e.g., jute mats or mulch) until permanent cover has been established.
- Adhere to federal and provincial regulations.

Contamination

During construction phase:

- Ensure that machinery arrives onsite in a clean condition and is maintained free of fluid leaks.
- Biodegradable fluids should be considered for use in place of petroleum products whenever possible, as a standard for best practices.
- Do not dump petroleum products or any other deleterious substances on ground.
- Be diligent and take all necessary precautions to avoid spills and contamination of the soil (both surface and subsurface) when handling POLs onsite and during fueling and servicing of vehicles and equipment.
- All on-site chemicals and POLs should also be stored at a designated fueling and material storage site with secondary containment at least 100 m from any surface waters. All spills or leaks such as those from machinery or storage tanks must be promptly contained, cleaned up and reported to the DELG's Fredericton Regional Office at 506-444-5149 or if the spill occurs after regular business hours, then the Canadian Coast Guard's 24-hour environmental emergencies reporting system must be contacted at 1-800-565-1633.
- Workers should be trained in spill clean-up. Please see the *5 CDSB Emergency Response Procedures* for further information.
- Spill clean-up kits must be available.

4.4.3 POTENTIAL INTERACTIONS AND EFFECTS

Construction activities associated with the Project may result in temporary or permanent adverse effects on wetland habitats that can result from site preparation (e.g., clearing, grubbing, grading), as well as associated dust, erosion and sedimentation, and possible introduction of invasive species. Potential effects on wetland habitats during construction may also occur as a result of accidental events. Effects can be limited to the footprint of the Project or may extend to adjacent lands as indicated below.

During construction, potential adverse effects on vegetation and habitat include:

- direct and indirect mortality of plants;
- temporary or permanent loss or alteration of habitat and habitat availability;
- impairment from changes to wind exposure and microclimatic conditions;
- impairment or displacement from introduction of invasive species; and
- mortality or impaired growth due to accidental events (discussed in Section 4.8).

Habitat Loss and Alteration

Site clearing, grubbing and grading outside of the 30 m buffer will result in loss of vegetation habitat, as well as direct mortality of the vascular and non-vascular plants in the area affected. For the purposes of this assessment, it is assumed that all the vegetation in the Project Area will be lost for the lifetime of the Project as a result of site clearing, grubbing and grading.

Clearing outside of the 30 m buffer may also change wind exposure and microclimatic conditions in adjacent forested wetlands, resulting in some die-off and reduced growth of forest species until edge vegetation matures; however, the 30 m buffer will provide some protection to the existing wetlands.

Given the common nature of the habitat and vegetation affected and the previous disturbance through human activities, the effects are not expected to adversely impact floral populations, habitat diversity, quality and availability.

Erosion / Sedimentation

Clearing and grubbing required for all Project components, results in disturbed soil surfaces without vegetative cover. Site clearing will be completed early in the construction phase. Grubbing is performed later to minimize the exposure time of the underlying soil. Exposed soil is vulnerable to erosion, and the resulting sedimentation may smother vegetation or impair plant growth in adjacent wetlands. These potential effects can be effectively mitigated and avoided through standard sediment and erosion control measures.

Fugitive Dust

Earthwork, movement of construction and transportation machinery, and storage of soil and construction materials may result in emissions of fugitive dust. The deposition of dust on the leaf surfaces of nearby vegetation may cause temporary inhibition of photosynthesis and transpiration in the affected plants, potentially resulting in slower growth rates (Farmer, 1993). However, dust deposition that could have such effects on plant growth are not expected to occur beyond a few metres from the source. Therefore, if buffers are respected, fugitive dust will be limited within wetlands. Standard dust abatement measures and measures for the protection of air quality as outlined in Section 5.1 will mitigate the potential effects of dust on vegetation in all habitats.

Introduction of Alien and Invasive Species

Clearing, grading and construction activities will result in disturbed areas without cover of natural vegetation. Open soil surfaces encourage the establishment of non-native and potentially invasive species of plants. As the plant inventory indicates, several alien plant species have already been detected in the footprint of the Project, which may be the result of previous disturbance from forest harvesting or other human use.

Seeds, roots or “rootable” fragments of invasive species may stick to construction equipment, transportation vehicles or shoes of workers. Introduction of non-native or invasive species may lead to alteration of nearby habitat and may have an adverse effect on the abundance and diversity of native flora.

4.4.4 RESIDUAL EFFECTS AND DETERMINATION OF SIGNIFICANCE

With the implementation of the recommended mitigation measures, Project activities are not likely to result in significant adverse residual effects on flora (including priority species) and wetland habitats.

Table 4.6 provides a summary of mitigation measures and residual environmental effects after successful implementation of the mitigation measures described above.

Table 4.6 Residual Effects - Wetlands

PROJECT-ENVIRONMENT INTERACTION	POTENTIAL POSITIVE (P) OR ADVERSE (A) EFFECT	MITIGATION	SIGNIFICANCE CRITERIA FOR RESIDUAL ENVIRONMENTAL EFFECTS					SIGNIFICANCE**
			MAGNITUDE*	GEOGRAPHIC EXTENT	DURATION / FREQUENCY	REVERSIBILITY (R=REVERSIBLE NR=NON-REVERSIBLE)	ECOLOGICAL / SOCIAL-CULTURAL AND ECONOMIC CONTEXT	
CONSTRUCTION								
Introduction of excess sediment into wetlands	A	Implementation and inspection of sediment and erosion control measures Adherence to federal and provincial regulations Adherence to the 30 m buffer	Low	Downstream of sediment introduction; full extent depends on water volume and flow	Construction phase	R	Three watercourses within the Project Area boundaries.	Minimal, not significant
Introduction of contaminants into wetlands	A	Proper use and storage of chemicals and Petroleum, oils, ore lubricants (POLs) Spill kits must be available on-site Workers should be trained in spill clean-up Adherence to federal and provincial regulations Adherence to the 30 m buffer	Low	Downstream of contaminant introduction; full extent depends on water volume and flow	Construction phase	R	Three watercourses within the Project Area boundaries.	Minimal, not significant
OPERATION								
Introduction of contaminants into wetlands	A	Adherence to federal and provincial regulations Adherence to the 30 m buffer	Low	Downstream of contaminant introduction; full extent depends on water volume and flow	Operation phase	R	Three watercourses within the Project Area boundaries.	Minimal, not significant

Notes:
*For definition of levels of magnitude (high, moderate, low, nil, unknown) refer to Section 2.0.
**For definition of levels of significance (major, medium, minor, minimal) refer to Section 2.0.

4.5 AVIFAUNA

4.5.1 SIGNIFICANCE DEFINITION

A significant adverse effect on avifauna (birds) would be one which results in contravention of MBCA, SARA or NBSRA provisions; for non-SARA or non-NBSRA listed priority species, a decline in abundance and/or a change in distribution beyond which natural recruitment (reproduction and immigration from unaffected areas) would not return the population to its pre-Project level within several (three to five) generations.

A complete effects assessment will be completed following the scheduled avian surveys and will be summarized in Table 4.7.

4.5.2 POTENTIAL INTERACTIONS AND EFFECTS

CONSTRUCTION PHASE

Construction activities associated with the Project may result in temporary or permanent adverse effects on avifauna that can result from site preparation (e.g., clearing, grubbing, grading), as well as associated dust, erosion and sedimentation, and possible introduction of invasive species. Potential effects on terrestrial flora, habitat, communities and individuals during construction may also occur as a result of accidental events. Effects can be limited to the footprint of the Project or may extend to adjacent lands as indicated below.

During construction, potential adverse effects on vegetation potentially used as avian habitat include:

- temporary or permanent loss or alteration of habitat and habitat availability;
- equipment presence and presence of people;
- noise / physical disturbance of wildlife;
- behavioural changes;
- mortality; and
- impairment from changes to wind exposure and microclimatic conditions.

HABITAT LOSS AND ALTERATION

Site clearing, grubbing and grading will result in loss of vegetation habitat, as well as direct mortality of the vascular and non-vascular plants in the area affected. For the purposes of this assessment, it is assumed that all the vegetation in the Project Area will be lost for the lifetime of the Project as a result of site clearing, grubbing and grading.

Clearing may also change wind exposure and microclimatic conditions in adjacent forests, resulting in some die-off and reduced growth of forest species until edge vegetation matures reducing the habitat that would be used by birds in the area.

For this Project, there will be no disturbance within the 30 m buffer of any watercourse or wetland; therefore, this remaining habitat will continue to be available for wildlife species. Given the common nature of the habitat and vegetation affected and the previous disturbance through human activities, the effects are not expected to adversely impact avian populations, habitat diversity, quality and availability.

4.5.3 MITIGATION MEASURES

To avoid harmful effects on migratory and SAR birds in the implementation of the Project, it will be necessary to avoid clearing within the breeding season (April 1st to August 31st) to the extent possible. If any clearing is required within this window, the area should be searched for evidence of breeding birds prior to disturbance and any active nests protected with a no-disturbance buffer. If during any stage of construction, evidence of an active nest is encountered, CWS and or NBNRED will be contacted, and work will not progress in that area until the young have fledged and are clear of the nesting area. The loss of habitat within the PDA is not anticipated to have a detrimental effect on populations of the bird species encountered in the Project Area as the conditions on the Project Area are not limiting at the landscape level, with the possible exception of the mature cedar/hemlock forest which is somewhat unusual (visible in Figure 3.2 depicting Terrestrial Habitat in the Project Area). However, no bird SAR or SOCC were encountered using that habitat during the breeding bird survey conducted in June 2023 (see Appendix B) and no species encountered require additional specific mitigation as long as clearing is conducted outside the breeding season and all disturbance around active nests are avoided. Nesting surveys will need to be completed if clearing is to be done during the nesting period.

4.5.4 RESIDUAL EFFECTS AND DETERMINATION OF SIGNIFICANCE

With the implementation of the recommended mitigation measures, Project activities are not likely to result in significant adverse residual effects on avifauna.

Table 4.7 provides a summary of mitigation measures and residual environmental effects after successful implementation of the mitigation measures described above.

Table 4.7 Residual Effects - Avifauna

PROJECT-ENVIRONMENT INTERACTION	POTENTIAL POSITIVE (P) OR ADVERSE (A) EFFECT	MITIGATION	SIGNIFICANCE CRITERIA FOR RESIDUAL ENVIRONMENTAL EFFECTS					RESIDUAL EFFECTS, SIGNIFICANCE**
			MAGNITUDE*	GEOGRAPHIC EXTENT	DURATION/FREQUENCY	REVERSIBILITY (R=REVERSIBLE	ECOLOGICAL/SOCIAL-CULTURAL AND ECONOMIC CONTEXT	
CONSTRUCTION								
Loss of avifauna habitat (and therefore potential to affect bird species) due to direct plant mortality, habitat removal or alteration due to site preparation, clearing and grubbing.	A	Minimize Project footprint. Minimize lay-down areas. Comply with regulatory approvals	Low	Limited to Site boundaries	Permanent loss; occurring once.	NR	Similar habitat and priority plants in the region. Site within an active military base.	Minor, not significant
Loss of avifauna habitat due to indirect plant mortality as a result of habitat changes through potential erosion, sediment loading, stormwater discharges, and spills.	A	Temporarily disturbed surfaces to be rehabilitated as soon as possible. Implement erosion and sediment control plans.	Low	Project Area	Construction phase.	R	See above	Minimal, not significant
Plant displacement or loss of suitable avifauna habitat due to the introduction of invasive species.	A	Revegetate or stabilize disturbed surfaces as soon as possible. Equipment to be cleaned from vegetation and soil residues before entering the Project site. Discourage workers from entering off-site areas.	Low	Local; depends on size of affected area.	Project lifetime; Infrequent.	R	See above	Minimal, not significant

PROJECT-ENVIRONMENT INTERACTION	POTENTIAL POSITIVE (P) OR ADVERSE (A) EFFECT	MITIGATION	SIGNIFICANCE CRITERIA FOR RESIDUAL ENVIRONMENTAL EFFECTS					RESIDUAL EFFECTS, SIGNIFICANCE**
			MAGNITUDE*	GEOGRAPHIC EXTENT	DURATION/FREQUENCY	REVERSIBILITY (R=REVERSIBLE	ECOLOGICAL/SOCIAL-CULTURAL AND ECONOMIC CONTEXT	
Loss of avifauna habitat due to impairment of plant growth as result of fugitive dust emissions.	A	Implement dust abatement measures and sediment control measures.	Low	Local	Construction phase; frequent.	R	See above	Minimal, not significant

Notes:
*For definition of levels of magnitude (high, moderate, low, nil, unknown) refer to Section 2.0.
**For definition of levels of significance (major, medium, minor, minimal) refer to Section 2.0.

4.6 FISH AND FISH HABITAT

Fish and fish habitat were identified as a VEC based on the effects that construction and operation may have on watercourses, and wetlands within and adjacent to the Project Area.

4.6.1 SIGNIFICANCE DEFINITION

A significant adverse effect from the Project on fish and fish habitat is defined as an effect that is likely to cause a permanent net loss of present species and/or available habitat within the Project Area.

4.6.2 POTENTIAL INTERACTIONS AND EFFECTS

As no in-water works are anticipated with the Project, potential interaction and effects noted in Surface Water Section 4.2.2 are sufficient to mitigate potential effects to fish and fish habitat.

4.6.3 MITIGATION

Mitigation noted in Surface Water Section 4.2.3 are sufficient to address fish and fish habitat.

4.6.4 RESIDUAL EFFECTS AND DETERMINATION OF SIGNIFICANCE

Residual effects and significance are not expected to differ from those presented in the Surface Water Section - Table 4.4.

4.7 SPECIES-AT-RISK

The desktop review and field surveys during the Project Area selection did not identify any SAR within the Project Area footprint.

4.7.1 SIGNIFICANCE DEFINITION

A significant adverse effect on SAR and SOCI would be one which results in contravention of SARA or NBSRA provisions. Significance definitions outlined in Sections 5.3.1 (Terrestrial Habitat), 5.4.1 (Wetlands), and 5.5.1 (Avifauna), would also apply to SAR / SOCI.

4.7.2 POTENTIAL INTERACTIONS AND EFFECTS

Construction activities associated with the Project may result in temporary or permanent adverse effects on SAR and SOCI. Potential adverse effects to terrestrial and aquatic flora, habitat, communities and individuals can result from site preparation (e.g., clearing, grubbing, grading, blasting), as well as associated dust, erosion and sedimentation, and possible introduction of invasive species. Potential effects on terrestrial and aquatic flora, habitat, communities and individuals during construction may also occur as a result of accidental events. Effects can include:

- Alteration / displacement of habitat;

- loss of sensitive / critical habitat;
- noise/disturbance to wildlife;
- behavioural changes; and
- mortality.

Effects can be limited to the Project Footprint or may extend to adjacent lands.

4.7.3 MITIGATION MEASURES

Mitigation for potential effects on identified SAR and SOCI mirror that provided in Sections 5.3.3 (Terrestrial Habitat), 4.4.3 (Wetlands), and 4.5.3 (Avifauna).

4.7.4 RESIDUAL EFFECTS AND DETERMINATION OF SIGNIFICANCE

Residual effects for SAR and SOCI will mirror those provided in Tables 4.4 (Wetlands), 4.5 (Terrestrial Habitats), and 4.7 (Avifauna).

The assessment presented in Section 6.0 addresses potential effects of routine, planned Project activities associated with the construction and operation / maintenance phases. Potential for adverse effects on VECs that could be caused by unplanned, accidental events is discussed below.

Plausible accidents and unplanned events that may occur during construction and operation of the Project that have the potential to adversely impact VECs include:

- Spills;
- Erosion and Sediment Control Failures; and
- Fire.

Table 4.8 provides an overview of the VECs that are of primary concern for each of the listed scenarios. Each scenario is briefly discussed in the following subsections.

Table 4.8 Accidents and Unplanned Events

WORKS AND ACTIVITIES	SURFACE WATER RESOURCES	ATMOSPHERIC ENVIRONMENT	AVIFAUNA	TERRESTRIAL HABITAT	WETLANDS	AQUATIC ENVIRONMENT	SPECIES AT RISK
Spills	●	●	●	●	●	●	●
Erosion / Sediment Control Failures	●		●	●	●	●	●
Fire	●	●	●	●	●	●	●

4.7.5 SPILLS OF CHEMICALS AND POLS

Accidental spills of POLs and other chemical substances during the construction and operation phases of the Project have the potential to contaminate soil, sediment, surface water and groundwater. The potential contaminants resulting from a spill may also adversely affect vegetation, wildlife and wetlands and could result in contaminants in nearby water wells.

During construction, the contractor will be responsible for reducing the likelihood of spills by implementing effective prevention measures including the careful handling and proper storage of the products in use. The contractor is accountable to prevent, eliminate and/or remediate an adverse effect resulting from a spill and to report the spill to the Project Engineer and other applicable organizations as requested in provincial and federal approvals, authorizations, terms and conditions and letters of advice. The contractor is also responsible for providing adequate training for spills to workers on-site. Please see the *5 CDSB Emergency Response Procedures* for further information. All spills or leaks such as those from machinery or storage tanks must be promptly contained, cleaned up and reported to the DELG's Fredericton Regional Office at 506-444-5149 or if the spill occurs after regular business hours, then the Canadian Coast Guard's 24-hour environmental emergencies reporting system must be contacted at 1-800-565-1633.

4.7.6 FAILURE OF ESC MEASURES

The risk of failure of ESC measures is heightened during spring runoff and extreme or prolonged rainfall events. Failure of ESC measures may cause discharge of runoff with elevated levels of TSS to surface water bodies, potentially causing adverse effects on fish and fish habitat, particularly should runoff with elevated TSS enter fish spawning habitat.

During construction sediment and erosion control measures will be installed as required by Site Supervisor to be maintained for the life of the Project. All construction personnel will be educated about the Project and importance of erosion and sediment control (ESC) measures and plans. To maintain ESC measures during construction, all installed ESC measures will be periodically inspected (especially before and after a rainfall event) and any exposed soil will be protected with either temporary or permanent covers after grading. Construction activities will be suspended during high water flow periods and extreme weather events. Maintain sufficient staff and equipment to manage erosion and sediment control during storm events and other emergencies. And finally, erodible soils will be stabilized using slope roughening, riprap and filter fabric, or by re-establishing vegetation through native seeding and rehabilitation by means of mulching, erosion control blankets, or sod, immediately after grading and existing vegetation will be preserved to the extent possible.

To avoid contamination machinery that arrives on-site will be in a clean condition and is maintained free of fluid leaks; biodegradable fluids should be considered in place of petroleum products whenever possible as a standard for best practices; petroleum products or any other deleterious substances will not be disposed on ground; all on-site chemicals and POLs should also be stored at a designated fueling and material storage site with secondary containment at least 100 m from any surface waters; no washing, fueling, or maintenance of vehicles or equipment in the vicinity of a watercourse without secondary containment; pumps operating within 100 m of a watercourse or wetland utilize an appropriate secondary containment system; and provide for training, equipment, and implementation of response procedures-based spill contingency response. All spills or leaks such as those from machinery or storage tanks must be promptly contained, cleaned up and reported to the DELG's

Fredericton Regional Office at 506-444-5149 or if the spill occurs after regular business hours, then the Canadian Coast Guard's 24-hour environmental emergencies reporting system must be contacted at 1-800-565-1633.

4.7.7 FIRES

Accidental fires during Project construction and operation / maintenance activities have the potential to occur. Activities that may accidentally cause a fire include equipment or hot exhaust, refuelling, brush burning, careless smoking near construction / work areas and vehicle accidents.

Accidental fires may have serious adverse effects on sensitive receptors through habitat loss, mortality to wildlife and vegetation, atmospheric emissions and damage or loss of property or heritage / archaeological resources. There is potential for chemicals in runoff during firefighting to adversely affect surface water and fish and fish habitat. With increasing annual mean temperature, a fire break will be considered to limit the potential damage to the installations associated with the Project due to forest fires.

In the unlikely event of a fire, local and provincial emergency response services and procedures would be initiated.

4.7.8 CONCLUSION

With the implementation of mitigation measures and significant adverse effects are unlikely to occur as a result of accidents and unplanned events.

4.8 HERITAGE AND ARCHAEOLOGICAL RESOURCES

Heritage and archaeological resources were identified as a VEC based on the potential effects that construction may have on one identified military cultural feature, which will be registered with the province as an archaeological site.

4.8.1 SIGNIFICANCE DEFINITION

A significant adverse effect from the Project on the archaeological resource is defined as an effect that is likely to cause damage to an archaeological resource. This is applicable to the archaeological resource identified during the visual field survey of the Project Area, as well as any other cultural features that may be identified during the Project construction, which may not have been identified during the visual field survey.

4.8.2 POTENTIAL INTERACTIONS AND EFFECTS

It is recommended that impacts to the identified Military feature (tank ramp) be avoided. However, if this is not possible, AHBNB will be contacted regarding possible mitigation measures. Mitigation measures previously presented in Table 4.2 should ensure that neither this identified feature, nor any unexpected discoveries during construction will be negatively affected by Project construction activities.

4.8.3 MITIGATION

As presented in Table 4.2, the following mitigation measures are recommended for the Project:

- Identify location of cultural/archaeological feature (tank ramp) in the field (45.824700°N, 66.424346°W, DD, WGS84) prior to Project design, to avoid negative impact of this feature during construction.
- The on-site construction crew be made aware that there is potential for archaeological resources within the Project Area.
- Project archaeological resources protocols be in place and adhered to during construction activities, should possible archaeological resources, Military resources, or human remains be discovered.

4.8.4 RESIDUAL EFFECTS AND DETERMINATION OF SIGNIFICANCE

No residual effects are anticipated should recommended mitigation measures be implemented.

4.9 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

Potential effects of the environment on the condition and function of the Project could result from severe weather.

4.9.1 SEVERE WEATHER

The main concern during construction relates to severe precipitation events and the potential for soil erosion and the release of a large quantity of runoff with elevated TSS to receiving watercourses, and subsequent adverse effects on fish and fish habitat. Proper installation, monitoring and maintenance of ESC measures to avoid adverse effects is therefore essential.

Extreme cold temperatures, as well as freezing rain, hail, ice and snow, are also a concern since they could delay construction activities and require additional mitigation measures. Prolonged dry and warm weather is unlikely to impact the construction schedule but could cause increased dust emissions and could require intensified dust management.

Severe weather may impact the Project during the operation phase. Ice and snow cover may affect efficiency of the infrastructure, and hail or high winds may cause damage to the panels.

4.9.2 CLIMATE CHANGE

The United Nations Framework Convention on Climate Change (UNFCCC) defines climate change as “a change of climate which can be attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods” (Government of Canada, 2010). Emissions of GHGs (including CO2, methane (CH4), nitrous oxide (N2O), ozone (O3), sulphur hexafluoride (SF6), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), and chlorofluorocarbons (CFCs)) released into the atmosphere primarily through anthropogenic activities such as the burning of fossil fuels are contributing to global climate change (Government of Canada, 2010).

The Intergovernmental Panel on Climate Change (IPCC) is an international organization of the world’s leading climate scientists and is affiliated with the United Nations. According to the IPCC, human activities have already resulted in an overall global warming of 1.0°C and is forecasted to reach 1.5 between 2030 and 2052 should it continue to increase at the current rate (IPCC, 2018).

The increase in average temperatures is projected to be accompanied by an increase in severe weather events, and a rise in sea levels. Severe weather events include flood, drought and storms, and the rise in sea levels will increase the number and severity (height) of storm surges, the wave energy and erosion (Lemmen *et al*., 2008).

4.9.3 SIGNIFICANCE OF EFFECTS

Project design will consider the potential effects of the environment and climate change on the Project, including severe weather during construction and operation. Environmental management and mitigation measures outlined in the EA will be implemented during construction together with monitoring of the effectiveness of ESC measures. Adverse significant effects of the environment on the Project are therefore not likely to occur.

5 PROJECT COMMUNICATIONS PROGRAM

As with any EIA, Public and First Nations Engagement is required. For the Project DND has created a Project Communications Program consisting of the elements listed below. Examples of these can be found in Appendix B:

- Newspaper notice – DND will put a notice in the 5 CDSB Post Gazette advising of the Project EIA registration (see attached notice sample). The notice will have information about the Project, will indicate the EIA website address and provide contact information for the DND local Project contact as well as the link to the EIA documents on the GNB website.
- Letters to First Nations – DND has sent letters describing the Project to all First Nations in New Brunswick.
- Notice on the Canadian Impact Assessment Registry (CIAR) – DND as a federal entity is also required to conduct an Environmental Effects Determination and as such, has posted Project information on the CIAR.
- Communications with local municipal and provincial representatives – DND has sent Project related information by email to the local MLA, and mayor of Oromocto to inform them of the Project plans.

DND will also have a hardcopy of Project documents available for viewing at their offices at 5 CDSB as described in the newspaper notice in Appendix B.

5.1 INDIGENOUS ENGAGEMENT AND CONSULTATION

On behalf of the Department of National Defence (DND), Public Services and Procurement Canada (PSPC) extended an offer to consult on this Project to First Nations in New Brunswick on May 29, 2023, including:

- Mi'gmawe'l Tplu'taqnn Incorporated (MTI) and represented Mi'kmaq First Nations
- Elsipogtog First Nation
- Wolastoqey First Nations including the Wolastoqey Nation in New Brunswick (WNNB)
- Peskotomuhkati First Nation

In accordance with Government of Canada guidance and relevant First Nation consultation protocols, Project information and an anticipated Project schedule were shared and associated environmental studies outlined. An invitation to discuss the Project in greater detail was also provided and several First Nations expressed an interest in the assessment process. Consultation with interested First Nations is ongoing and DND is committed to continued dialogue to ensure an open, transparent, thorough, fair and reasonable assessment process that minimizes adverse impacts to the environment and avoid impacts to constitutionally protected Section 35 Indigenous rights. The NB Department of Aboriginal Affairs will rely on the outcomes of these efforts.

All comments received, whether from the general public or First Nations, will be taken into account during final Project design by the successful contractor.

6 CUMULATIVE EFFECTS

The recently enacted federal *Impact Assessment Act* (August 2019) defines cumulative effects as "changes to the environment that are caused by an action in combination with other past, present and future human actions" and that a cumulative effects assessment should:

- assess effects over a larger (i.e., "regional") area that may cross jurisdictional boundaries, including effects due to natural perturbations affecting environmental components and human actions;
- assess effects during a longer period of time into the past and future;
- consider effects on VECs that may result in interactions with other actions, and not just the effects of the single action under review;
- include other past, existing and future (reasonably foreseeable) actions; and
- evaluate significance in consideration of other than just local, direct effects.

To-date, the IAAC has adopted the existing reference guide entitled "Practitioner's Guide to Federal Impact Assessments" from the Agency (IAAC, 2023).

6.1 BOUNDARIES

For the purpose of identifying and assessing cumulative effects, the spatial dimensions can be variable, depending on the VEC that is being assessed. For example, the cumulative effects on air quality can cover an area well beyond the footprint of the Project Area. For this assessment, interaction with other major developments within about 15 km have been considered. The temporal boundaries are extended to include past, current, and known planned or reasonably foreseeable Projects.

6.2 OTHER PROJECTS IN THE AREA

A search of the Canadian Impact Assessment Registry identified three ongoing Projects within 5 km of the Project Area. Two projects involve upgrades to Tilley Avenue and the other involves upgrades piping at a wastewater treatment plant. These projects are being conducted within the garrison of 5 CDSB, north of the Project Area. The NBDELG EIA Registry did not identify any ongoing projects in the area. One project that was not identified, but is underway, is the PPA1, a 5 MW solar farm located within the Range and Training Area (RTA) between Shirley Road and the Trans-Canada Highway (TCH).

These Projects are anticipated to have impacts to, at a minimum, air quality, acoustic environment and surface water. It is not anticipated that residual adverse effects from the proposed Project will substantially contribute to existing adverse effects from other undertakings. Other future undertakings are anticipated to implement similar mitigation measures for environmental protection as those outlined in this document. This will further reduce potential for future other undertakings in the area to contribute additional adverse effects. All Projects are short-term and limited in their scope.

7 GENDER-BASED ANALYSIS +

7.1 PURPOSE

The Government of Canada is committed to supporting the full implementation of Gender-based analysis + (GBA+) across federal departments and agencies. GBA+ helps to ensure that the development of policies, programs and legislation includes the consideration of differential impacts on diverse groups.

The purpose of this section is to provide a structured approach for the Gender Based Analysis + (GBA+).

GBA+ should begin as soon as the department has identified a need for a new or updated program or project– it should inform options to be used to support policy and funding decisions.

GBA+ considerations are incorporated throughout the submission: from Design, Delivery and Implementation through to the Results. These considerations include:

- Identify likely GBA+ impacts or risks, and explain how they influence program design;
- Set out a plan to monitor performance, from a GBA+ perspective; and,

Articulate plans for collecting disaggregated data to support ongoing GBA+ (monitoring, evaluations).

7.2 SUMMARY OF GBA+ CONSIDERATIONS

This Gagetown Green PPA Development project has identified GBA+ consideration for the impact of construction and operation of the renewable energy development across many dimensions including sex, sexual orientation, gender identity or expression, race, national and ethnic origin, indigenous origin or identity, age, socio-economic condition, place of residence and disability.

This analysis has identified three key GBA+ areas for consideration as detailed below.

Improve Inclusion of Women in Trades

- The construction tender documents could include a section to encourage the general contractor to develop and implement a meaningful Women in Trades Engagement Plan.

Enhance Indigenous Relations

- DND and PSPC have engaged and are engaged in ongoing consultation with Indigenous groups throughout the EIA process to conduct studies that are part of the baseline studies for this project.
- Continue data sharing and open communication with interested communities.
- As a continuation of this engagement, the construction tender documents could include the requirement for the general contractor to develop an Indigenous Participation Plan and subcontract with Indigenous-owned businesses where possible.

Reduce Fossil Fuel Reliance

- The overall aim of this project is to reduce fossil fuel use which in turn reduces overall energy usage for the 5CDSB contributing to a net reduction in CO2 equivalents provincially.

The implementation of this project will help the Government of Canada move closer to its target of purchasing 100% clean electricity for all federal facilities through the purchase of new renewables.

8 CONCLUSION

This EIA has been conducted for the proposed construction and operation of a solar farm at 5 CDSB in Oromocto, NB. The assessment presented in this report has considered potential effects on the environment resulting from the activities as described in Section 2.0. A description of the existing environment at the Project Area has been presented (Section 3.0) based on available information. The VECs identified by issues scoping and pathway analysis (Section 4.0) for which potential effects may be a concern include:

- Atmospheric environment;
- Surface water;
- Terrestrial habitat;
- Wetlands;
- Avifauna;
- Fish and fish habitat; and
- Species-at-Risk.

The potential for environmental effects has been discussed in Section 5.0. Significant adverse residual effects are not anticipated based on:

- available information and results of previous field studies in the Project Area presented in Section 4.0; and
- the mitigation measures outlined in this EIA.

9 FOLLOW UP

The effectiveness of mitigation measures will be monitored during construction and the anticipated electrical outputs will be monitored during operation. Should any unanticipated effects be observed during construction or operation, adaptive management strategies will be put in place.

10 SUMMARY OF RESIDUAL EFFECTS

No significant adverse residual environmental effects of the Project (after considering the application of mitigation measures) are anticipated.

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Appendix A

Environmental Reports

Maqamigew Anqotumeg

Report for Wetland Survey – CFB Gagetown Solar Plant

September 14, 2023

Prepared for: WSP E&I Canada Limited – CFB Gagetown Solar Plant

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INTRODUCTION

WSP E&I Canada Limited has enlisted the services of Maqamigew Anqotumeg Inc to conduct a number of baseline biophysical assessments on New Brunswick PID 60058690. Assessments include wetland delineations, wetland functional assessments, vegetation assessment, report to summarize the findings. The intention of the presented report is to provide preliminary findings of all biophysical assessment previously mentioned as part of the regulatory requirements for the proposed Solar Plant Environmental Impact Assessment located at CFB Gagetown, Oromocto.

Wetlands are generally characterized by the presence of saturated soils in the upper 30 cm of soil for a period of time in the growing season sufficient to develop hydrophytic soils and vegetation. Wetland types can vary from a closed peat bog to an open water body dominated by submergent vegetation. By providing natural flood control, points of recharge and discharge of groundwater, acting as filters, and by trapping silt, wetlands play an important role in the hydrological cycle and generally enhance the water regime. Since they provide habitat for a wide variety of plants and animals, they may be highly productive and often exceed adjacent uplands in their productivity, biodiversity, and much higher incidence of rare species and species at risk. In the past, wetlands have been viewed mainly in terms of development, such as agricultural land or peat resources. However, their ecological value is now more clearly understood. Ecological wetland values may include sustenance for waterfowl; sources of fish production; storage and slow release of water; erosion protection; and areas of aesthetic or recreational enjoyment.

With increasing competition for land, particularly in urban areas, wetlands have continued to be impacted through diking, filling, drainage, flooding, and other forms of conversion. Such use has caused the number and extent of wetlands to decrease substantially (Bond, et al., 1992). This is particularly true of coastal wetlands where historical losses in the Maritimes may be as high as 80% (Hanson & Calkins, 1996).

Both collectively and as individual units, wetland resources serve a variety of important ecological and socioeconomic functions. Wetlands function in the maintenance of surface and groundwater resources and quality, as well as in the provision of wildlife habitat. The value of wetlands to society and their ecological value are derived from their biological productivity, biodiversity, and functional role in processing surface and groundwater.

The Study Area (SA) is in the traditional Wolastoqey Nation territory, the town of Oromocto New Brunswick, Canada. Trans-Canada Highway 2 is approximately 400 m west, and Shirley Road runs parallel to the SA. A proposed Solar Plant is to be built within the approximate 44.03 hectares of SA boundaries.

METHODOLOGY

Wetland surveys were conducted on Monday June 26 to Friday June 30 2023, with the exception of Wednesday June 28, 2023. Vegetation surveys were conducted Wednesday July 12 and Thursday July 13, 2023. Wetland and vegetation assessment visits were conducted by Lyle Vicaire of Maqamigew Anqotumeg. Dakota Tomah of Wolastoqey Nation Network of New Brunswick (WNNB) had accompanied the wetland survey on Tuesday June 27, 2023. Lyle Vicaire is an experienced field biologists and a very well-trained wetland delineator. During the week of June 26, 2023, four wetlands (WL1, WL2, WL3, and WL4) were delineated. A total of 2.61 hectares (ha) was identified and delineated within the Study Area boundaries. Table 1 describes the size, location, and type of each wetland.

Table 1 – Identified wetlands, size, location, and type for Skinners Pond Wind Energy Center.

Wetland	Size (Ha)	Location	Type
WL1	1.28	-66.419828, 45.526851	Throughflow Forested Stream Swamp
WL2	0.11	-66.421783, 45.825964	Forested Basin Swamp
WL3	0.96	-66.421188, 45.823927	Forested Basin Swamp
WL4	0.26	-66.4297250, 45.8223470	Forested Basin Swamp

The wetland delineation was conducted using the methodology developed by the US Army Corps of Engineers Wetland Delineation Manual (Environmental Laboratory 1987), and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region, (U.S Army Corps of Engineers, 2012). This protocol has been adopted by Canadian regulators and practitioners. The wetland determination and boundary delineation is based on of the use of three parameters that must all be present for a wetland determination: wetland (hydrophytic) vegetation, hydric soil, and evidence of wetland hydrology. At representative locations along the boundary, paired sampling points are placed (one within the wetland, and one in the adjacent upland) where the three parameters are measured and recorded on data forms. The wetland boundary was recorded in the field using a Google Pixel 5 connected to a Garmin GLO 2, utilizing QField (version 2.8.5), with an accuracy of 2.8 – 3.89 m). Figure 1 is attached.

Wetland Functional Assessments were completed for each wetland using the Wetland Ecosystem Services Protocol-Atlantic Canada (WESP-AC) wetland evaluation technique. The WESP process involves the completion of three forms: a desktop review portion that examines the landscape level arial conditions within which the wetland is situated, and two field forms. The process serves as a rapid method for assessing individual wetland functions and benefits. Table 2 provides their definitions and potential benefits. In non—tidal wetlands, the specific wetlands functions are individually allocated and also grouped into wetland functions, then measured for “Function” and “Benefits” scores. Wetland function relates to what a wetland does naturally through physical, chemical, and/or biological processes (i.e., water

purification). Wetland benefits relate to the importance of the functions, whether it be ecological, social, or economic importance.

In addition to the grouped wetland functions described, WESP also measures the following groups; however, these are only evaluated by their benefit scores:

- Wetland Condition; and
- Wetland Risk

The following individual functions are assessed to determine the benefit scores with these groups:

- Public use & Recognition
- Wetland Sensitivity
- Wetland Ecological Conditions; and
- Wetland Stressors

For each wetland evaluated, the WESP process calculates the overall score for the seven grouped wetland functions and the 17 specific wetlands functions for non-tidal wetland, the tidal wetland WESP process calculates the overall score for the 9 individual wetland functions. One score each is provided for function and benefit. Scores are ranked as 'Lower', 'Moderate', or 'Higher', allowing for analysis of the wetland. A 'Higher' WESP score means that wetland has a greater capacity to support those processes as compared to other wetlands in the province. A "Higher' WESP score in both the function and benefits category means the wetland supports the natural ecosystem functions and provides services potentially important to society. For example, a 'Higher' function and benefit score in the specific wetland function 'Water Cooling' means the wetland is very effective in maintaining or reducing the temperature of downslope waters.

To improve the analysis for the Functional Assessments, this report illustrates the five Summary Ratings for grouped Functions as follows:

- Hydrologic Group (Water Storage & Delay)
- Water Quality Support Group (Sediment Retention, Phosphorus Retention, Nitrate Removal & Retention, and Carbon Sequestration).
- Aquatic Support Group (Stream Flow Support, Aquatic Invertebrate Habitat, Organic Nutrient Export, and Water Cooling)
- Aquatic Habitat Group (Anadromous Fish Habitat, Resident Fish Habitat, Amphibian & Turtle Habitat, Waterbird Feeding Habitat, and Waterbird nesting Habitat)
- Transition Habitat (Songbird, Raptor, & Mammal Habitat, Native Plant Habitat, and Pollinator Habitat).

Table 2 – Non-tidal wetland functions and other attributes (WESP-AC, 2018)

Function	Definition	Potential Benefits
HYDROLOGICAL FUNCTIONS:		
Water Storage & Delay (WS)	The effectiveness for storing runoff or delaying the downslope movement of surface water for long or short periods	Flood control, maintain ecological systems
Stream Flow Support (SFS)	The effectiveness for contributing water to streams, especially during the driest part of a growing season	Support fish and other aquatic life
WATER QUALITY MAINTENANCE FUNCTIONS:		
Water Cooling	The effectiveness for maintaining or reducing temperatures of downslope waters	Support cold water fish and other aquatic life
Sediment Retention & Stabilization	The effectiveness for intercepting the filtering suspended inorganic sediments thus allowing their deposition, as well as reducing energy of waves and currents, resisting excessive erosion, and stabilizing underlying sediments or soil	Maintain quality of receiving waters. Protect shoreline structures from erosion
Phosphorus Retention	The effectiveness for retaining phosphorus for long periods (>1 growing season)	Maintain quality of receiving waters
Nitrate Removal & Retention	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)	Maintain quality of receiving waters
Organic Nutrient Export	The effectiveness for producing and subsequently exporting organic nutrients (mainly carbon), either particulate or dissolved	Support food chains in receiving waters
ECOLOGICAL (HABITAT) FUNCTIONS:		
Fish Habitat	The capacity to support an abundance and diversity of native fish (both anadromous and resident species)	Support recreational and ecological values
Aquatic Invertebrate Habitat	The capacity to support or contribute to an abundance or diversity of invertebrate animals which spend all or part of their life cycle underwater or in most soil. Includes dragonflies, midges, clams, snails, water beetles, shrimps, aquatic worms, and others	Support salmon and other aquatic life. Maintain regional biodiversity

	Definition	Potential Benefits
Amphibian & Reptile Habitat	The capacity to support or contribute to an abundance or diversity of native frogs, toads, salamanders, and turtles	Maintain regional biodiversity
Waterbird Feeding Habitat	The capacity to support or contribute to an abundance or diversity of waterbirds that migrate or winter but do not breed in the region	Support hunting and ecological values. Maintain regional biodiversity
Waterbird Nesting Habitat	The capacity to support or contribute to an abundance or diversity of waterbirds that nest in the region	Maintain regional biodiversity
Songbird, Raptor, & Mammal Habitat	The capacity to support or contribute to an abundance or diversity of native songbird, raptor, and mammal species and functional groups, especially those that are most dependent on tidal wetlands or water	Maintain regional biodiversity and food webs
Native Plant Habitat, Pollinator Habitat	The capacity to support or contribute to a diversity of native, hydrophytic, vascular plant species, communities, and/or functional groups, as well as the pollinating insects linked to them	Maintain regional biodiversity and food chains
Public Use & Recognition	Prior designation of the wetland, by a natural resource or environmental agency, as some type of special protected area. Also, the potential and actual use of a wetland for low-intensity outdoor recreation, sustainable consumptive uses, education, or research	Commercial and social benefits of recreation. Protection of prior public investments

RESULTS

A total of four wetlands were delineated in the field covering a total area of 2.61 ha. The wetlands delineated were all of non-tidal types as seen in Table 1. All wetlands identified presented evidence of past disturbances from previous anthropogenic, or beaver activity. The WESP-AC assessment scores for these wetlands generally showed a moderate amount of high grouped wetland functionality. The wetland shapes are shown on Figure 1 overlain on Google Earth Imagery. WESP-AC in Appendix B, vegetation list in Appendix C and delineation forms in Appendix A.

VEGETATION

Two distinctive floral habitats were observed during the surveys. The eastern section (Figure 1) of the SA showed the most past disturbances and is mostly secondary succession vegetation dominated by Birch (Betulla spp...) and Willow (Salix spp...) with a mostly colonized understorey. Wetlands one, two and three are present within the eastern floral habitat. The western section (Figure 1) of the SA provides signs of old growth of red pine (Pinus resinosa), eastern hemlock (Tsuga canadensis), and eastern white cedar (Thuja occidentalis) with an almost bare understorey. Primary succession with a medium to thick understorey is also common within the western section of the SA. Wetland four is present within the western section. No Species At Risk (SAR) were observed during the vegetation surveys; however, purple loosestrife (Lythrum salicara) was found in WL1 and along the edge at the northern boundary of the SA (Figure 1). Purple loosestrife is a highly invasive species. Floral habitat boundaries had been roughly delineated. All floral species found are listed below in Appendix C

WETLANDS

Wetland 1

Wetland 1 (WL1 Figure 1) on PID 60058690 is a Throughflow Forested Seepage Swamp dominated by a robust herbaceous layer. The area mapped is approximately 1.28 hectares. Mapped watercourse is confirmed. One paired sampling site was recorded. The wetland was determined to have normal site conditions/hydrology within it. Upland areas surrounding the wetland are regenerative forests and gravel/dirt roads.

In the wetland, a small, forested layer of white pine (Pinus strobus) occupies the outer boundaries. A shrub layer contains a large amount of grey alder (Alnus incana) and a scattered population of paper birch (Betula papyrifera). The wetland contains an extensive herbaceous layer dominated largely by broom sedge (Carex scoparia), fair amounts of fowl-mana grass (Glyceria striata), common marsh bedstraw (Galium palustre), three-seeded sedge (Carex trisperma), and creeping buttercup (Ranunculus repens). Included were lesser populations of common pale st john's wort (Hypericum ellipticum), old field cinquefoil (Potentilla simplex), soft rush (Juncus effusus), and a scattered population of white meadowsweet (Spiraea alba). The topography is varied

Prevalence Index (PI) was observed to be 2.31. A Depleted Matrix (5YR/4/2 80%) with redox features (5YR/4/6 20%) at 0 – 30 cm was observed within the soils.

The immediately adjacent upland is a mix of regenerative forest and gravel/dirt roads. The forest layer consists of a moderate population of white pine, with lesser populations of paper birch and pear-leaved crabapple (Malus prunifolia). A large population of speckled alder (Alnus incana) and lesser amounts of paper birch saplings comprise the shrub layer. The herbaceous layer has a modest amount of red raspberry (Rubus idaeus) and dwarf raspberry (Rubus pubescens), and lesser amounts of smooth blackberry (Rubus canadensis). A relatively flat upland surrounds WL1, with a slow declined slope on the northern boundary and an abrupt ditch on the southern boundary. The PI was observed to be 3.64. The soil is a well-drained sandy loam.

The wetland boundary was established utilizing changes in vegetation and topography, while noting changes in hydrology.

One mapped watercourse was observed draining into Lindsay Brook at the northwestern boundaries. An unmapped watercourse (Figure 1) drains into WL1 at the northeastern boundaries. The wetland also receives intermittent surface runoff and possible groundwater input from the upgradient forest. No SAR species were observed in the wetland or adjacent forest at the time of survey.

The Wetland Functional Assessment revealed that WL1 has higher functional grouped values in aquatic habitat, and water quality support.

Higher grouped function for aquatic habitat, is likely due to the large pond with dynamic water levels that persistently keeps WL1 inundated, including the extensive herbaceous cover and upland vegetation surrounding the wetland. These parameters provide high support for aquatic invertebrates throughout their lifecycle, amphibians/turtles, and resident fish when present. Open water also provides high support of feeding habitat for waterbirds. A fishless water body will provide high nesting habitat for waterbirds. Surrounding upland vegetation provide support for amphibians. The lack of fish populations also provides support for amphibian habitat. Extensive microtopography indicates higher capacity to support a diverse population of invertebrates, and adult amphibians. And finally, the lack of human activity assists WL1 in providing higher grouped functions for aquatic habitat.

There is higher grouped function aquatic support group, largely due to having a persistent movement of water through the wetland. High organic nutrient export from the watercourse and high interspersion of open water with vegetation assist in higher grouped functions for aquatic support.

Wetland 2

Wetland 2 (WL2 - Figure 1) on PID 60058690 is a small Forested Basin Swamp dominated by fowl-mana grass. The area mapped is approximately 0.11 hectares. No water courses were observed. One paired sampling site was recorded. The wetland was determined to have normal site

conditions/hydrology within it. The upland areas surrounding the wetland is a young regenerating forest.

In the wetland, the dominating herbaceous layer mainly contains a lush population of fowl-mana grass, moderate amounts of sensitive fern (Onoclea sensibilis), white meadowsweet, and canada goldenrod (Solidago canadensis). A scattered population of dwarf raspberry is also present. The forest layer includes a modest population of red maple (Acer rubrum), lesser amounts of white pine and a discrete population of paper birch. The shrub layer contains a small population of red maple saplings and discrete amounts of speckled alder. The topography is mostly flat throughout the entire wetland with the exception of rutted areas on the eastern edge of WL02. The PI was observed to be 2.55. Soils were observed to have a Depleted Matrix (5YR/4/2) with redox features (5YR/5/60-30). Including the water table at 25 cm.

The immediately adjacent upland is regenerating forests and old dirt roads. The dominant forest layer contains a rich population of white pine and lesser amounts of paper birch. A small amount of grey alder comprises the shrub layer. The topography is mostly flat surrounding the entire wetland. The PI was observed to be 3.00. The soil is a well-drained sandy loam.

The wetland boundary was established utilizing changes in vegetation and topography, while noting changes in hydrology.

No surface outflow or inflow was observed during the survey. The wetland receives intermittent surface runoff and possible groundwater input from the upgradient forest. No SAR was observed in the wetland or adjacent forest at the time of survey.

The Wetland Functional Assessment revealed that WL2 has higher functional grouped values in water quality support and hydrologic group.

Higher grouped functionality for water quality support is likely due to an absence of water outlet and dense vegetation, that support sediment retention. Upland vegetation surrounding the wetland provide support for removal of nitrate via denitrification, where upland and wetland vegetation converge. Finally, carbon sequestration is more likely to occur in WL2, which deposits more sediment and removal of carbon dioxide from the air.

Higher grouped functionality for the hydrologic group is likely due to an absence of water outlet and flat topography that retain rainwater for longer periods.

Wetland 3

Wetland 03 (WL3 – Figure 1) on PID 60058690 is a Forested Basin Swamp dominated by fowl-mana grass. The area mapped is approximately 0.96 hectares. No water courses were observed at the time of the survey. However, a pond is within the wetland. The mapped wetland is part of a larger wetland continuing outside the SA at the southern border. An abandoned bridge runs through the wetland just outside the SA at the southern section. One paired sampling site was recorded. The wetland was determined to have normal site

conditions/hydrology within it. The upland surrounding the wetland is a young regenerating forest.

In the wetland, the dominating shrub layer mainly consists of a very healthy population of fowl-mana grass and lesser amounts of common woolly bulrush (Scirpus cyperinus). A small forest canopy contains small populations of paper birch and discrete amounts of trembling aspen (Populus trembuloides). The shrub layer contains a small population of red maple saplings and scattered speckled alder. The topography is flat throughout the wetland with discrete upland slopes and an abrupt slope at the abandoned bridge. The PI was observed to be 2.29. Wetland three had presented surface water of 26 cm, which provided difficulty to attain a proper soil profile to assess hydric soils.

The immediately adjacent upland is a young regenerating forests and has an abandoned bridge running through the wetland at the southern section. The forest layer is dominated by a large population of paper birch and moderate amounts of trembling aspen. The shrub layer contains small populations of red maple saplings and mountain holly (Ilex mucronata), and scattered amounts of speckled alder and bebb's willow (Salix bebbiana). A healthy herbaceous layer is present with a healthy cover of bunchberry (Cornus canadensis) and moderate amounts of white meadowsweet and Canada goldenrod. Discrete populations of dwarf raspberry and small enchanter's nightshade (Circea alpina) are also present. The topography is a discrete slope surrounding the entire wetland. The PI was observed to be 3.31. The soil is a well-drained sandy loam.

The wetland boundary was established utilizing changes in vegetation and topography, while noting changes in hydrology

No surface outflow was observed during the survey. Surface inflow was observed on each side of the wetland (Figure 1- blue arrow). An abandoned beaver dam and beaver lodge was observed during survey. A large portion of the wetland is flooded due to the abandoned beaver dam. The wetland receives intermittent surface runoff and groundwater input from the upgradient forest. No SAR species were observed in the wetland or adjacent forest at the time of survey.

The Wetland Functional Assessment revealed that WL3 provides higher functional grouped values in aquatic habitat, and aquatic support.

Higher grouped function for aquatic habitat, is likely due to the large pond with dynamic water levels that persistently keeps WL3 inundated, including the extensive herbaceous cover and upland vegetation surrounding the wetland. These parameters provide high support for aquatic invertebrates throughout their lifecycle, amphibians/turtles, and resident fish when present. Open water provided by the beaver dam also provides high support of feeding habitat for waterbirds. A fishless water body will provide high nesting habitat for waterbirds. Surrounding upland vegetation provide support for amphibians, including the lack of fish populations.

There is higher grouped function aquatic support group, largely due to having a persistent movement of water through the wetland, and organic nutrient export from the high interspersion of open water with vegetation.

Wetland 4

Wetland 4 (WL4 – Figure 1) on PID 60058690 is a Forested Basin Swamp dominated by marsh bedstraw. The area mapped is approximately 0.26 hectares. No water courses were observed at the time of the survey. An abandoned dirt road runs through the wetland, where the wetland has formed. One paired sampling site was recorded. The wetland was determined to have normal site conditions/hydrology within it. The upland surrounding the wetland is a mature mixed wood forest.

In the wetland, the dominating herbaceous layer is a lush population of marsh bedstraw and moderate amounts of swamp yellow loosestrife (Lysimachia terrestris), with scattered populations of broom sedge (Carex scoparia) and hidden-scaled sedge (Carex cryptolepis). The small, forested layer includes small amount of eastern white cedar (Thuja occidentalis) and discrete populations of paper birch and red maple. The shrub layer includes moderate amounts of white meadowsweet and smaller amounts of red maple saplings and speckled alder. The topography is quite flat throughout the wetland with abrupt slopes on the western boundaries. The PI was observed to be 2.34. Wetland four had presented surface water of 10 cm, which provided difficulty to attain a proper soil profile to assess hydric soils.

The immediately adjacent upland is a mature mixed wood forest, and an abandoned dirt road. The dominating forest canopy has moderate populations of eastern hemlock (Tsuga canadensis) and smaller populations of paper birch, red maple, eastern white cedar, and balsam fir (Abies balsamea). Small populations of balsam fir, eastern hemlock, and red maple saplings comprise the shrub layer. The herbaceous layer contains small populations of wild sarsaparilla (Aralia nudicaulis), and wild-lily-of-the-valley (Maianthemum canadense), with scattered populations of large false-solomon's seal (Maianthemum racemosum), bracken fern (Pteridium aquilinum), evergreen wood fern (Dryopteris intermedia), and northern starflower (Lysimachia borealis). The topography in the forested upland is mostly flat surrounding the wetland with an abrupt slope on the western boundary. The PI was observed to be 3.34. The soil is a well-drained sandy loam.

The wetland boundary was established utilizing changes in vegetation and topography, while noting changes in hydrology.

No surface outflow or inflow was observed during the survey. The wetland receives intermittent surface runoff and possible groundwater input from the upgradient forest. No SAR species were observed in the wetland or adjacent forest at the time of survey.

The Wetland Functional Assessment revealed that WL4 provides higher functional grouped values in the water quality support, hydrologic groups, and aquatic habitat group, in descending order.

Higher grouped functionality for water quality support is likely due to an absence of water outlet, relatively flat microtopography, and dense vegetation, that support sediment retention. Upland vegetation surrounding the wetland provide support for removal of nitrate via denitrification, where upland and wetland vegetation converge.

Higher grouped functionality for aquatic habitat is likely due to the pond that persistently keeps WL4 inundated and upland vegetation surrounding the wetland. These parameters provide high support for aquatic invertebrates throughout their lifecycle, amphibians/turtles, and resident fish when present. Open water also provides high support of feeding habitat for waterbirds. A fishless water body will provide high nesting habitat for waterbirds. Surrounding upland vegetation provide support for amphibians, including the lack of fish populations. And finally, the lack of human activity assists WL4 in providing higher grouped functions for aquatic habitat.

Higher grouped functionality for the hydrologic group is likely due to an absence of water outlet and relatively flat topography that retain rainwater for longer periods.

HISTORIC LAND USE

The 44 ha SA is located within CFB Gagetown, and has had no major disturbances in over 20 years. The SA had historically been a driving circuit for over 40 years, and a part of the SA had been an air strip with an air tower in the area.

CLOSURE

We appreciate the opportunity to submit this wetland delineation survey report and have endeavored to be thorough in our assessment of the Study Area for the CFB Gagetown Solar Plant. In total, 2.61 ha of wetland had been mapped with all 4 being drainage swamps and a beaver lodge in one wetland. All wetlands are in good ecological standing. The wetlands delineated in the SA are representative to the surrounding areas. Vegetation survey did not discover any SAR; however, purple loosestrife was discovered in WL1 and northern edge of SA. Should you have any questions, would like to clarify anything with this report or require any additional information, please do not hesitate to contact the undersigned.

Regards,

Maqamigew Anqotumeg Inc.

Lyle Vicaire, Terrestrial Biologist, BSc

CEO/President, Maqamigew Anqotumeg Inc.

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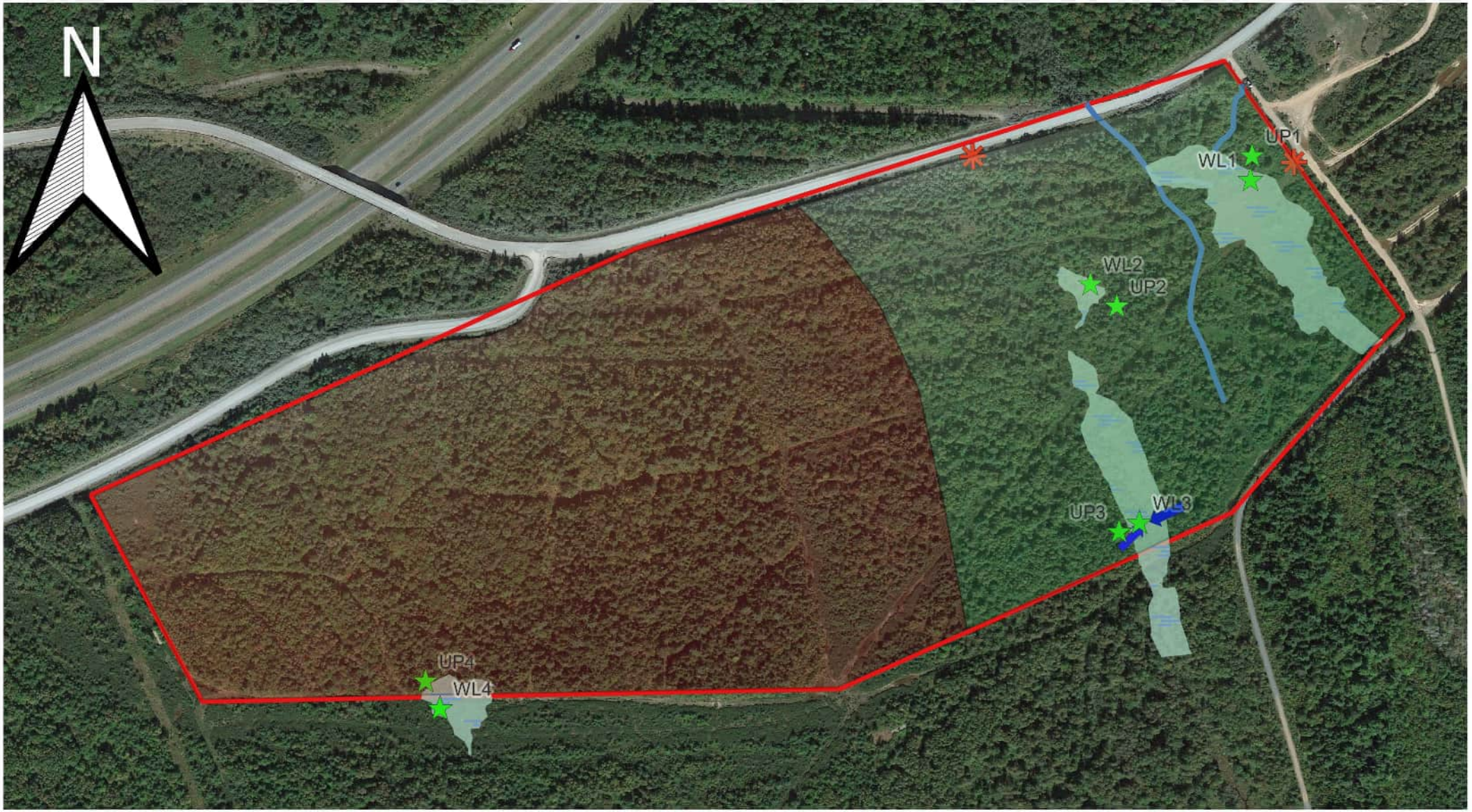
LIST OF FIGURES



Study_Area

Floral Habitat

- East
- West
- VegPlots
- Wetland
- Purple Loosestrife
- Watercourse

Maqamigew Anqotumeg

wsp

0 100 200 300 400 500 m

CANADIAN ARMED FORCES BASE GAGETOWN SOLAR PLANT

OROMOCTO, NEW BRUNSWICK

Prepared by: Lyle Vicaire

September 14, 2023

Figure 1 Scale 1:5000

Datum: New Brunswick Stereographic

LIST OF PHOTOS

WL1 Photo 1 – Displaying typical tree and shrub vegetation of WL1

WL1 Photo 2 – Displaying typical tree and shrub vegetation of WL1

WL1 Photo 3 – Displaying typical herbaceous vegetation of WL1

WL1 Photo 4 – Displaying Depleted Matrix (5YR 4/2 80%, 5YR 4/6 20%) at 0 – 30 cm for WL1

WL1 Photo 5 – Displaying typical upland tree and shrub vegetation surrounding WL1

WL1 Photo 6 – Displaying typical upland herbaceous vegetation surrounding WL1

WL1 Photo 7 – Displaying typical upland herbaceous vegetation surrounding WL1

WL1 Photo 8 – Displaying typical upland soils (5YR 5/4 100%) at 0 – 33cm surrounding WL1

WL2 Photo 1 – Displaying typical tree and shrub vegetation of WL2

WL2 Photo 2 – Displaying typical tree and shrub vegetation of WL2

WL2 Photo 3 – Displaying typical herbaceous vegetation of WL1

WL2 Photo 4 – Displaying Depleted Matrix (5YR 4/2 90%, 5YR 5/6 10%) at 0-30 cm for WL2

WL2 Photo 5 – Displaying typical upland tree and shrub vegetation surrounding WL2

WL2 Photo 6 – Displaying typical upland tree and shrub vegetation surrounding WL2

WL2 Photo 7 – Displaying typical upland herbaceous vegetation surrounding WL2

WL2 Photo 8 – Displaying typical upland soils (7.5YR 4/4 100%) at 0 – 25cm surrounding WL2

WL3 Photo 1 – Displaying typical tree and shrub vegetation of WL3

WL3 Photo 2 – Displaying typical tree and shrub vegetation of WL3

WL3 Photo 3 – Displaying typical herbaceous vegetation of WL3

WL3 Photo 4 – Displaying 26 cm of surface water over WL3

WL3 Photo 5 – Displaying typical upland tree and shrub vegetation surrounding WL3

WL3 Photo 6 – Displaying typical upland tree and shrub vegetation surrounding WL3

WL3 Photo 7 – Displaying typical upland herbaceous vegetation surrounding WL3

WL3 Photo 8 – Displaying oversaturated upland soils (7.5YR 4/4 100%) at 6 – 25cm surrounding WL3

WL4 Photo 1 – Displaying pond plus typical tree and shrub vegetation of WL4

WL4 Photo 2 – Displaying typical tree and shrub vegetation of WL4

WL4 Photo 3 – Displaying typical herbaceous vegetation of WL4

WL4 Photo 4 – Displaying 10 cm of surface water over WL4

WL4 Photo 5 – Displaying typical upland tree and shrub vegetation surrounding WL4

WL4 Photo 6 – Displaying typical upland tree and shrub vegetation surrounding WL4

WL4 Photo 7 – Displaying typical upland herbaceous vegetation surrounding WL4

WL4 Photo 8 – Displaying typical upland soils (5YR 5/4 100%) at 6 – 31 cm surrounding WL4

APPENDIX A – WETLAND DELINEATION FORMS

WETLAND DELINEATION DATA FORM – NEW BRUNSWICK

Project/Site: **CFB Gagetown Solar Plant** Municipality/County: **Oromocto/Sunbury** Sampling Date: June 30, 2023

Applicant/Owner: **Canadian Armed Forces** Sampling Point: **1 of 2**

Investigator(s): **Lyle Vicaire** Affiliation: **Magamigew Angotumeg** Landform (hillslope, terrace, etc.): _____

Local relief (concave, convex, none): _____ Slope (%): _____ X coord: **-66.419828** Y coord **45.826851**

Datum: WGS84 Soil Map Unit Name/Type: _____ Wetland Type: **Herbaceous Drainage Swamp**

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil **X** _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes **X** No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes **X** No _____	**Is the Sampled Area within a Wetland?** **Yes X No** _____
Hydric Soil Present? Yes **X** No _____	If yes, optional Wetland Site ID: **Wetland 01**
Wetland Hydrology Present? Yes **X** No _____	

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15m)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Pinus strobus*	05		FAC
2.			
3.			
4.			
5.			
	05 = Total Cover		
Sapling/Shrub Stratum (Plot size: 5m)			
1. *Alnus incana*	45		FACW
2. *Betula papyrifera*	05		FACU
3.			
4.			
5.			
6.			
	50 = Total Cover		
Herb Stratum (Plot size: 1m)			
1. *Spirea alba*	05		FAC
2. *Carex scoparia*	50		FAC
3. *Juncus effusus*	10		FACW
4. *Glyceria striata*	30		FACW
5. *Galium palustre*	20		FACW
6. *Carex trisperma*	25		FACW
7. *Ranunculus repens*	20		FAC
8. *Potentilla simplex*	10		UPL
9. *Hypericum ellipticum*	15		OBL
10.			
	182 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1. No woody vines			
2.			
	_____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species 15	x 1 = 15
FACW species 120	x 2 = 240
FAC species 70	x 3 = 210
FACU species 05	x 4 = 20
UPL species _____	x 5 = _____
Column Totals: 210 (A)	485 (B)

Prevalence Index = B/A = 2.31

Hydrophytic Vegetation Indicators:

X Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes X No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: **1 of 2**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (cm)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-30	5YR4/2	80	5YR4/6	20	D	M	Sandyloam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surfaces (S7)
___ Polyvalue Below Surface (S8)
___ Thin Dark Surface (S9)
___ Loamy Gleyed Matrix (F2)
X Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ Coast Prairie Redox (A16)
___ 5 c Mucky Peat or Peat (S3)
___ Iron-Manganese Masses (F12)
___ Piedmont Floodplain Soils (F19)
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (F22)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: **Water**
Depth (cm): 26

Hydric Soil Present? Yes X No ____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

X Surface Water (A1)
X High Water Table (A2)
X Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
X Water-Stained Leaves (B9)
X Aquatic Fauna (B13)
___ Marl Deposits (B15)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres on Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

___ Surface Soil Cracks (B6)
___ Drainage Patterns (B10)
___ Moss Trim Lines (B16)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Stunted or Stressed Plants (D1)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ Microtopographic Relief (D4)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ____ Depth (cm): 10
Water Table Present? Yes X No ____ Depth (cm): 26
Saturation Present? (includes capillary fringe) Yes ____ No ____ Depth (cm): ____

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DELINEATION DATA FORM – NEW BRUNSWICK

Project/Site: **CFB Gagetown Solar Plant** Municipality/County: **Oromocto/Sunbury** Sampling Date: June 30, 2023

Applicant/Owner: **Canadian Armed Forces** Sampling Point: **2 of 2**

Investigator(s): **Lyle Vicaire** Affiliation: **Magamigew Angotumeg** Landform (hillslope, terrace, etc.): _____

Local relief (concave, convex, none): _____ Slope (%): _____ X coord: **-66.419808** Y coord **45.827058**

Datum: WGS84 Soil Map Unit Name/Type: _____ Wetland Type: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil **X**, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes **X** No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes _____ No **X**	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** **X**
Hydric Soil Present? Yes _____ No **X**	
Wetland Hydrology Present? Yes _____ No **X**	If yes, optional Wetland Site ID: _____

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15m)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Pinus strobus*	30		FAC
2. *Betula papyrifera*	15		FACU
3. *Malus prunifolia*	10		UPL
4.			
5.			
	45 = Total Cover		
Sapling/Shrub Stratum (Plot size: 5m)			
1. *Alnus incana*	40		FACW
2. *Betula papyrifera*	05		FACU
3.			
4.			
5.			
6.			
	45 = Total Cover		
Herb Stratum (Plot size: 1m)			
1. *Rubus alumnus*	15		UPL
2. *Rubus idaeus*	35		FAC
3. *Rubus pubescens*	20		FAC
4. *Solidago canadensis*	10		FAC
5.			
6.			
7.			
8.			
9.			
10.			
	80 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1. No woody vines			
2.			
	_____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species _____	x 1 =	_____
FACW species 40	x 2 =	80
FAC species 95	x 3 =	285
FACU species 20	x 4 =	80
UPL species 25	x 5 =	100
Column Totals: 180 (A)		545 (B)

Prevalence Index = B/A = 3.03

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** _____ **No** **X**

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: **2 of 2**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (cm)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-33	5YR5/4	100					Sandyloam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surfaces (S7)
___ Polyvalue Below Surface (S8)
___ Thin Dark Surface (S9)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ Coast Prairie Redox (A16)
___ 5 c Mucky Peat or Peat (S3)
___ Iron-Manganese Masses (F12)
___ Piedmont Floodplain Soils (F19)
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (F22)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (cm): _____

Hydric Soil Present? Yes _____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9)
___ Aquatic Fauna (B13)
___ Marl Deposits (B15)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres on Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

___ Surface Soil Cracks (B6)
___ Drainage Patterns (B10)
___ Moss Trim Lines (B16)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Stunted or Stressed Plants (D1)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ Microtopographic Relief (D4)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (cm): _____

Water Table Present? Yes _____ No _____ Depth (cm): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (cm): ____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DELINEATION DATA FORM – NEW BRUNSWICK

Project/Site: **CFB Gagetown Solar Plant** Municipality/County: **Oromocto/Sunbury** Sampling Date: June 30, 2023

Applicant/Owner: **Canadian Armed Forces** Sampling Point: **1 of 2**

Investigator(s): **Lyle Vicaire** Affiliation: **Magamigew Angotumeg** Landform (hillslope, terrace, etc.): _____

Local relief (concave, convex, none): _____ Slope (%): _____ X coord: **-66.421783** Y coord **45.825964**

Datum: NAD83 Soil Map Unit Name/Type: _____ Wetland Type: **Forested Drainage Swamp**

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil **X**, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes **X** No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No _____	**Is the Sampled Area within a Wetland?** **Yes X No** _____
Hydric Soil Present? Yes X No _____	If yes, optional Wetland Site ID: Wetland 02
Wetland Hydrology Present? Yes X No _____	

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15m)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Pinus strobus*	10		FAC
2. *Acer rubrum*	20		FAC
3. *Betula papyrifera*	05		FACU
4.			
5.			
	35	= Total Cover	
Sapling/Shrub Stratum (Plot size: 5m)			
1. *Acer rubrum*	15		FAC
2. *Alnus incana*	05		FACW
3.			
4.			
5.			
6.			
	20	= Total Cover	
Herb Stratum (Plot size: 1m)			
1. *Glyceria striata*	50		FACW
2. *Spiraea alba*	20		FAC
3. *Onoclea sensibilis*	30		FACW
4. *Solidago canadensis*	20		FAC
5. *Rubus pubescens*	05		FAC
6.			
7.			
8.			
9.			
10.			
	125	= Total Cover	
Woody Vine Stratum (Plot size: _____)			
1. No woody vines			
2.			
	_____	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species 85	x 2 = 170
FAC species 90	x 3 = 270
FACU species 05	x 4 = 20
UPL species _____	x 5 = _____
Column Totals: 180 (A)	460 (B)

Prevalence Index = B/A = 2.55

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes X No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: **2 of 2**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (cm)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-30	5YR4/2	90	5YR5/6	10	D	M	Sandyloam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surfaces (S7)
___ Polyvalue Below Surface (S8)
___ Thin Dark Surface (S9)
___ Loamy Gleyed Matrix (F2)
X Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ Coast Prairie Redox (A16)
___ 5 c Mucky Peat or Peat (S3)
___ Iron-Manganese Masses (F12)
___ Piedmont Floodplain Soils (F19)
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (F22)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Water
Depth (cm): **25**

Hydric Soil Present? Yes X No ____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)
X High Water Table (A2)
X Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
X Water-Stained Leaves (B9)
___ Aquatic Fauna (B13)
___ Marl Deposits (B15)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres on Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

___ Surface Soil Cracks (B6)
___ Drainage Patterns (B10)
___ Moss Trim Lines (B16)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Stunted or Stressed Plants (D1)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ Microtopographic Relief (D4)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ____ Depth (cm): 05
Water Table Present? Yes X No ____ Depth (cm): 25
Saturation Present? (includes capillary fringe) Yes ____ No ____ Depth (cm): ____

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DELINEATION DATA FORM – NEW BRUNSWICK

Project/Site: **CFB Gagetown Solar Plant** Municipality/County: **Oromocto/Sunbury** Sampling Date: June 30, 2023

Applicant/Owner: **Canadian Armed Forces** Sampling Point: **2 of 2**

Investigator(s): **Lyle Vicaire** Affiliation: **Magamigew Angotumeg** Landform (hillslope, terrace, etc.): _____

Local relief (concave, convex, none): _____ Slope (%): _____ X coord: **-66.421460** Y coord **45.825776**

Datum: **NAD83** Soil Map Unit Name/Type: _____ Wetland Type: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil **X**, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes **X** No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes _____ No X Hydric Soil Present? Yes _____ No X Wetland Hydrology Present? Yes _____ No X	**Is the Sampled Area within a Wetland?** **Yes** _____ **No X** If yes, optional Wetland Site ID: _____

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15m)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Pinus strobus*	80		FAC
2. *Betula papyrifera*	10		FACU
3.			
4.			
5.			
	90	= Total Cover	
Sapling/Shrub Stratum (Plot size: 5m)			
1. *Alnus incana*	10		FACW
2.			
3.			
4.			
5.			
6.			
	10	= Total Cover	
Herb Stratum (Plot size: 1m)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	_____	= Total Cover	
Woody Vine Stratum (Plot size: _____)			
1. No woody vines			
2.			
	_____	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species 10	x 2 = 20
FAC species 80	x 3 = 240
FACU species 10	x 4 = 40
UPL species _____	x 5 = _____
Column Totals: 100 (A)	300 (B)

Prevalence Index = B/A = 3.00

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes X** **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: **2 of 2**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (cm)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-25	7.5YR4/4	100					Sandyloam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surfaces (S7)
- ___ Polyvalue Below Surface (S8)
- ___ Thin Dark Surface (S9)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ 5 c Mucky Peat or Peat (S3)
- ___ Iron-Manganese Masses (F12)
- ___ Piedmont Floodplain Soils (F19)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (cm): _____

Hydric Soil Present? Yes _____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (cm): _____

Water Table Present? Yes _____ No _____ Depth (cm): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (cm): ____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DELINEATION DATA FORM – NEW BRUNSWICK

Project/Site: **CFB Gagetown Solar Plant** Municipality/County: **Oromocto/Sunbury** Sampling Date: June 30, 2023

Applicant/Owner: **Canadian Armed Forces** Sampling Point: **1 of 2**

Investigator(s): **Lyle Vicaire** Affiliation: **Magamigew Angotumeg** Landform (hillslope, terrace, etc.): _____

Local relief (concave, convex, none): _____ Slope (%): _____ X coord: **-66.421188** Y coord **45.823927**

Datum: NAD83 Soil Map Unit Name/Type: _____ Wetland Type: **Forested Drainage Swamp**

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil **X**, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes **X** No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No _____	**Is the Sampled Area within a Wetland?** **Yes X No** _____
Hydric Soil Present? Yes X No _____	If yes, optional Wetland Site ID: Wetland 03
Wetland Hydrology Present? Yes X No _____	

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15m)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Betula papyrifera*	15		FACU
2. *Populus tremuloides*	05		FAC
3.			
4.			
5.			
	20 = Total Cover		
Sapling/Shrub Stratum (Plot size: 5m)			
1. *Acer rubrum*	15		FAC
2. *Alnus incana*	05		FACW
3.			
4.			
5.			
6.			
	20 = Total Cover		
Herb Stratum (Plot size: 1m)			
1. *Glyceria striata*	85		FACW
2. *Scirpus cyperinus*	10		FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	95 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1. No woody vines			
2.			
	_____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species 100	x 2 = 200
FAC species 20	x 3 = 60
FACU species 15	x 4 = 60
UPL species _____	x 5 = _____
Column Totals: 140 (A)	320 (B)

Prevalence Index = B/A = 2.29

Hydrophytic Vegetation Indicators:

X Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes X No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: **1 of 2**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (cm)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- X Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surfaces (S7)
- ___ Polyvalue Below Surface (S8)
- ___ Thin Dark Surface (S9)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ 5 c Mucky Peat or Peat (S3)
- ___ Iron-Manganese Masses (F12)
- ___ Piedmont Floodplain Soils (F19)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Water

Depth (cm): **0**

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (cm): 26

Water Table Present? Yes ___ No ___ Depth (cm): ___

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (cm): ___

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DELINEATION DATA FORM – NEW BRUNSWICK

Project/Site: **CFB Gagetown Solar Plant** Municipality/County: **Oromocto/Sunbury** Sampling Date: June 30, 2023

Applicant/Owner: **Canadian Armed Forces** Sampling Point: **2 of 2**

Investigator(s): **Lyle Vicaire** Affiliation: **Magamigew Angotumeg** Landform (hillslope, terrace, etc.): _____

Local relief (concave, convex, none): _____ Slope (%): _____ X coord: **-66.421435** Y coord **45.823851**

Datum: NAD83 Soil Map Unit Name/Type: _____ Wetland Type: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil **X** _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes **X** No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes _____ No X Hydric Soil Present? Yes _____ No X Wetland Hydrology Present? Yes _____ No X	**Is the Sampled Area within a Wetland?** **Yes** _____ **No X** If yes, optional Wetland Site ID: _____

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15m)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Betula papyrifera*	70		FACU
2. *Populus tremuloides*	20		FAC
3.			
4.			
5.			
	90	= Total Cover	
Sapling/Shrub Stratum (Plot size: 5m)			
1. *Acer rubrum*	15		FAC
2. *Alnus incana*	05		FACW
3. *Ilex mucronatus*	10		FAC
4. *Salix bebbiana*	05		FAC
5.			
6.			
	35	= Total Cover	
Herb Stratum (Plot size: 1m)			
1. *Solidago canadensis*	15		FAC
2. *Spirea alba*	20		FAC
3. *Cornus canadensis*	40		FAC
4. *Rubus pubescens*	05		FAC
5. *Circaea alpina*	05		FAC
6.			
7.			
8.			
9.			
10.			
	85	= Total Cover	
Woody Vine Stratum (Plot size: _____)			
1. No woody vines			
2.			
	_____	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species 05	x 2 = 10
FAC species 135	x 3 = 405
FACU species 70	x 4 = 280
UPL species _____	x 5 = _____
Column Totals: 210 (A)	695 (B)

Prevalence Index = B/A = 3.31

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** _____ **No X**

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: **2 of 2**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (cm)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	Organic							
6-25	7.5 YR 4/4	100					Sandyloam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surfaces (S7)
___ Polyvalue Below Surface (S8)
___ Thin Dark Surface (S9)
___ Loamy Gleyed Matrix (F2)
X Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ Coast Prairie Redox (A16)
___ 5 c Mucky Peat or Peat (S3)
___ Iron-Manganese Masses (F12)
___ Piedmont Floodplain Soils (F19)
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (F22)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock/Water
Depth (cm): **25/23**

Hydric Soil Present? Yes _____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9)
___ Aquatic Fauna (B13)
___ Marl Deposits (B15)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres on Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

___ Surface Soil Cracks (B6)
___ Drainage Patterns (B10)
___ Moss Trim Lines (B16)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Stunted or Stressed Plants (D1)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ Microtopographic Relief (D4)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (cm): _____
Water Table Present? Yes X_____ No _____ Depth (cm): 23
Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (cm): ____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DELINEATION DATA FORM – NEW BRUNSWICK

Project/Site: **CFB Gagetown Solar Plant** Municipality/County: **Oromocto/Sunbury** Sampling Date: June 30, 2023

Applicant/Owner: **Canadian Armed Forces** Sampling Point: **1 of 2**

Investigator(s): **Lyle Vicaire** Affiliation: **Magamigew Angotumeg** Landform (hillslope, terrace, etc.): _____

Local relief (concave, convex, none): _____ Slope (%): _____ X coord: **-66.4297250** Y coord **45.8223470**

Datum: WGS84 Soil Map Unit Name/Type: _____ Wetland Type: **Forested Drainage Swamp**

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil **X** _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes **X** No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No _____	**Is the Sampled Area within a Wetland?** **Yes X No** _____
Hydric Soil Present? Yes X No _____	If yes, optional Wetland Site ID: Wetland 04
Wetland Hydrology Present? Yes X No _____	

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15m)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Betula papyrifera*	05		FACU
2. *Thuja occidentalis*	10		FACW
3. *Acer rubrum*	05		FAC
4.			
5.			
	20 = Total Cover		
Sapling/Shrub Stratum (Plot size: 5m)			
1. *Spirea alba*	25		FAC
2. *Acer rubrum*	10		FAC
3. *Alnus incana*	10		FAC
4.			
5.			
6.			
	45 = Total Cover		
Herb Stratum (Plot size: 1m)			
1. *Lysimachia terrestris*	30		FACW
2. *Galium palustre*	50		FACW
3. *Glyceria striata*	30		FACW
4. *Carex scoparia*	05		FAC
5. *Carex cryptolepis*	05		OBL
6.			
7.			
8.			
9.			
10.			
	120 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1. No woody vines			
2.			
	_____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:
OBL species	05	x 1 = 05
FACW species	110	x 2 = 220
FAC species	55	x 3 = 165
FACU species	05	x 4 = 20
UPL species		x 5 =
Column Totals:	175 (A)	410 (B)

Prevalence Index = B/A = 2.34

Hydrophytic Vegetation Indicators:

X Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes X No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: **1 of 2**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (cm)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- X Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surfaces (S7)
- ___ Polyvalue Below Surface (S8)
- ___ Thin Dark Surface (S9)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ 5 c Mucky Peat or Peat (S3)
- ___ Iron-Manganese Masses (F12)
- ___ Piedmont Floodplain Soils (F19)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Water

Depth (cm): **0**

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (cm): 10

Water Table Present? Yes ___ No ___ Depth (cm): ___

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (cm): ___

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DELINEATION DATA FORM – NEW BRUNSWICK

Project/Site: **CFB Gagetown Solar Plant** Municipality/County: **Oromocto/Sunbury** Sampling Date: June 30, 2023

Applicant/Owner: **Canadian Armed Forces** Sampling Point: **2 of 2**

Investigator(s): **Lyle Vicaire** Affiliation: **Magamigew Angotumeg** Landform (hillslope, terrace, etc.): _____

Local relief (concave, convex, none): _____ Slope (%): _____ X coord: **-66.4299001** Y coord **45.8225804**

Datum: WGS84 Soil Map Unit Name/Type: _____ Wetland Type: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes **X** No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes _____ No X Hydric Soil Present? Yes _____ No X Wetland Hydrology Present? Yes _____ No X	**Is the Sampled Area within a Wetland?** **Yes** _____ **No X** If yes, optional Wetland Site ID: _____

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15m)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Betula papyrifera*	10		FACU
2. *Thuja occidentalis*	10		FACW
3. *Tsuga canadensis*	25		FACU
4. *Abies balsamea*	10		FAC
5. *Acer rubrum*	15		FAC
	70 = Total Cover		
Sapling/Shrub Stratum (Plot size: 5m)			
1. *Tsuga canadensis*	15		FACU
2. *Acer rubrum*	15		FAC
3. *Abies balsamea*	10		FAC
4.			
5.			
6.			
	40 = Total Cover		
Herb Stratum (Plot size: 1m)			
1. *Maianthemum racemosum*	05		FACU
2. *Aralia nudicaulis*	15		FAC
3. *Pteridium aquilnum*	05		FACU
4. *Dryopteris intermedia*	05		FAC
5. *Trientalis borealis*	05		FAC
6. *Maianthemum canadense*	10		FAC
7.			
8.			
9.			
10.			
	45 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1. No woody vines			
2.			
	_____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species 10	x 2 = 20
FAC species 85	x 3 = 255
FACU species 65	x 4 = 260
UPL species _____	x 5 = _____
Column Totals: 160 (A)	535 (B)

Prevalence Index = B/A = 3.34

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** _____ **No X**

Remarks: (Include photo numbers here or on a separate sheet.)

Adapted from U.S. Army Corps of Engineers form for North Central and North East Region (Version 2.0), and Field Indicators for Identifying Hydric Soils in New England (Version 4.0) Supplement for use in New Brunswick (2019)

SOIL

Sampling Point: **2 of 2**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (cm)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	Organics							
6-31	5YR5/4	100					Sandyloam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surfaces (S7)
___ Polyvalue Below Surface (S8)
___ Thin Dark Surface (S9)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ Coast Prairie Redox (A16)
___ 5 c Mucky Peat or Peat (S3)
___ Iron-Manganese Masses (F12)
___ Piedmont Floodplain Soils (F19)
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (F22)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (cm): ___

Hydric Soil Present? Yes _____ No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9)
___ Aquatic Fauna (B13)
___ Marl Deposits (B15)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres on Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

___ Surface Soil Cracks (B6)
___ Drainage Patterns (B10)
___ Moss Trim Lines (B16)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Stunted or Stressed Plants (D1)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ Microtopographic Relief (D4)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (cm): _____

Water Table Present? Yes _____ No _____ Depth (cm): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (cm): ____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

APPENDIX B – WETLAND FUNCTIONAL ASSESSMENT EXCEL SPREAD SHEETS

Cover Page: Basic Description of Assessment	WESP-AC version 2			
Site Name:	Wetland 1	Wetland 2	Wetland 3	Wetland 4
4Investigator Name:	Lyle Vicaire	Lyle Vicaire	Lyle Vicaire	Lyle Vicaire
Date of Field Assessment:	June 28, 2023	June 28, 2023	June 29, 2023	June 29, 2023
Nearest Town:	Oromocto, NB	Oromocto, NB	Oromocto, NB	Oromocto, NB
Latitude (decimal degrees):	45.826851	45.825964	45.823927	45.8223470
Longitude (decimal degrees):	-66.419828	-66.421783	-66.421188	-66.4297250
Is a map based on a formal on-site wetland delineation available?	Yes	Yes	Yes	Yes
Approximate size of the Assessment Area (AA, in hectares):	1.28	0.103	0.96	0.259
AA as percent of entire wetland (approx.). Attach sketch map if AA is smaller than the entire contiguous wetland.	100	100	100	100
What percent (approx.) of the **wetland** were you able to visit?	100	100	100	100
What percent (approx.) of the **AA** were you able to visit?	100	100	100	100
Were you able to ask the site owner/manager about any of the questions?	Yes	Yes	Yes	Yes
Indicate here if you intentionally surveyed for rare plants, calciphile plants, or rare animals:	Yes	Yes	Yes	Yes
Have you attended a WESP-AC training session? If so, indicate approximate month & year.	No	No	No	No
How many wetlands have you assessed previously using WESP-AC? (approx.)	43	44	45	46
Comments about the site or this WESP-AC assessment (attach extra page if desired):				

Form OF (Office). Non-tidal Wetland Data Form. WESP-AC version 2 for NB Wetlands

#	Indicators	Condition Choices	WL1	WL2	WL3	WL4
OF1	Province	Mark the province in which the AA is located by changing the 0 in the column next to it to a "1". Mark only one.				
		New Brunswick	1	1	1	1
		Nova Scotia	0	0	0	0
		Prince Edward Island	0	0	0	0
		Newfoundland-Labrador	0	0	0	0
OF2	Ponded Area Within 1 km.	The area of surface water ponded during most of the growing season that is both (1) in or adjacent to the AA and (2) within 1 km is:				
		<0.01 hectare (about 10 m x 10 m).	0	0	0	0
		0.01 - 0.1 hectare.	0	0	0	0
		0.1 - 1 hectare.	1	1	0	0
		1 to 10 hectares.	0	0	1	1
		10 to 100 hectares.	0	0	0	0
		>100 hectares.	0	0	0	0
OF3	Ponded Water & Wetland Within 1 km.	The area of wetlands and surface water ponded during most of the growing season that is both (1) in or adjacent to the AA and (2) within 1 km is:				
		<0.01 hectare (about 10 m x 10 m).	0	0	0	0
		0.01 - 0.1 hectare.	0	0	0	0
		0.1 - 1 hectare.	0	0	0	0
		1 to 10 hectares.	1	1	1	1
		10 to 100 hectares.	0	0	0	0
		>100 hectares.	0	0	0	0
OF4	Size of Largest Nearby Vegetated Tract or Corridor	WL1				
		<0.01 hectare (about 10 m x 10 m).	0	0	0	0
		0.01 - 0.1 hectare.	0	0	0	0
		0.1 - 1 hectare.	0	0	0	0
		1 to 10 hectares.	0	0	0	0
		10 to 100 hectares.	0	0	0	0
		100 to 1000 hectares.	0	0	0	0

		>1000 hectares. [This is nearly always the answer in relatively undeveloped landscapes.]	1	1	1	1
OF5	Distance to Large Vegetated Tract	The minimum distance from the edge of the AA to the edge of the closest vegetated land (but excluding row crops, lawn, conifer plantation) larger than 375 hectares (about 2 km on a side), is:				
		<50 m, and not separated from the 375-ha vegetated area by any width of paved roads, stretches of open water, row crops, bare ground, lawn, or impervious surface. Or the AA itself contains >375 ha of vegetation. [This is often the answer in relatively undeveloped landscapes.]	1	1	1	1
		<50 m, but completely separated from the 375-ha vegetated area by those features, and AA does not contain >375 ha of vegetation.	0	0	0	0
		50-500 m, and not separated.	0	0	0	0
		50-500 m, but separated by those features.	0	0	0	0
		0.5 - 5 km, and not separated.	0	0	0	0
		0.5 - 5 km, but separated by those features.	0	0	0	0
		None of the above (the closest patches or corridors which are that large are >5 km away).	0	0	0	0
OF6	Herbaceous Uniqueness	The AA's vegetation cover is >10% herbaceous* but uplands within 5 km have <10% herbaceous cover. If so, enter "3" and continue to OF7. If not, consider: The AA's vegetation cover is >10% herbaceous* but uplands within 1 km have <10% herbaceous cover. If so enter "2" and continue to OF7. If not, consider: The AA's vegetation cover is >10% herbaceous* but uplands within 100 m of the wetland edge have <10% herbaceous cover. If so, enter "1". [* NOTE: Exclude lawns, row crops, heavily grazed lands, forest, shrublands. Include moss as well as grasslike plants in this use of "herbaceous vegetation"]	1	1	1	1
OF7	Woody Uniqueness	The AA's vegetation cover is >10% woody* but uplands within 5 km have <10% woody cover. If so, enter "3" and continue to OF8. If not, consider: The AA's vegetation is >10% woody* but uplands within 1 km have <10% woody cover. If so enter "2" and continue to OF8. If not, consider: The AA's vegetation is >10% woody* but uplands within 100 m of the wetland edge have <10% woody cover. If so, enter "1" [* NOTE: woody cover = trees & shrubs taller than 1 m.]	0	0	0	0
OF8	Local Vegetated Cover Percentage	Draw a 5-km radius circle measured from the center of the AA. Ignoring all permanent water in the circle, the percent of the remaining area that is wooded or unmanaged herbaceous vegetation (NOT lawn, row crops, bare or heavily grazed land, clearcuts, or conifer plantations) is:				
		<5% of the land.	0	0	0	0
		5 to 20% of the land.	0	0	0	0
		20 to 60% of the land.	1	1	1	1
		60 to 90% of the land.	0	0	0	0

		>90% of the land. SKIP to OF10.	0	0	0	0
OF9	Type of Land Cover Alteration	Within the 5-km radius circle, and ignoring all permanent water, the land area that is bare or non-perennial cover is mostly:				
		Impervious surface, e.g., paved road, parking lot, building, exposed rock.	1	1	1	1
		Bare pervious surface, e.g., lawn, recent (<5 yrs ago) clearcut, dirt or gravel road, cropland, landslide, conifer plantation.	0	0	0	0
OF10	Distance by Road to Nearest Population Center	Measured along the maintained road nearest the AA, the distance to the nearest population center is:				
		<100 m.	0	0	0	0
		100 - 500 m.	0	0	0	0
		0.5- 1 km.	0	0	0	0
		1 - 5 km.	1	1	1	1
		>5 km.	0	0	0	0
OF11	Distance to Nearest Maintained Road	From the center of the AA, the distance to the nearest maintained public road (dirt or paved) is:				
		<10 m.	0	0	0	0
		10 - 25 m.	0	0	0	0
		25 - 50 m.	0	0	0	0
		50 - 100 m.	0	0	0	0
		100 - 500 m.	1	1	1	1
		>500 m.	0	0	0	0
OF12	Wildlife Access	Draw a circle of radius of 5 km from the center of the AA. If mammals and amphibians can move from the center of the AA to ALL other separate wetlands and ponds located within the circle without being forced to cross pavement (any width), lawns, bare ground, and/or marine waters, mark 1= yes can move to all, 0= no. Change to blank if there are no other wetlands within 5 km.	0	0	0	0
OF13	Distance to Ponded Water	The distance from the AA center to the closest (but separate) ponded water body visible in GoogleEarth imagery is:				
		<50 m, and not separated by any width of paved roads, stretches of open water, row crops, lawn, bare ground, or impervious surface.	0	0	0	0
		<50 m, but completely separated by those features.	0	0	0	0
		50-500 m, and not separated.	0	0	0	1
		50-500 m, but separated by those features.	1	1	1	0
		0.5 - 1 km, and not separated.	0	0	0	0
		0.5 - 1 km, but separated by those features.	0	0	0	0
		None of the above (the closest patches or corridors that large are >1 km away).	0	0	0	0
OF14	Distance to Large Ponded Water	The distance from the AA center to the closest (but separate) non-tidal body of water that is ponded during most of the year and is larger than 8 hectares during most of a normal year is:				

		<100 m.	0	0	0	0
		100 m - 1 km.	0	0	0	0
		1 -2 km.	0	0	0	0
		2-5 km.	0	0	0	0
		5-10 km.	1	1	1	1
		>10 km.	0	0	0	0
OF15	Tidal Proximity	The distance from the AA edge to the closest tidal water body (regardless of its salinity) is:				
		<100 m.	0	0	0	0
		100 m - 1 km.	0	0	0	0
		1 - 5 km.	0	0	0	0
		5-10 km.	0	0	0	0
		10-40 km.	0	0	0	0
		>40 km.	1	1	1	1
OF16	Upland Edge Contact	Select one:				
		The AA has no upland edge (or upland is <1% of perimeter). The AA is entirely surrounded by (& contiguous with) other wetlands or water.	0	0	0	0
		1-25% of the AA's perimeter abuts upland (including filled areas). The rest adjoins other wetlands or water that is mostly wider than the AA.	0	0	0	0
		25-50% of the AA's perimeter abuts upland. The rest adjoins other wetlands or water that is mostly wider than the AA.	0	0	0	0
		50-75% of the AA's perimeter abuts upland. The rest adjoins other wetlands or water that is mostly wider than the AA.	0	0	0	0
		More than 75% of the AA's perimeter abuts upland. Any remainder adjoins other wetlands or water that is mostly wider than the AA. This will be true for most assessments done with WESP-AC.	1	1	1	1
OF17	Flood Damage from Non-tidal Waters	Within 5 km downstream or downslope of the AA (select first true choice):				
		Maps show Flood Zone or Flood Risk areas and there appears to be infrastructure vulnerable to river flooding not caused by tidal storm surges.	0	0	0	0
		Maps show Flood Zone or Flood Risk areas, but infrastructure is absent or is not vulnerable to floods from a non-tidal river. In some cases levees, upriver dams, or other measures may partly limit damage or risk from smaller events.	0	0	0	0
		Maps do not show Flood Zone or Flood Risk areas (or no such mapping has been done locally) and there appears to be infrastructure vulnerable to river flooding unrelated to tidal storm surges.	0	0	0	0
		Maps do not show Flood Zone or Flood Risk areas (or no such mapping has been done locally) and there is no infrastructure vulnerable to river flooding unrelated to tidal storm surges.	1	1	1	1

OF18	Relative Elevation in Watershed	In Google Earth, enable the Terrain layer (lower left menu) and open the NB_Watersheds KMZ file that accompanies this calculator. Then determine the AA's approximate elevation (bottom right, NOT the "eye alt"). Then move cursor around to determine the watershed's maximum and minimum elevation. Divide the AA's elevation by the (max-min).	0.44	0.44	0.41	0.48
OF19	Water Quality Sensitive Watershed or Area	In Google Earth, open the KMZ file NB_Watershed Protected Area which accompanies this calculator. The AA is within such an area. Enter 1= yes, 0= no.	0	0	0	0
OF20	Degraded Water Upstream	Sampling indicates a problem with concentrations of metals, hydrocarbons, nutrients, or other substances (excluding bacteria, acidic water, high temperatures) being present at levels harmful to aquatic life or humans, and:				
		The condition is present within the AA.	0	0	0	0
		The condition is present in waters within 1 km that flow into the AA, but has not been documented in the AA itself.	0	0	0	0
		Sampling during both low water periods and times with high runoff (storms, snowmelt) indicates no problems in either the AA or inflowing waters.	0	0	0	0
		Data are insufficient (no or inadequate sampling within 1 km, or condition exists only at >1 km upstream). This is the situation for nearly all wetlands in this region.	1	1	1	1
OF21	Degraded Water Downstream	The problem described above is downslope from the AA, and:				
		The condition is present within 1 km downslope and connected to the AA by a channel.	0	0	0	0
		The condition is present within 5 km downslope and connected to the AA by a channel, or within 1 km but not connected to the AA by a channel.	0	0	0	0
		Sampling during both low water periods and times with high runoff (storms, snowmelt) indicates no problems in either the AA or inflowing waters.	0	0	0	0
		Data are insufficient (no or inadequate sampling within 1 km, or condition exists only at >1 km upstream). This is the situation for nearly all wetlands in this region.	1	1	1	1
OF22	Wetland as a % of Its Contributing Area (Catchment)	From a topographic map and field observations, estimate the approximate boundaries of the catchment (CA) of the entire wetland of which the AA may be only a part. Then adjust those boundaries if necessary based on your field observations of the surrounding terrain, and/or by using procedures described in the Manual. Divide the area of the wetland (not just the AA) by the approximate area of its catchment excluding the area of the wetland itself. When doing the calculation, if ponded water is adjacent to the wetland, include that in the wetland's area. The result is:				
		<0.01, or catchment size unknown due to stormwater pipes that collect water from an indeterminate area.	0	1	0	1
		0.01 to 0.1.	1	0	1	0
		0.1 to 1.	0	0	0	0

		>1 (wetland is larger than its catchment (e.g., wetland with flat surrounding terrain and no inlet, or is entirely isolated by dikes, or is a raised bog).	0	0	0	0
OF23	Unvegetated Surface in the Contributing Area	The proportion of the AA's contributing area (measured to no more than 1000 m upslope) that is comprised of buildings, roads, parking lots, other pavement, exposed bedrock, landslides, and other mostly-bare surface is about :				
		<10%.	0	1	1	1
		10 to 25%.	1	0	0	0
		>25%.	0	0	0	0
OF24	Transport From Upslope	A relatively large proportion of the precipitation that falls farther upslope in the CA reaches this wetland quickly as runoff (surface water), as indicated by the following: (a) input channel is present, (b) input channels have been straightened, (c) upslope wetlands have been ditched extensively, (d) land cover is mostly non-forest, (e) CA slopes are steep, and/or (f) most CA soils are shallow (bedrock near surface) and/or have high runoff coefficients. This statement is:				
		Mostly true.	0	0	0	0
		Somewhat true.	1	0	0	0
		Mostly untrue.	0	1	1	1
OF25	Aspect	The overland flow direction of most surface water (in streams, rivers, or runoff) that enters the AA is:				
		Northward (N, NE). north-facing contributing area.	0	0	0	0
		Southward (S, SW). south-facing contributing area.	1	1	1	0
		Other (E, SE, W, NW), or no detectable uphill slope or input channel (flat).	0	0	0	1
OF26	Internal Flow Distance (Path Length)	The horizontal flow distance from the wetland's inlet to outlet is:				
		<10 m.	0	0	0	0
		10 - 50 m.	0	0	0	0
		50 - 100 m.	0	0	0	0
		100 - 1000 m.	1	0	1	0
		1- 2 km.	0	0	0	0
		>2 km, or wetland lacks an inlet and outlet.	0	1	0	1
OF27	Growing Degree Days	In Google Earth, open the KMZ file that accompanies this calculator, called NB-PEI_GrowingDegreeDays. Place your cursor over the AA and left-click. From the pop-up, enter the GRIDCODE in the next column.	2202	2202	2202	2202
OF28	Fish Access or Use	According to agency biologists and/or your own observations, the AA. [Mark just the first choice that is true.]:				

		Is known to support rearing and/or spawning by Atlantic salmon or other anadromous species or eels. In NB, consult Figure A-2 in Appendix A of the Manual. Contact local fishery biologists, review the ACCDC report, and visit these websites: http://www.salmonatlas.com/atlanticsalmon/canada-east/index.1.html http://atlanticsalmonfederation.org/rivers/introduction.html	0	0	0	0
		Has not been documented to support Atlantic salmon rearing and/or spawning, but is connected to nearby waters likely to contain Atlantic salmon or other anadromous species or eels and is probably accessed by those during some conditions.	0	0	0	0
		Is probably is not accessed by any anadromous fish species but is known or likely to have other fish at least seasonally.	0	0	0	0
		Is known or likely to be fishless (e.g., too small, dry, and/or not accessible even temporarily, and not stocked).	1	1	1	1
OF29	Species of Conservation Concern	Within the past 10 years, in the AA (or in its adjoining waters or wetland), qualified observers have documented [mark all applicable]:				
		Presence of one or more of the plant species listed in the Plants_Rare worksheet of the accompanying SuppInfo file, or the AA is within a mapped Atlantic Coastal Plain Flora Buffer	0	0	0	0
		Presence of one or more of the amphibian or reptile species (AM) of conservation concern as listed in the Wildlife_Rare worksheet of the accompanying SuppInfo file.	0	0	0	0
		Presence of one or more of the waterbird species (WBF, WBN) of conservation concern as listed in the Wildlife_Rare worksheet of the accompanying SuppInfo file.	0	0	0	0
		Presence of one or more of the nesting songbird or raptor species (SBM) of conservation concern as listed in the Wildlife_Rare worksheet of the accompanying SuppInfo file, during their nesting season (May-July for most species).	0	0	0	0
		None of the above, or no data.	1	1	1	1
OF30	Important Bird Area (IBA)	In Google Earth, open the KMZ file that accompanies this calculator, called IBAs_Canada. The AA is all or part of an officially designated IBA. Enter 1= yes, 0= no.	0	0	0	0
OF31	Black Duck Nesting Area	In Google Earth, open the KMZ file that accompanies this calculator, called BlackDuck. Adjust its alignment and opacity. Determine the predicted density (pairs per 25 sq. km) of nesting American Black Duck in the AA's vicinity: <10 (enter 0), 10-20 (enter 1), 20-30 (enter 2), >30 (enter 3). If outside of region shown in map, change to blank.	0	0	0	0
OF32	Wintering Deer or Moose Concentration Areas	If AA is on private land with no information, change to blank (not 0). If on public/crown land, in Google Earth open the KMZ file that accompanies this report called NB_DeerWinteringAreas.Otherwise: Enter: yes= 1, no= 0.	0	0	0	0

OF33	Other Conservation Designation	With GeoNB, click on Candidate PNA Map Viewer to identify Provincially Significant Wetland, Environmentally Significant Area, Protected Natural Area -- but also include if the AA is all or part of an area designated by government, FIrst Nations, or the Nature Conservancy of Canada (NCC) for its exceptional ecological features or highly intact natural conditions. Enter: yes= 1, no= 0. If uncertain, consult NCC and agencies for more recent information.	0	0	0	0
OF34	Conservation Investment	The AA is part of or contiguous to a wetland on which public or private organizational funds were spent to preserve, create, restore, or enhance the wetland (excluding mitigation wetlands). Ask the property owner. Enter: yes= 1, no= 0. If no information, change to blank (not 0).	0	0	0	0
OF35	Mitigation Investment	The AA is all or part of a mitigation site used explicitly to offset impacts elsewhere. Ask the property owner. Enter: yes= 1, no= 0. If no information, change to blank.	0	0	0	0
OF36	Sustained Scientific Use	Plants, animals, or water in the AA have been monitored for >2 years, unrelated to any regulatory requirements, and data are available to the public. Or the AA is part of an area that has been designated by an agency or institution as a benchmark, reference, or status-trends monitoring area. Ask the property owner. Enter: yes= 1, no= 0. If no information, change to blank.	0	0	0	0
OF37	Calcareous Region	The AA is in an area that is at least partly underlain by soil, sediment, or bedrock that is highly calcareous (enter 3 in next column), moderately calcareous (enter 2), or slightly calcareous (enter 1), none= 0. Limestone is typically a major component (karst geology) and water is not acidic (pH is usually >8).See Figure A-6 in Appendix A of the Manual. If no map coverage, change to blank.	0	0	0	0
OF38	Ownership	Select the ONE ownership that covers the most of the AA. In Google Earth, open KMZ file called NB Crown lands.Use more recent information if available.				
		New timber harvest, roads, mineral extraction, and intensive summer recreation (e.g., off-road vehicles) are permanently prohibited. Includes many publicly-owned Protected Lands, and private lands under long-term (30+ year) legal agreements to maintain nearly-unaltered conditions.	0	0	0	0
		Ownership is public (e.g., municipal, Crown Reservations/Notations) but some or all of the above activities are allowed.	0	0	0	0
		Ownership is private but public access is allowed, and/or a shorter-term conservation easement (whether renewable or not) is in place.	0	0	0	0
		Ownership is private and owner does not allow access, or access permission unknown, and not a conservation easement.	1	1	1	1

Form F (Field). Non-tidal Wetland Data Form. WESP-AC version 2 for PEI Wetlands

#	Indicators	Condition Choices	WL1	WL2	WL3	WL4
F1	Wetland Type	Follow the key below and mark the ONE row that best describes MOST of the vegetated part of the AA:				
		A. Moss and/or lichen cover more than 25% of the ground. Often dominated by ericaceous shrubs (e.g., Labrador tea) or other acid-tolerant plants (e.g., bog cranberry, pitcher plant, sundew, orchids). Substrate is mostly undecomposed peat. Choose between A1 and A2 and mark the choice with a 1 in their adjoining column. Otherwise go to B below.				
		A1. Surface water is usually absent or, if present, pH is typically <4.5 and conductivity is usually <100 µS/cm (<64 ppm TDS). Trees are absent or nearly so. Sedge cover usually sparse or absent but cottongrass and/or lichen cover may be extensive, as well as cloudberry, lingonberry, sheep laurel, and a sedge (Carex rariflora). Wetland surface and surrounding landscape are seldom sloping and wetland often is domed (convex). Inlet and outlet channels are usually absent. If known, pH of peat is <4.0.	0	0	0	0
		A2. Not A1. Surface water, if present, has pH typically >4.5 and conductivity is usually >100 µS/cm (>64 ppm TDS). Sedge cover is usually extensive, and/or tree and tall shrub cover is extensive. Sometimes at toe of slope or edge of water body. An exit channel is usually present. Wetter than A1 and peat depth may be shallower (<2 m).	0	0	0	0
		B. Moss and/or lichen cover less than 25% of the ground. Soil is mineral or decomposed organic (muck). Choose between B1 and B2 and mark the choice with a 1 in their adjoining column:				
		B1. Trees and shrubs taller than 1 m comprise more than 25% of the vegetated cover. Surface water is mostly absent or inundates the vegetation only seasonally (e.g., vernal pools or floodplain).	0	1	0	1
		B2. Not B1. Tree & tall shrubs comprise less than than 25% of the vegetated cover. Vegetation is mostly herbaceous, e.g., cattail, bulrush, burreed, pond lily, horsetail. Surface water may be extensive and fluctuates seasonally, being either persistent or drying up partly or entirely.	1	0	1	0
Reminder: For all questions, the AA should include all persistent waters in ponds smaller than 8 hectares (~283 m on a side) that are adjacent to the AA. The AA should also include part of the water area of adjacent ponded water larger than 8 ha and adjacent rivers wider than 20 m. Specifically, the AA should include the open water part adjacent to wetland vegetation and equal in width to the average width of that vegetated zone. Throughout this data form, "adjacent" is used synonymously with abutting, adjoining,						

bordering, contiguous -- and means no upland (manmade or natural) completely separates the described features along their directly shared edge. Features joined only by a channel are not necessarily considered to be adjacent -- a large portion of their edges must match. The features do not have to be hydrologically connected in order to be considered adjacent.						
F2	Wetland Types - Adjoining or Subordinate	If the AA is smaller than 1 ha, mark all other types that occupy more than 1% of the vegetated AA. If the AA is larger than 1 ha, mark all other types which are within or adjacent to the AA and occupy more than 1 ha, as visible from the AA or as interpreted from aerial imagery. Do not mark again the type marked in F1.				
		A1.	0	0	0	0
		A2.	0	0	0	0
		B1.	0	0	0	0
		B2.	0	0	0	0
F3	Woody Height & Form Diversity	Following EACH row below, indicate with a number code the percentage of the living vegetation in the AA which is occupied by that feature (6 if >95%, 5 if 75-95%, 4 if 50-75%, 3 if 25-50%, 2 if 5-25%, 1 if <5%, 0 if none). If the vegetated part of the AA is largely herbaceous (non-woody) vegetation, these percentages should not sum to 100%.				
		coniferous trees (may include tamarack) taller than 3 m.	2	2	2	2
		deciduous trees taller than 3 m.	0	3	2	2
		coniferous or ericaceous shrubs or trees 1-3 m tall not directly below the canopy of trees.	1	1	1	1
		deciduous shrubs or trees 1-3 m tall not directly below the canopy of trees.	3	2	2	1
		coniferous or ericaceous shrubs <1 m tall not directly below the canopy of taller vegetation.	1	1	1	1
		deciduous shrubs or trees <1 m tall (e.g., deciduous seedlings) not directly below the canopy of taller vegetation.	2	1	1	1
Note: If none of top 4 rows in F3 was marked 2 or greater,SKIP to F9 (N fixers).						
F4	Dominance of Most Abundant Shrub Species	Determine which two woody plant species comprise the greatest portion of the low (<3 m) woody cover . Then choose one:				
		those species together comprise > 50% of such cover.	1	1	0	1
		those species together do not comprise > 50% of such cover.	0	0	1	0
F5	Woody Diameter Classes	Mark ALL the types that comprise >5% of the woody canopy cover in the AA or >5% of the wooded areas (if any) along its upland edge (perimeter). The edge should include only the trees whose canopies extend into the AA.				
		coniferous, 1-9 cm diameter and >1 m tall.	1	1	1	1
		broad-leaved deciduous 1-9 cm diameter and >1 m tall.	1	1	1	1

		coniferous, 10-19 cm diameter.	1	1	1	1
		broad-leaved deciduous 10-19 cm diameter.	1	1	1	1
		coniferous, 20-40 cm diameter.	1	1	0	0
		broad-leaved deciduous 20-40 cm diameter.	0	1	0	0
		coniferous, >40 cm diameter.	0	0	0	0
		broad-leaved deciduous >40 cm diameter.	0	0	0	0
F6	Height Class Interspersion	Follow the key below and mark the ONE row that best describes MOST of the AA:				
		A. Neither the vegetation taller than 1 m nor the vegetation shorter than that comprise >70% of the vegetated part of the AA. They each comprise 30-70%. Choose between A1 and A2 and mark the choice with a 1 in the adjoining column. Otherwise go to B below.				
		A1. The two height classes are mostly scattered and intermixed throughout the AA.	0	0	0	0
		A2. Not A1. The two height classes are mostly in separate zones or bands, or in proportionately large clumps.	0	0	0	0
		B. Either the vegetation shorter than 1 m comprises >70% of the vegetated part of the AA, or the vegetation taller than that does. One size class might even be totally absent. Choose between B1 and B2 and mark the choice with a 1 in the adjoining column:				
		B1. The less prevalent height class is mostly scattered and intermixed within the prevalent one.	0	1	1	0
		B2. Not B1. The less prevalent height class is mostly located apart from the prevalent one, in separate zones or clumps, or is completely absent.	1	0	0	1
F7	Large Snags (Dead Standing Trees)	The number of large snags (diameter >20 cm) in the AA plus adjacent upland area within 10 m of the wetland edge is:				
		None, or fewer than 8/ hectare which exceed this diameter.	0	1	1	1
		Several (>8/hectare) and a pond, lake, or slow-flowing water wider than 10 m is within 1 km.	1	0	0	0
		Several (>8/hectare) but above not true.	0	0	0	0
F8	Downed Wood	The number of downed wood pieces longer than 2 m and with diameter >10 cm, and not persistently submerged, is:				
		Few or none that meet these criteria.	0	1	0	0
		Several (>5 if AA is >5 hectares, less for smaller AAs) meet these criteria.	1	0	1	1
F9	N Fixers	The percentage of the AA's vegetated cover that contains nitrogen-fixing plants (e.g., alder, sweetgale, clover, lupine, alfalfa, other legumes) is:				
		<1% or none.	0	0	0	0
		1-25% of the vegetated cover, in the AA or along its water edge (whichever has more).	0	1	1	1

		25-50% of the vegetated cover, in the AA or along its water edge (whichever has more).	1	0	0	0
		50-75% of the vegetated cover, in the AA or along its water edge (whichever has more).	0	0	0	0
		>75% of the vegetated cover, in the AA or along its water edge (whichever has more).	0	0	0	0
F10	Sphagnum Moss Extent	The cover of Sphagnum moss (or any moss that forms a dense cushion many centimeters thick), including the moss obscured by taller sedges and other plants rooted in it, is:				
		<5% of the vegetated part of the AA.	1	1	1	1
		5-25% of the vegetated part of the AA.	0	0	0	0
		25-50% of the vegetated part of the AA.	0	0	0	0
		50-95% of the vegetated part of the AA.	0	0	0	0
		>95% of the vegetated part of the AA.	0	0	0	0
F11	% Bare Ground & Thatch	Consider the parts of the AA that lack surface water at the driest time of the growing season. Viewed from directly above the ground layer, the predominant condition in those areas at that time is:				
		Little or no (<5%) bare ground is visible between erect stems or under canopy anywhere in the vegetated AA. Ground is extensively blanketed by dense thatch, moss, lichens, graminoids with great stem densities, or plants with ground-hugging foliage.	0	1	1	1
		Slightly bare ground (5-20% bare between plants) is visible in places, but those areas comprise less than 5% of the unflooded parts of the AA.	1	0	0	0
		Much bare ground (20-50% bare between plants) is visible in places, and those areas comprise more than 5% of the unflooded parts of the AA.	0	0	0	0
		Other conditions.	0	0	0	0
		Not applicable. Surface water (either open or obscured by emergent plants) covers all of the AA all the time.	0	0	0	0
F12	Ground Irregularity	Imagine the AA without any living vegetation. Excluding the portion of the AA that is always under water, the number of hummocks, small pits, raised mounds, animal burrows, ruts, gullies, natural levees, microdepressions, and other areas of peat or mineral soil that are raised or depressed >10 cm compared to most of the area within a few meters surrounding them is:				
		Few or none (minimal microtopography; <1% of the land has such features, or entire AA is always water-covered).	0	0	0	0
		Intermediate.	0	1	1	1
		Several (extensive micro-topography).	1	0	0	0
F13	Upland Inclusions	Within the AA, inclusions of upland are:				
		Few or none.	0	1	0	0

		Intermediate (1 - 10% of vegetated part of the AA).	1	0	1	1
		Many (e.g., wetland-upland "mosaic", >10% of the vegetated AA).	0	0	0	0
F14	Soil Texture	In parts of the AA that lack persistent water, the texture of soil in the uppermost layer is mostly: [To determine this, use a trowel to check in at least 3 widely spaced locations, and use the soil texture key (in Appendix A of the Manual).]				
		Loamy: soils that may contain a little fine grit and do not make a "ribbon" longer than 2 cm when moistened, rolled, squeezed, and extended between thumb and forefinger.	0	0	0	0
		Fines: includes silt, clay, silt, soils that make a ribbon longer than 2 cm when moistened, rolled, squeezed, and extended between thumb and forefinger.	0	0	0	0
		Deep Peat, to 40 cm depth or greater.	0	0	1	0
		Shallow Peat or organic <40 cm deep.	0	0	0	1
		Coarse: includes sand, loamy sand, gravel, cobble, soils that do not make a ribbon when moistened, rolled, squeezed, and extended between thumb and forefinger.	1	1	0	0
F15	Shorebird Feeding Habitats	During any 2 consecutive weeks of the growing season, the extent of mudflats, bare unshaded saturated areas not covered by thatch, and unshaded waters shallower than 6 cm is: [Include also any area that is adjacent to the AA.]				
		None, or <100 sq. m.	1	1	1	1
		100-1000 sq. m.	0	0	0	0
		1000 – 10,000 sq. m.	0	0	0	0
		>10,000 sq. m.	0	0	0	0
F16	Herbaceous % of Vegetated Wetland	In aerial ("ducks eye") view, the maximum annual cover of herbaceous vegetation (all non-woody plants except moss) is:				
		<5% of the vegetated part of the AA or <0.01 hectare (whichever is less). Mark "1" here and SKIP to F20 (Invasive Plant Cover).	0	0	0	0
		5-25% of the vegetated part of the AA.	0	1	0	0
		25-50% of the vegetated part of the AA.	0	0	0	0
		50-95% of the vegetated part of the AA.	1	0	1	1
		>95% of the vegetated part of the AA.	0	0	0	0
F17	Forb Cover	Within parts of the AA having herbaceous cover (excluding SAV), the areal cover of forbs reaches an annual maximum of:				
		<5% of the herbaceous part of the AA.	0	0	0	0
		5-25% of the herbaceous part of the AA.	0	1	1	1
		25-50% of the herbaceous part of the AA.	1	0	0	0
		50-95% of the herbaceous part of the AA.	0	0	0	0

		>95% of the herbaceous part of the AA.	0	0	0	0
F18	Sedge Cover	Sedges (Carex spp.) and cottongrass (Eriophorum spp.) occupy:				
		<5% of the vegetated area, or none.	0	1	1	0
		5-50% of the vegetated area.	1	0	0	1
		50-95% of the vegetated area.	0	0	0	0
		>95% of the vegetated area.	0	0	0	0
F19	Dominance of Most Abundant Herbaceous Species	Determine which two herbaceous species comprise the greatest portion of the herbaceous cover (excluding mosses and floating-leaved aquatic plants). Then choose one of the following:				
		those species together comprise > 50% of the areal cover of herbaceous plants at any time during the year.	0	1	1	1
		those species together do not comprise > 50% of the areal cover of herbaceous plants at any time during the year.	1	0	0	0
F20	Invasive Plant Cover	How extensive is the cover of invasive plant species in the AA? For species, see Plants_invasive worksheet in the accompanying SupplInfo file.				
		invasive species appear to be absent in the AA, or are present only in trace amount (a few individuals).	0	1	1	1
		invasive species are present in more than trace amounts, but comprise <5% of herbaceous cover (or woody cover, if the invasives are woody).	1	0	0	0
		invasive species comprise 5-20% of the herb cover (or woody cover, if the invasives are woody).	0	0	0	0
		invasive species comprise 20-50% of the herb cover (or woody cover, if the invasives are woody).	0	0	0	0
		invasive species comprise >50% of the herb cover (or woody cover, if the invasives are woody).	0	0	0	0
F21	Invasive Cover Along Upland Edge	Along the wetland-upland boundary, the percent of the upland edge (within 3 m upslope from the wetland) that is occupied by invasive plant species is:				
		none of the upland edge (invasives apparently absent), or AA has no upland edge.	1	1	1	1
		some (but <5%) of the upland edge.	0	0	0	0
		5-50% of the upland edge.	0	0	0	0
		most (>50%) of the upland edge.	0	0	0	0
F22	Fringe Wetland	During most of the year, open water within or adjacent to the vegetated part of the wetland is much wider than the maximum width of the vegetated zone within the wetland. Enter "1" if true, "0" if false.	0	0	0	0
F23	Lacustrine Wetland	The vegetated part of the AA is within or adjacent to a body of non-tidal standing open water whose size exceeds 8 hectares during most of a normal year.	0	0	0	0

F24	% of AA Without Surface Water	The percentage of the AA that never contains surface water during an average year (that is, except perhaps for a few hours after snowmelt or rainstorms), but which is still a wetland, is:				
		<1% . In other words, all or nearly all of the AA is covered by water permanently or at least seasonally.	0	0	0	0
		1-25% of the AA, or <1% but >0.01 ha never contains surface water.	1	0	0	1
		25-50% of the AA never contains surface water.	0	1	1	0
		50-75% of the AA never contains surface water.	0	0	0	0
		75-99% of the AA never contains surface water, OR >99% and there is at least one persistently ponded water body larger than 1 ha in the AA.	0	0	0	0
		99-100%. AND there is no persistently ponded water body larger than 1 ha within the AA. Enter "1" and SKIP to F42 (Channel Connection).	0	0	0	0
F25	% of AA with Persistent Surface Water	Identify the parts of the AA that still contain surface water (flowing or ponded, open or hidden beneath vegetation) even during the driest times of a normal year, i.e., when the AA's surface water is at its lowest annual level. At that time, the percentage of the AA that still contains surface water is:				
		None. The AA dries up completely (no water in channels either) or never has surface water during most years. SKIP to F27.	0	1	0	0
		1-20% of the AA.	0	0	0	0
		20-50% of the AA.	0	0	0	0
		50-95% of the AA.	1	0	1	1
		>95% of the AA. True for many fringe wetlands.	0	0	0	0
F26	% of Summertime Water that Is Shaded	At mid-day during the warmest time of year, the area of surface water within the AA that is shaded by vegetation and other features that are within the AA at that time is:				
		<5% of the water is shaded, or no surface water is present then.	0	0	0	0
		5-25% of the water is shaded.	1	0	1	1
		25-50% of the water is shaded.	0	0	0	0
		50-75% of the water is shaded.	0	0	0	0
		>75% of the water is shaded.	0	0	0	0
F27	% of AA that is Flooded Only Seasonally	The percentage of the AA's area that is between the annual high water and the annual low water (surface water) is:				
		None, or <0.01 hectare and <1% of the AA. SKIP to F29.	0	1	0	0
		1-20% of the AA, or <1% but >0.01 ha.	1	0	1	1
		20-50% of the AA.	0	0	0	0
		50-95% of the AA.	0	0	0	0

		>95% of the AA.	0	0	0	0
F28	Annual Water Fluctuation Range	The annual fluctuation in surface water level within most of the parts of the AA that contain surface water at least temporarily is:				
		<10 cm change (stable or nearly so).	0	0	0	0
		10 cm - 50 cm change.	1	0	1	1
		0.5 - 1 m change.	0	0	0	0
		1-2 m change.	0	0	0	0
		>2 m change.	0	0	0	0
Is the AA plus adjacent ponded water smaller than 0.01 hectare (about 10m x 10m, or 1m x 100 m)? If so, enter "1" in column D and SKIP TO F42 (Connection).			0	0	0	0
F29	Predominant Depth Class	During most of the time when surface water is present during the growing season, its depth, averaged over the entire inundated part of the AA, is:				
		<10 cm deep (but >0).	0	1	0	0
		10 - 50 cm deep.	1	0	1	1
		0.5 - 1 m deep.	0	0	0	0
		1 - 2 m deep.	0	0	0	0
		>2 m deep. True for many fringe wetlands.	0	0	0	0
F30	Depth Classes - Evenness of Proportions	When present, surface water in most of the AA usually consists of (select one):				
		One depth class that comprises >90% of the AA's inundated area (use the classes in the question above).	0	1	0	1
		One depth class that comprises 50-90% of the AA's inundated area.	0	0	1	0
		Neither of above. There are 3 or more depth classes and none occupy >50%.	1	0	0	0
F31	% of Water That Is Ponded (not Flowing)	During most times when surface water is present, the percentage that is (1) ponded (stagnant, or flows so slowly that fine sediment is not held in suspension) AND (2) is likely to be deeper than 0.5 m in some places, is:				
		<5% of the water, or it occupies <100 sq.m cumulatively. Nearly all the surface water is flowing. SKIP to F34.	0	1	0	0
		5-30% of the water.	0	0	0	0
		30-70% of the water.	1	0	1	0
		70-95% of the water.	0	0	0	1
		>95% of the water.	0	0	0	0
F32	Ponded Open Water - Minimum Size	During most of the growing season, the largest patch of open water that is ponded and is in or bordering the AA is >0.01 hectare (about 10 m by 10 m) and mostly deeper than 0.5 m. If true enter "1" and continue, If false, enter "0" and SKIP to F41 (Floating Algae & Duckweed).	1	0	1	1

F33	% of Ponded Water that is Open	In ducks-eye aerial view, the percentage of the ponded water that is open (lacking emergent vegetation during most of the growing season, and unhidden by a forest or shrub canopy) is:				
		None, or <1% of the AA and largest pool occupies <0.01 hectares. Enter "1" and SKIP to F41 (Floating Algae & Duckweed).	0	1	0	0
		1-4% of the ponded water. Enter "1" and SKIP to F41 (Floating Algae & Duckweed).	0	0	0	0
		5-30% of the ponded water.	0	0	0	0
		30-70% of the ponded water.	0	0	1	0
		70-99% of the ponded water.	1	0	0	0
		100% of the ponded water.	0	0	0	1
F34	Width of Vegetated Zone within Wetland	At the time during the growing season when the AA's water level is lowest, the average width of vegetated area in the AA that separates adjoining uplands from open water within the AA is:				
		<1 m.	0	0	0	0
		1 - 9 m.	1	1	0	1
		10 - 29 m.	0	0	1	0
		30 - 49 m.	0	0	0	0
		50 - 100 m.	0	0	0	0
		> 100 m, or open water is absent at that time.	0	0	0	0
F35	Flat Shoreline Extent	During most of the part of the growing season when water is present, the percentage of the AA's water edge length that is nearly flat (a slope less than about 5% measured within 5 m landward of the water) is:				
		<1% of the water edge.	0	1	0	1
		1-25% of the water edge.	0	0	0	0
		25-50% of the water edge.	1	0	1	0
		50-75% of the water edge.	0	0	0	0
		>75% of the water edge.	0	0	0	0
F36	Robust Emergents	The percentage of the emergent vegetation cover in the AA that is cattail (Typha spp.), common reed (Phragmites), or tall (>1m) bulrush is:				
		<1% of the emergent vegetation, or emergent vegetation is absent. SKIP to F38.	0	1	0	1
		1-25% of the emergent vegetation.	1	0	1	0
		25-75% of the emergent vegetation.	0	0	0	0
		>75%, of the emergent vegetation.	0	0	0	0

F37	Interspersion of Emergents & Open Water	During most of the part of the growing season when water is present, the spatial pattern of emergent vegetation within the water is mostly:				
		Scattered. More than 30% of such vegetation forms small islands or corridors surrounded by water.	1	0	0	0
		Intermediate.	0	0	1	0
		Clumped. More than 70% of such vegetation is in bands along the wetland perimeter or is clumped at one or a few sides of the surface water area.	0	0	0	0
F38	Persistent Deepwater Area	If the deepest patch of surface water (flowing or ponded) in or directly adjacent to the AA is mostly deeper than 0.5 m for >2 weeks during the growing season, enter "1" and continue. If not, enter "0" and SKIP to F42.(Connection).	0	0	1	1
F39	Non-vegetated Aquatic Cover	During most of the growing season and in waters deeper than 0.5 m, the cover for fish, aquatic invertebrates, and/or amphibians that is provided NOT by living vegetation, but by accumulations of dead wood and undercut banks is:				
		Little or none.	0	0	1	1
		Intermediate.	0	0	0	0
		Extensive.	0	0	0	0
F40	Isolated Island	The AA contains (or is part of) an island or beaver lodge within a lake, pond, or river, and is isolated from the shore by water depths >1 m on all sides during an average June. The island may be solid, or it may be a floating vegetation mat that is sufficiently large and dense to support a waterbird nest.	0	0	0	0
F41	Floating Algae & Duckweed	At some time of the year, mats of algae and/or duckweed are likely to cover >50% of the AA's otherwise-unshaded water surface, or blanket >50% of the underwater substrate. If true, enter "1" in next column. If untrue or uncertain, enter "0".	0	0	0	0
F42	Channel Connection & Outflow Duration	The most persistent surface water connection (outlet channel or pipe, ditch, or overbank water exchange) between the AA and a downslope stream network is: [Note: If the AA represents only part of a wetland, answer this according to whichever is the least permanent surface connection: the one between the AA and the rest of the wetland, or the surface connection between the wetland and the downslope stream network.]				
		Persistent (surface water flows out for >9 months/year).	1	0	1	0
		Seasonal (surface water flows out for 14 days to 9 months/year, not necessarily consecutive).	0	0	0	0
		Temporary (surface water flows out for <14 days, not necessarily consecutive).	0	0	0	0

		None -- but maps show a stream network downslope from the AA and within a distance that is less than the AA's length. SKIP to F47 (pH Measurement).	0	0	0	0
		No surface water flows out of the wetland except possibly during extreme events (<once per 10 years). Or, water flows only into a wetland, ditch, or lake that lacks an outlet. SKIP to F47 (pH Measurement).	0	1	0	1
F43	Outflow Confinement	During major runoff events, in the places where surface water exits the AA or connected waters nearby, the water:				
		Mostly passes through a pipe, culvert, narrowly breached dike, berm, beaver dam, or other partial obstruction (other than natural topography) that does not appear to drain the wetland artificially during most of the growing season.	1	0	0	0
		Leaves through natural exits (channels or diffuse outflow), not mainly through artificial or temporary features.	0	0	1	0
		Is exported more quickly than usual due to ditches or pipes within the AA or connected to its outlet, or within 10 m of the AA's edge, which drain the wetland artificially, or water is pumped out of the AA.	0	0	0	0
F44	Tributary Channel	At least once annually, surface water from a tributary channel that is >100 m long moves into the AA. Or, surface water from a larger permanent water body adjacent to the AA spills into the AA. If it enters only via a pipe, that pipe must be fed by a mapped stream or lake further upslope. If no, SKIP to F47 (pH Measurement).	0	0	0	0
F45	Input Water Temperature	Based on lack of shade, water source characteristics, or actual temperature measurements, the inflow is likely to be warmer than surface water in the AA during part of most years. Enter 1= yes, 0= no.	0	0	0	0
F46	Throughflow Resistance	During its travel through the AA at the time of peak annual flow, water arriving in channels: [select only the ONE encountered by most of the incoming water].				
		Does not bump into many plant stems as it travels through the AA. Nearly all the water continues to travel in unvegetated (often incised) channels that have minimal contact with wetland vegetation, or through a zone of open water such as an instream pond or lake.	0	0	0	0
		Bumps into herbaceous vegetation but mostly remains in fairly straight channels.	0	0	0	0
		Bumps into herbaceous vegetation and mostly spreads throughout, or is in widely meandering, multi-branched, or braided channels.	0	0	0	0
		Bumps into tree trunks and/or shrub stems but mostly remains in fairly straight channels.	0	0	0	0
		Bumps into tree trunks and/or shrub stems and follows a fairly indirect path from entrance to exit (meandering, multi-branched, or braided).	0	0	0	0
F47		The pH in most of the AA's surface water:				

	pH Measurement	Was measured, and is: [enter the reading in the column to the right.]				
		Was not measured but surface water is present and is darkly tea-coloured. Or if no surface water, then mosses and plants that indicate peatland (e.g., Labrador tea) are prevalent. Enter "1".	0	0	0	0
		Neither of above. Enter "1".	1	1	1	1
F48	TDS and/or Conductivity	The TDS (total dissolved solids) or conductivity off the AA's surface water is: (select the first true row with information):				
		TDS is: [Enter the reading in ppm or mg/L in the column to the right, if measured, or answer next row.]				
		Conductivity is [Enter the reading in µS/cm in the column to the right.]				
		Was not measured, but plants that indicate saline conditions cover much of the vegetated AA. Enter "1".	0	0	0	0
		Neither of above	1	1	1	1
F49	Beaver Probability	Use of the AA by beaver during the past 5 years is (select most applicable ONE):				
		Evident from direct observation or presence of gnawed limbs, dams, tracks, dens, lodges, or extensive stands of water-killed trees (snags).	0	0	1	0
		Likely based on known occurrence in the region and proximity to suitable habitat, which may include: (a) a persistent freshwater wetland, pond, or lake, or a perennial low or mid-gradient (<10%) channel, and (b) a corridor or multiple stands of hardwood trees and shrubs in vegetated areas near surface water.	0	0	0	0
		Unlikely because site characteristics above are deficient, and/or this is a settled area or other area where beaver are routinely removed.	1	1	0	1
F50	Groundwater Strength of Evidence	Select first applicable choice:				
		Springs are known to be present within the AA, or if groundwater levels have been monitored, that has demonstrated that groundwater primarily discharges to the wetland for longer periods during the year than periods when the wetland recharges the groundwater.	0	0	0	0
		Most of the AA has a slope of >5%, or is very close to the base of a natural slope longer than 100 and much steeper than the slope of the AA, AND the pH of surface water, if known, is >5.5.	0	0	0	0
		Neither of above is true, although some groundwater may discharge to or flow through the AA. Or groundwater influx is unknown.	1	1	1	1
F51		The gradient along most of the flow path within the AA is:				

	Internal Gradient	<2% or the AA has no surface water outlet (not even seasonally).	0	1	0	1
		2-5%.	1	0	1	0
		6-10%.	0	0	0	0
		>10%.	0	0	0	0
Note for the next three questions: If the AA lacks an upland edge, evaluate based on the AA's entire perimeter, and moving outward into whatever areas are adjacent. In many situations, these questions are best answered by measuring from aerial images.						
F52	Vegetated Buffer as % of Perimeter	Within a zone extending 30 m laterally from the AA's edge with upland and/or other wetlands, the percentage that contains perennial vegetation cover (except lawns, row crops, heavily grazed land, conifer plantations) is:				
		<5%.	0	0	0	0
		5 to 30%.	0	0	0	0
		30 to 60%.	0	0	0	0
		60 to 90%.	0	0	0	0
		>90%, or all the area within 30 m of the AA edge is other wetlands. SKIP to F55.	1	1	1	1
F53	Type of Cover in Buffer	Within 30 m upslope of where the wetland transitions to upland, the upland land cover that is NOT perennial vegetation is mostly (mark ONE):				
		Impervious surface, e.g., paved road, parking lot, building, exposed rock.	0	0	0	0
		Bare or nearly bare pervious surface or managed vegetation, e.g., lawn, row crops, unpaved road, dike, landslide.	0	0	0	0
F54	Buffer Slope	The steepest and/or most disturbed part of the upland area that is within 30 m of the wetland and occupies >10% of that upland area has a percent slope of:				
		<1% (flat -- almost no noticeable slope) or all the area within 30 m of the AA edge is other wetlands.	0	0	0	0
		2-5%.	0	0	0	0
		5-30%.	0	0	0	0
		>30%.	0	0	0	0
F55	Cliffs or Steep Banks	In the AA or within 100 m, there are elevated terrestrial features such as cliffs, talus slopes, stream banks, or excavated pits (but not riprap) that extend at least 2 m nearly vertically, are unvegetated, and potentially contain crevices or other substrate suitable for nesting or den areas. Enter 1 (yes) or 0 (no).	0	0	0	0
F56	New or Expanded Wetland	Human actions within or adjacent to the AA have persistently expanded a naturally occurring wetland or created a wetland where there previously was none (e.g., by excavation, impoundment):				

		No.	0	0	0	0
		Yes, and created or expanded 20 - 100 years ago.	0	0	0	0
		Yes, and created or expanded 3-20 years ago.	1	1	1	1
		Yes, and created or expanded within last 3 years.	0	0	0	0
		Yes, but time of origin or expansion unknown.	0	0	0	0
		Unknown if new or expanded within 20 years or not.	0	0	0	0
F57	Burn History	More than 1% of the AA's previously vegetated area:				
		Burned within past 5 years.	0	0	0	0
		Burned 6-10 years ago.	0	0	0	0
		Burned 11-30 years ago.	0	0	0	0
		Burned >30 years ago, or no evidence of a burn and no data.	1	1	1	1
F58	Visibility	The maximum percentage of the wetland that is visible from the best vantage point on public roads, public parking lots, public buildings, or public maintained trails that intersect, adjoin, or are within 100 m of the AA (select one) is:				
		<25%.	1	1	1	1
		25-50%.	0	0	0	0
		>50%.	0	0	0	0
F59	Non-consumptive Uses - Actual or Potential	Assuming access permission was granted, select ALL statements that are true of the AA as it currently exists:				
		For an average person, walking is physically possible in (not just near) >5% of the AA during most of the growing season, e.g., free of deep water and dense shrub thickets.	1	1	1	1
		Maintained roads, parking areas, or foot-trails are within 10 m of the AA, or the AA can be accessed part of the year by boats arriving via contiguous waters.	0	0	0	0
		Within or near the AA, there is an interpretive center, trails with interpretive signs or brochures, and/or regular guided interpretive tours.	0	0	0	0
F60	Unvisited Core Area	The percentage of the AA almost never visited by humans during an average growing season probably comprises: [Note: Only include the part actually walked or driven (not simply viewed from) with a vehicle or boat. Do not include visitors on trails outside of the AA unless more than half the wetland is visible from the trails and they are within 30 m of the wetland edge. In that case include only the area occupied by the trail.]				
		<5% and no inhabited building is within 100 m of the AA.	0	0	0	0
		<5% and inhabited building is within 100 m of the AA.	0	0	0	0
		5-50% and no inhabited building is within 100 m of the AA.	0	0	0	0
		5-50% and inhabited building is within 100 m of the AA.	0	0	0	0
		50-95%, with or without inhabited building nearby.	0	0	0	0

		>95% of the AA with or without inhabited building nearby.	1	1	1	1
F61	Frequently Visited Area	The part of the AA visited by humans almost daily for several weeks during an average growing season probably comprises: [See note above.]				
		<5%. If F60 was answered ">95%" (mostly never visited), SKIP to F64.	1	1	1	1
		5-50%.	0	0	0	0
		50-95%.	0	0	0	0
		>95% of the AA.	0	0	0	0
F62	BMP - Soils	Boardwalks, paved trails, fences or other infrastructure and/or well-enforced regulations appear to effectively prevent visitors from walking on soil within nearly all of the AA when the soil is unfrozen. Enter "1" if true.	0	0	0	0
F63	BMP - Wildlife Protection	Fences, observation blinds, platforms, paved trails, exclusion periods, and/or well-enforced prohibitions on motorised boats, off-leash pets, and off road vehicles appear to effectively exclude or divert visitors and their pets from the AA at critical times in order to minimize disturbance of wildlife (except during hunting seasons). Enter "1" if true.	0	0	0	0
F64	Consumptive Uses (Provisioning Services)	Recent evidence was found within the AA of the following potentially-sustainable consumptive uses. Select ALL that apply.				
		Low-impact commercial timber harvest (e.g., selective thinning).	0	0	0	0
		Commercial or traditional-use harvesting of native plants, their fruits, or mushrooms.	0	0	0	0
		Waterfowl hunting.	0	0	0	0
		Fishing.	0	0	0	0
		Trapping of furbearers.	0	0	0	0
		None of the above.	1	1	1	1
F65	Domestic Wells	The closest wells or water bodies that currently provide drinking water are:				
		Within 0-100 m. of the AA.	0	0	0	0
		100-500 m. away.	0	0	0	0
		>500 m. away, or no information.	1	1	1	1
F66	Calcareous Fen	The AA is, or is part of, a calcareous fen. See the Plants_Calcar worksheet in the accompanying SuppInfo file for list of plant indicators (calciphiles). Enter 1 If more than two Strong or more than five Moderate calciphile species are present; otherwise enter 0, but if not able to identify those and no information, change to blank.	0	0	0	0

Stressor (S) Data Form for Non-Tidal Wetlands. WESP-AC for New Brunswick. Version 2.					WL1	WL2	WL3	WL4
S1	**Aberrant Timing of Water Inputs**							
	In the last column, place a check mark next to any item that is likely to have caused the timing of water inputs (but not necessarily their volume) to shift by hours, days, or weeks, becoming either more muted (smaller or less frequent peaks spread over longer times, more temporal homogeneity of flow or water levels) or more flashy (larger or more frequent spikes but over shorter times). [FA, FR, INV, PH, STR]							
	Stormwater from impervious surfaces that drains directly to the wetland.				1		1	1
	Water subsidies from wastewater effluent, septic system leakage, snow storage areas, or irrigation.							
	Regular removal of surface or groundwater for irrigation or other consumptive use.							
	Flow regulation in tributaries or water level regulation in adjoining water body, or other control structure at water entry points that regulates inflow to the wetland.							
	A dam, dike, levee, weir, berm, or fill -- within or downgradient from the wetland -- that interferes with surface or subsurface flow in/out of the AA (e.g., road fill, wellpads, pipelines).							
	Excavation within the wetland, e.g., dugout, artificial pond, dead-end ditch.				1			
	Artificial drains or ditches in or near the wetland.				1			
	Accelerated downcutting or channelization of an adjacent or internal channel (incised below the historical water table level).							
	Logging within the wetland.							
	Subsidence or compaction of the wetland's substrate as a result of machinery, livestock, fire, drainage, or off road vehicles.							
	Straightening, ditching, dredging, and/or lining of tributary channels.							
	If any items were checked above, then for each row of the table below, assign points. However, if you believe the checked items had no measurable effect on the timing of water conditions in any part of the AA, then leave the "0's" for the scores in the following rows. To estimate effects, contrast the current condition with the condition if the checked items never occurred or were no longer present.							
		Severe (3 points)		Mild (1 point)				
	Spatial extent of timing shift within the wetland:	>95% of wetland.	0	<5% of wetland.	2	0	1	1
	When most of the timing shift began:	<3 yrs ago.	0	10-100 yrs ago.	1	0	1	1
	Score the following 2 rows only if the altered inputs began within past 10 years, and only for the part of the wetland that experiences those.							
	Input timing now vs. previously:	Shift of weeks.	0	Shift of hours or minutes.	0	0	0	0
	Flashiness or muting:	Became very flashy or controlled.	0	Became mildly flashy or controlled.	0	0	0	0
	Sum=				3	0	2	2
				Stressor subscore=	0.25	0.00	0.17	0.17

S2	**Accelerated Inputs of Contaminants and/or Salts**							
	In the last column, place a check mark next to any item -- occurring in either the wetland or its CA -- that is likely to have accelerated the inputs of contaminants or salts to the AA. [AM, FA, PH, POL, STR]							
	Stormwater or wastewater effluent (including failing septic systems), landfills, industrial facilities.				1			
	Metals & chemical wastes from mining, shooting ranges, snow storage areas, oil/ gas extraction, other sources (download many locations from National Pollutant Release Inventory and view KMZ overlay in Google Earth. https://www.ec.gc.ca/inrp-npri/default.asp?lang=En&n=B85A1846-1				1	1		
	Road salt.							
	Spraying of pesticides, as applied to lawns, croplands, roadsides, or other areas in the CA.							
	If any items were checked above, then for each row of the table below, assign points. However, if you believe the checked items did not cumulatively expose the AA to significantly higher levels of contaminants and/or salts, then leave the "0's" for the scores in the following rows. To estimate effects, contrast the current condition with the condition if the checked items never occurred or were no longer present.							
		Severe (3 points)		Mild (1 point)				
	Usual toxicity of most toxic contaminants:	Industrial effluent, mining waste, unmanaged landfill.	2	Low density residential.	1	2		
	Frequency & duration of input:	Frequent and year-round.	2	Infrequent & during high runoff events mainly.	1	1		
	AA proximity to main sources (actual or potential):	0 - 15 m.	2	In more distant part of contributing area.	1	2		
	Sum=				4	5	0	0
				Stressor subscore=	0.44	0.56	0.00	0.00
S3	**Accelerated Inputs of Nutrients**							
	In the last column, place a check mark next to any item -- occurring in either the wetland or its CA -- that is likely to have accelerated the inputs of nutrients to the wetland. [NRv, PRv, STR]							
	Stormwater or wastewater effluent (including failing septic systems), landfills.							
	Fertilizers applied to lawns, ag lands, or other areas in the CA.							
	Livestock, dogs.							
	Artificial drainage of upslope lands.				1			
	If any items were checked above, then for each row of the table below, assign points. However, if you believe the checked items did not cumulatively expose the AA to significantly more nutrients, then leave the "0's" for the scores in the following rows. To estimate effects, contrast the current condition with the condition if the checked items never occurred or were no longer present.							
		Severe (3 points)		Mild (1 point)				
	Type of loading:	High density of unmaintained septic, some types of industrial sources.	2	Livestock, pets, low density residential.	3	0	0	0

	Frequency & duration of input:	Frequent and year-round.	2	Infrequent & during high runoff events mainly.	1	0	0	0
	AA proximity to main sources (actual or potential):	0 - 15 m.	2	In more distant part of contributing area.	2	0	0	0
	Sum=				6	0	0	0
				Stressor subscore=	0.67	0.00	0.00	0.00
S4	**Excessive Sediment Loading *from Contributing Area***							
	In the last column, place a check mark next to any item present in the CA that is likely to have elevated the load of waterborne or windborne sediment reaching the wetland from its CA. [FA, FR, INV, PH, SRv, STR]							
	Erosion from plowed fields, fill, timber harvest, dirt roads, vegetation clearing, fires.				1		1	1
	Erosion from construction, in-channel machinery in the CA.				1			
	Erosion from off-road vehicles in the CA.				1			
	Erosion from livestock or foot traffic in the CA.							
	Stormwater or wastewater effluent.							
	Sediment from road sanding, gravel mining, other mining, oil/ gas extraction.							
	Accelerated channel downcutting or headcutting of tributaries due to altered land use.							
	Other human-related disturbances within the CA.							
	If any items were checked above, then for each row of the table below, assign points (3, 2, or 1 as shown in header) in the last column. However, if you believe the checked items did not cumulatively add significantly more sediment or suspended solids to the AA, then leave the "0's" for the scores in the following rows. To estimate effects, contrast the current condition with the condition if the checked items never occurred or were no longer present.							
		Severe (3 points)		Mild (1 point)				
	Erosion in CA:	Extensive evidence, high intensity.*	1	Potentially (based on low-intensity* land use) with little or no direct evidence.	1	0	1	1
	Recentness of significant soil disturbance in the CA:	Current & ongoing.	1	>1 yr ago.	1	0	1	1
	Duration of sediment inputs to the wetland:	Frequent and year-round.	1	Infrequent & during high runoff events mainly.	2	0	1	1
	AA proximity to actual or potential sources:	0 - 15 m.	2	In more distant part of contributing area.	1	0	2	2
	* high-intensity= extensive off-road vehicle use, plowing, grading, excavation, erosion with or without veg removal; low-intensity= veg removal only with little or no apparent erosion or disturbance of soil or sediment.			Sum=	5	0	5	5
				Stressor subscore=	0.42	0.00	0.42	0.42
S5	**Soil or Sediment Alteration *Within the Assessment Area***							

	In the last column, place a check mark next to any item present in the wetland that is likely to have compacted, eroded, or otherwise altered the wetland's soil. Consider only items occurring within past 100 years or since wetland was created or restored (whichever is less). [CS, INV, NR, PH, SR, STR]							
	Compaction from machinery, off-road vehicles, livestock, or mountain bikes, especially during wetter periods.				1			
	Leveling or other grading not to the natural contour.				1			
	Tillage, plowing (but excluding disking for enhancement of native plants).				1			
	Fill or riprap, excluding small amounts of upland soils containing organic amendments (compost, etc.) or small amounts of topsoil imported from another wetland.							
	Excavation.							
	Ditch cleaning or dredging in or adjacent to the wetland.							
	Boat traffic in or adjacent to the wetland and sufficient to cause shore erosion or stir bottom sediments.							
	Artificial water level or flow manipulations sufficient to cause erosion or stir bottom sediments.							
	If any items were checked above, then for each row of the table below, assign points. However, if you believe the checked items did not measurably alter the soil structure and/or topography, then leave the "0's" for the scores in the following rows. To estimate effects, contrast the current condition with the condition if the checked items never occurred or were no longer present.							
		Severe (3 points)		Mild (1 point)				
	Spatial extent of altered soil:	>95% of wetland or >95% of its upland edge (if any).	0	<5% of wetland and <5% of its upland edge (if any).	1	0	0	0
	Recentness of significant soil alteration in wetland:	Current & ongoing.	0	>1 yr ago.	1	0	0	0
	Duration:	Long-lasting, minimal veg recovery.	0	Short-term, revegetated, not intense.	2	0	0	0
	Timing of soil alteration:	Frequent and year-round.	0	Mainly during one-time or scattered events.	1	0	0	0
	Sum=				5	0	0	0
				Stressor subscore=	0.42	0.00	0.00	0.00

Assessment Area (AA) Results: Wetland 1

Wetland Functions or Other Attributes:	Function Score (Normalised)	Function Rating	Benefits Score (Normalised)	Benefits Rating	Function Score (raw)	Benefits Score (raw)
Water Storage & Delay (WS)	1.49	Lower	4.18	Moderate	2.88	4.23
Stream Flow Support (SFS)	2.92	Lower	5.65	Moderate	1.56	3.29
Water Cooling (WC)	3.29	Moderate	5.78	Higher	2.19	3.48
Sediment Retention & Stabilisation (SR)	1.94	Moderate	1.89	Lower	4.49	1.15
Phosphorus Retention (PR)	2.02	Lower	7.00	Higher	4.33	6.67
Nitrate Removal & Retention (NR)	3.13	Moderate	6.25	Moderate	5.76	6.67
Carbon Sequestration (CS)	2.97	Lower			5.84	
Organic Nutrient Export (OE)	5.56	Higher			5.28	
Anadromous Fish Habitat (FA)	0.00	Lower	0.00	Lower	0.00	0.00
Resident Fish Habitat (FR)	0.00	Lower	0.00	Lower	0.00	0.00
Aquatic Invertebrate Habitat (INV)	7.65	Higher	6.10	Higher	6.57	4.53
Amphibian & Turtle Habitat (AM)	9.46	Higher	5.00	Moderate	8.30	5.13
Waterbird Feeding Habitat (WBF)	9.00	Higher	3.33	Moderate	7.16	3.33
Waterbird Nesting Habitat (WBN)	8.03	Higher	3.33	Moderate	6.86	3.33
Songbird, Raptor, & Mammal Habitat (SBM)	5.90	Moderate	3.33	Moderate	4.89	3.33
Pollinator Habitat (POL)	8.43	Higher	3.33	Moderate	6.79	3.33
Native Plant Habitat (PH)	5.13	Moderate	5.77	Moderate	5.16	5.00
Public Use & Recognition (PU)			1.56	Lower		1.44
Wetland Sensitivity (Sens)			5.62	Higher		3.89
Wetland Ecological Condition (EC)			6.87	Higher		8.19
Wetland Stressors (STR) (higher score means more stress)			4.43	Moderate		3.89
Summary Ratings for Grouped Functions:						
HYDROLOGIC Group (WS)	1.49	Lower	4.18	Moderate	2.88	4.23
WATER QUALITY SUPPORT Group (max+avg/2 of SR, PR, NR, CS)	2.82	Lower	6.03	Moderate	5.47	5.75
AQUATIC SUPPORT Group (max+avg/2 of SFS, INV, OE, WC)	6.25	Higher	5.97	Higher	5.23	4.15
AQUATIC HABITAT Group (max+avg/2 of FA, FR, AM, WBF, WBN)	7.38	Higher	3.67	Moderate	6.38	3.74
TRANSITION HABITAT Group (max+avg/2 of SBM, PH, POL)	7.46	Moderate	4.95	Moderate	6.20	4.45
WETLAND CONDITION (EC)			6.87	Higher		8.19
WETLAND RISK (average of Sensitivity & Stressors)			5.02	Higher		3.89

Assessment Area (AA) Results: Wetland 2

Wetland Functions or Other Attributes:	Function Score (Normalised)	Function Rating	Benefits Score (Normalised)	Benefits Rating	Function Score (raw)	Benefits Score (raw)
Water Storage & Delay (WS)	5.51	Higher	1.02	Lower	5.97	1.10
Stream Flow Support (SFS)	0.00	Lower	0.00	Lower	0.00	0.00
Water Cooling (WC)	5.25	Moderate	0.00	Lower	3.50	0.00
Sediment Retention & Stabilisation (SR)	10.00	Higher	1.10	Lower	10.00	0.67
Phosphorus Retention (PR)	10.00	Higher	0.74	Lower	10.00	1.00
Nitrate Removal & Retention (NR)	10.00	Higher	2.50	Lower	10.00	3.33
Carbon Sequestration (CS)	4.61	Moderate			6.55	
Organic Nutrient Export (OE)	3.48	Moderate			4.18	
Anadromous Fish Habitat (FA)	0.00	Lower	0.00	Lower	0.00	0.00
Resident Fish Habitat (FR)	0.00	Lower	0.00	Lower	0.00	0.00
Aquatic Invertebrate Habitat (INV)	5.42	Moderate	3.83	Moderate	5.78	3.31
Amphibian & Turtle Habitat (AM)	3.06	Lower	4.43	Moderate	4.92	4.78
Waterbird Feeding Habitat (WBF)	6.11	Moderate	3.33	Moderate	4.86	3.33
Waterbird Nesting Habitat (WBN)	4.60	Moderate	3.33	Moderate	3.93	3.33
Songbird, Raptor, & Mammal Habitat (SBM)	7.41	Higher	3.33	Moderate	6.14	3.33
Pollinator Habitat (POL)	7.74	Moderate	3.33	Moderate	6.23	3.33
Native Plant Habitat (PH)	5.82	Moderate	6.03	Moderate	5.43	5.23
Public Use & Recognition (PU)			1.56	Lower		1.44
Wetland Sensitivity (Sens)			7.16	Higher		4.35
Wetland Ecological Condition (EC)			5.66	Moderate		7.50
Wetland Stressors (STR) (higher score means more stress)			0.60	Lower		2.48
Summary Ratings for Grouped Functions:						
HYDROLOGIC Group (WS)	5.51	Higher	1.02	Lower	5.97	1.10
WATER QUALITY SUPPORT Group (max+avg/2 of SR, PR, NR, CS)	9.33	Higher	1.97	Lower	9.57	2.50
AQUATIC SUPPORT Group (max+avg/2 of SFS, INV, OE, WC)	4.48	Moderate	2.55	Moderate	4.57	2.21
AQUATIC HABITAT Group (max+avg/2 of FA, FR, AM, WBF, WBN)	4.43	Moderate	3.32	Moderate	3.83	3.53
TRANSITION HABITAT Group (max+avg/2 of SBM, PH, POL)	7.36	Moderate	5.13	Moderate	6.08	4.60
WETLAND CONDITION (EC)			5.66	Moderate		7.50
WETLAND RISK (average of Sensitivity & Stressors)			3.88	Moderate		3.41

Assessment Area (AA) Results: Wetland 3

Wetland Functions or Other Attributes:	Function Score (Normalised)	Function Rating	Benefits Score (Normalised)	Benefits Rating	Function Score (raw)	Benefits Score (raw)
Water Storage & Delay (WS)	1.51	Lower	0.95	Lower	2.90	1.03
Stream Flow Support (SFS)	4.17	Moderate	5.50	Moderate	2.22	3.21
Water Cooling (WC)	4.29	Moderate	4.33	Moderate	2.86	2.61
Sediment Retention & Stabilisation (SR)	1.65	Lower	1.36	Lower	4.29	0.82
Phosphorus Retention (PR)	2.93	Moderate	0.37	Lower	4.98	0.67
Nitrate Removal & Retention (NR)	2.16	Lower	1.56	Lower	5.16	2.50
Carbon Sequestration (CS)	3.55	Moderate			6.09	
Organic Nutrient Export (OE)	6.86	Higher			5.97	
Anadromous Fish Habitat (FA)	0.00	Lower	0.00	Lower	0.00	0.00
Resident Fish Habitat (FR)	0.00	Lower	0.00	Lower	0.00	0.00
Aquatic Invertebrate Habitat (INV)	8.72	Higher	6.13	Higher	6.94	4.55
Amphibian & Turtle Habitat (AM)	8.86	Higher	4.94	Moderate	7.98	5.09
Waterbird Feeding Habitat (WBF)	8.73	Higher	3.33	Moderate	6.94	3.33
Waterbird Nesting Habitat (WBN)	8.63	Higher	3.33	Moderate	7.38	3.33
Songbird, Raptor, & Mammal Habitat (SBM)	6.02	Moderate	3.33	Moderate	4.99	3.33
Pollinator Habitat (POL)	7.53	Moderate	3.33	Moderate	6.06	3.33
Native Plant Habitat (PH)	7.98	Higher	5.53	Moderate	6.30	4.80
Public Use & Recognition (PU)			1.56	Lower		1.44
Wetland Sensitivity (Sens)			5.89	Higher		3.97
Wetland Ecological Condition (EC)			5.66	Moderate		7.50
Wetland Stressors (STR) (higher score means more stress)			0.79	Lower		2.55
Summary Ratings for Grouped Functions:						
HYDROLOGIC Group (WS)	1.51	Lower	0.95	Lower	2.90	1.03
WATER QUALITY SUPPORT Group (max+avg/2 of SR, PR, NR, CS)	3.06	Lower	1.33	Lower	5.61	1.92
AQUATIC SUPPORT Group (max+avg/2 of SFS, INV, OE, WC)	7.36	Higher	5.73	Higher	5.72	4.00
AQUATIC HABITAT Group (max+avg/2 of FA, FR, AM, WBF, WBN)	7.05	Higher	3.63	Moderate	6.22	3.72
TRANSITION HABITAT Group (max+avg/2 of SBM, PH, POL)	7.58	Moderate	4.80	Moderate	6.05	4.31
WETLAND CONDITION (EC)			5.66	Moderate		7.50
WETLAND RISK (average of Sensitivity & Stressors)			3.34	Moderate		3.26

Assessment Area (AA) Results: Wetland 4

Wetland Functions or Other Attributes:	Function Score (Normalised)	Function Rating	Benefits Score (Normalised)	Benefits Rating	Function Score (raw)	Benefits Score (raw)
Water Storage & Delay (WS)	7.20	Higher	1.13	Lower	7.26	1.20
Stream Flow Support (SFS)	0.00	Lower	0.00	Lower	0.00	0.00
Water Cooling (WC)	2.17	Moderate	0.00	Lower	1.44	0.00
Sediment Retention & Stabilisation (SR)	10.00	Higher	1.66	Lower	10.00	1.01
Phosphorus Retention (PR)	10.00	Higher	0.74	Lower	10.00	1.00
Nitrate Removal & Retention (NR)	10.00	Higher	2.50	Lower	10.00	3.33
Carbon Sequestration (CS)	2.89	Lower			5.81	
Organic Nutrient Export (OE)	4.27	Moderate			4.60	
Anadromous Fish Habitat (FA)	0.00	Lower	0.00	Lower	0.00	0.00
Resident Fish Habitat (FR)	0.00	Lower	0.00	Lower	0.00	0.00
Aquatic Invertebrate Habitat (INV)	2.01	Lower	4.92	Moderate	4.58	3.90
Amphibian & Turtle Habitat (AM)	7.14	Higher	4.77	Moderate	7.07	4.98
Waterbird Feeding Habitat (WBF)	8.68	Higher	3.33	Moderate	6.91	3.33
Waterbird Nesting Habitat (WBN)	5.50	Higher	3.33	Moderate	4.70	3.33
Songbird, Raptor, & Mammal Habitat (SBM)	5.68	Moderate	3.33	Moderate	4.71	3.33
Pollinator Habitat (POL)	7.65	Moderate	3.33	Moderate	6.16	3.33
Native Plant Habitat (PH)	6.08	Higher	5.46	Moderate	5.54	4.74
Public Use & Recognition (PU)			1.56	Lower		1.44
Wetland Sensitivity (Sens)			7.02	Higher		4.30
Wetland Ecological Condition (EC)			5.66	Moderate		7.50
Wetland Stressors (STR) (higher score means more stress)			1.07	Lower		2.65
Summary Ratings for Grouped Functions:						
HYDROLOGIC Group (WS)	7.20	Higher	1.13	Lower	7.26	1.20
WATER QUALITY SUPPORT Group (max+avg/2 of SR, PR, NR, CS)	9.11	Higher	2.07	Lower	9.48	2.56
AQUATIC SUPPORT Group (max+avg/2 of SFS, INV, OE, WC)	3.19	Lower	3.28	Moderate	3.63	2.60
AQUATIC HABITAT Group (max+avg/2 of FA, FR, AM, WBF, WBN)	6.47	Higher	3.53	Moderate	5.40	3.66
TRANSITION HABITAT Group (max+avg/2 of SBM, PH, POL)	7.06	Moderate	4.75	Moderate	5.82	4.27
WETLAND CONDITION (EC)			5.66	Moderate		7.50
WETLAND RISK (average of Sensitivity & Stressors)			4.04	Moderate		3.48

APPENDIX C – VEGETATION LIST

VEGETATION LIST	
Scientific Name	**Common Name**
Acer pensylvanicum	Striped Maple
Acer rubrum	Red Maple
Acer sacharum	Sugar Maple
Achillea millefolium	Common Yarrow
Actaea rubra	Red Baneberry
Alnus incana	Speckled Alder
Apocynum androsaemifolium	Spreading Dogbane
Aralia nudicaulis	Wild Sarsaparilla
Arctium lappa	Great Burdock
Asclepias syriaca	Common Milkweed
Athrium filix-femina	Common Lady Fern
Betula papyrifera	Paper Birch
Carex cryptolepis	Hidden-scaled Sedge
Carex disperma	Two-seeded Sedge
Carex intumescens	Bladder Sedge
Carex scopia	Broom Sedge
Carex trispera	Three-Seeded Sedge
Chamaenerion angustifolium	Fireweed
Circaea alpina	Small Enchanter's Nightshade
Claytosmunda claytoniana	Interrupted Fern
Clintonia borealis	Yellow Bluebead Lily
Comptonia peregrina	Sweet-fern
Coptis trifolia	Goldenthread
Cornus canadense	Bunchberry
Cornus sericea	Red Osier Dogwood
Corylus cornuta	Beaked Hazel
Dryopteris intermedia	Evergreen Wood Fern
Epipactis helleborine	Helleborine
Equisetum arvense	Field Horsetail
Eupatorium perfoliatum	Common Boneset
Frasniux americana	White Ash
Galium palustre	Marsh Bedstraw
Gaultheria hispidula	Creeping Snowberry
Glyceria striata	Fowl-mana Grass
Hypericum ellipticum	Common Pale St.John's-Wort
Hypericum fraseri	Fraser's St. John's-wort
Ilex mucronata	Mountain Holly
Impatiens capensis	Spotted Jewelweed

Iris versicolor	Harlequin Blue Flag
Juncus effuus	Soft Rush
Larix laricina	Tamarack
Lysimachia borealis	Northern Starflower
Lysimachia terrestris	Swamp Yellow Loosestrife
Lythrum salicaria	Purple Loosestrife
Maianthemum canadense	Wild Lily-of-The-Valley
Maianthemum racemosum	Large False Solomon's Seal
Malus prunifolia	Pear-leaved Crabapple
Medeola virginiana	Cucumber Root
Monotropa uniflora	Convulsion-Root
Oclemena acuminata	Whorled Wood Aster
Onoclea sensibilis	Sensitive Fern
Osmundastrum cinnamomeum	Cinnamon Fern
Oxalis montana	Common Wood Sorrel
Phegopteris connectilis	Northern Beech Fern
Phleum pratense	Timothy
Pinus resinosa	Red Pine
Pinus strobus	Eastern White Pine
Populus trembuloides	Trembling Aspen
Potentilla simplex	Old Field Cinquefoil
Prunella vulgaris	Common Self-heal
Prunus serotina	Black Cherry
Prunus virginiana	Chokecherry
Pteridium aquilinum	Bracken Fern
Pyrola elliptica	Shinleaf
Ranunculus repens	Creeping Buttercup
Rhododendron canadense	Rhodora
Ribes triste	Swamp Red Currant
Rosa virginiana	Virginia Rose
Rubus alumnus	Smooth Blackberry
Rubus idaeus	Red Raspberry
Rubus occidentalis	Black Raspberry
Rubus pubescens	Dwarf Raspberry
Rudbeckia hirta	Black-Eyed Susan
Salix bebbiana	Bebb's Willow
Salix discolor	Pussy Willow
Scirpus cyperinus	Common Woolly Bullrush
Solidago canadensis	Canada Goldenrod
Sorbus americana	American Mountain Ash
Spiraea alba	White Meadowsweet

Spiraea tomentosa	Seeplebush
Streptopus lanceolatus	Rose Twisted-stalk
Thuja occidentalis	Eastern White Cedar
Trifolium pratense	Red Clover
Tsuga canadensis	Eastern Hemlock
Vaccinium angustifolium	Late Lowbush Blueberry
Viburnum cassinoides	Northern Wild Raisin
Viburnum lantanoides	Hobblebush
Vicia sativa	Common Vetch
Viola blanda	Sweet White Violet

BOREAL
ENVIRONMENTAL

Janet Blackadar
WSP E&I Canada Limited
495 Prospect St. W., Suite 201
Fredericton, New Brunswick
E3B 9M4

Date: September 5th, 2023

Correspondance via email

Re: Breeding bird survey for Shirley Road/ Lindsey Brook Study Area.

Boreal Environmental was engaged by WSP E&I Canada (WSP) to conduct a breeding bird survey of a 44-ha area at the northern end of the CFB Gagetown Training Area along Shirley Road near the location of the Lindsey Brook crossing as shown on Figure 1.

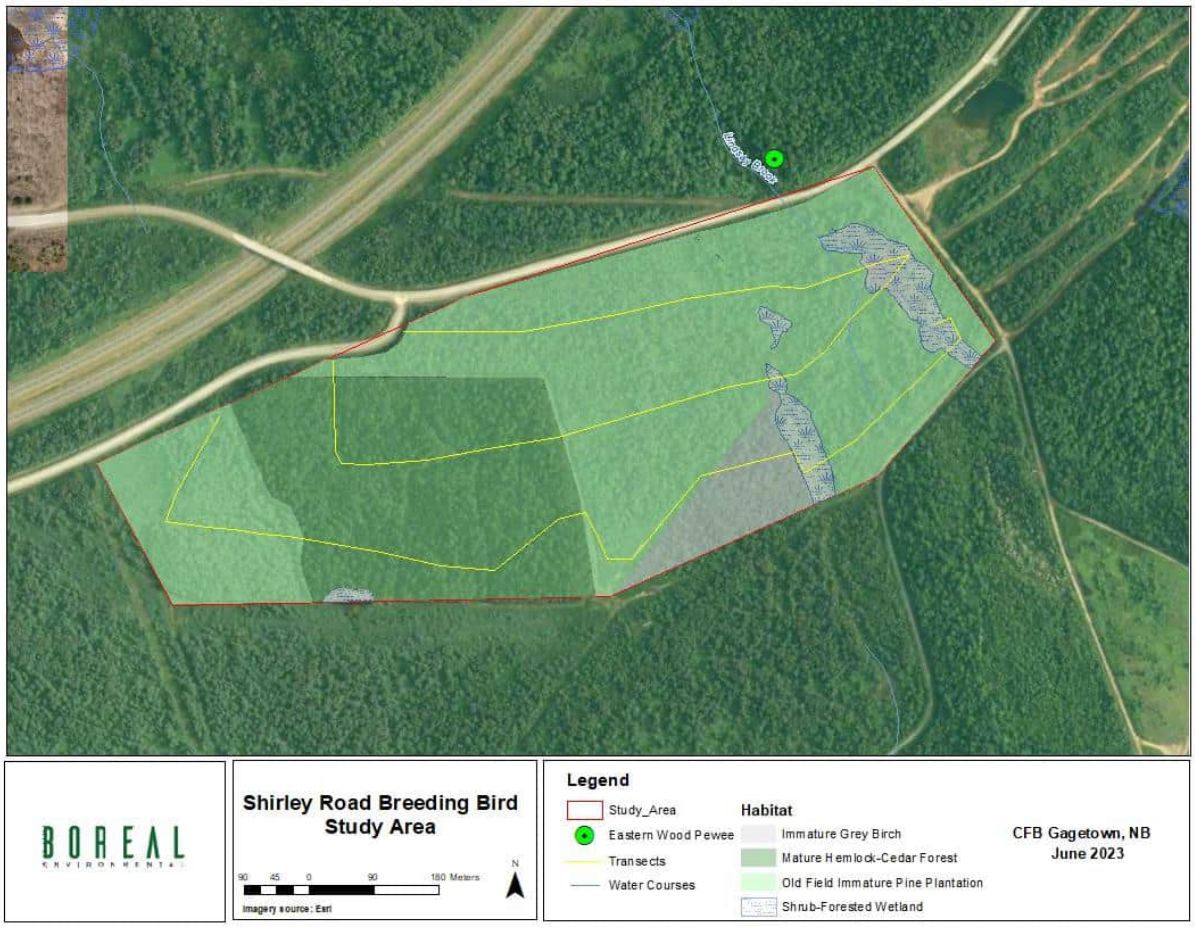


Figure 1 Study area with transect layout, major habitat types, and SAR location.

Methods

Boreal biologists conducted an area search along transects within the study area on the Morning of June 30 2023 (Temp 17-18C, Beaufort 1-2) The two transects (shown as black lines on Figure 1) were positioned at approximately 200m apart so that birds could be detected for the entire study area. Two surveyors began each transect at 6:30 AM and

slowly traversed each line recording all birds detected by sight or sound and each point was positioned at the estimated location of the bird. We recorded a total of 296 birds in an adjacent to the Study Area. No Species at Risk (SAR[1]) or Species of Conservation Concern (SOCC[2]) were found within the Study Area but one Eastern Wood Pewee was recorded just outside the Study Area on the northern side of the Shirley Road (as shown by the yellow dot on the map screenshot below.

Results – Birds

The weather on June 12th 2023 was calm (<Beaufort 2) and clear with temperature ranging from 17 degrees Celsius at 6:30 AM to 18 degrees by 9 AM. A total of 295 individual birds from 44 different species were recorded during the transects as listed in Table 3. The most numerous species recorded were ovenbird (25) and American Redstart (22). One bird SAR/SOCC was recorded.

Eastern Wood Pewee (S3B Special Concern under SARA) – One individual was recorded during breeding bird survey occurring outside the PDA, to the northeast of the Study Area on the north side of Shirley Road. Eastern Wood-Pewees are found in the mid-canopy layer of forest clearings and edges of deciduous and mixed forests (COSEWIC, 2012). These habitat conditions are available in the surrounding region around the study area but not abundant in the Study Area.

The locations of the single bird SAR record and transect layout is shown on the Figure 1. The raw data from the breeding bird point counts is included in Table 3.

There were no Schedule 1 protected nests under the Migratory Bird Convention Act and Regulations present. Suitable nesting habitat for species listed under Schedule 1 such as Pileated Woodpecker (*Dryocopus pileatus*) and Great Blue Heron (*Ardea herodias*) were sparse or not present with the exception of the mature cedar/hemlock habitat. This area was searched for evidence of pileated woodpecker activity but no recent activity was found and no pileated woodpeckers were recorded during the survey.

Bird Habitat Conditions

The study area shows extensive evidence of past human disturbance, including several wood roads, an abandoned amoured vehicle-launched (AVL) bridge, old agricultural fields, excavations, and white pine (*Pinus strobus*) plantations. Most of the Study area is comprised of immature pine plantation (25 ha), with lesser amounts of shrub/forested wetland (3 ha) and mature hemlock/cedar forest. There is a small (3 ha) area of nearly pure gray birch (*Betula populifolia*) that was likely once part of the pine plantation, but the plantings failed. Gray birch is scattered throughout much of the plantation habitat, particularly in the east where the soil is more poorly drained and less suited to white pine. The shrub/forested wetland habitat was mostly speckled alder (*Alnus incana*) dominated, with open blue-joint reedgrass (*Calamagrostis canadensis*)-dominated beaver meadow in the middle along the associated watercourses (Lindsey Brook). A formal wetland delineation was conducted by another consultant and the results provided under a separate cover. The mature hemlock-cedar forest is an uncommon habitat type in New

[1] Listed under Provincial Species at Risk Acts.
[2] Ranked as S3 or rarer by the Atlantic Canada Conservation Data Centre.

Brunswick and is possibly home to a breeding pair of broad-winged hawks as they were recorded here, though no nest was found.

Table 1 Summary of Avian Habitat Types

Habitat Type	Area (ha)
Immature Grey Birch	3
Mature Hemlock-Cedar Forest	13
Old Field Immature Pine Plantation	25
Shrub-Forested Wetland	3
Total	44

Table 2 Representative photos of habitat types.

Mature Hemlock/Cedar (10 ha)

Old Field Immature Pine Plantation (22 ha)

Shrub/Forested Wetland (10 ha)

Immature Grey Birch (2 ha)

Table 3 List of birds encountered during the breeding bird survey.

Common Name	Scientific Name	SARA Status	ACCDC RANK	Count
Alder Flycatcher	*Empidonax alnorum*		S5B	3
American Crow	*Corvus brachyrhynchos*		S5	3
American Goldfinch	*Spinus tristis*		S5	4
American Redstart	*Setophaga ruticilla*		S5B	22

Common Name	Scientific Name	SARA Status	ACCDC RANK	Count
American Robin	*Turdus migratorius*		S5B	10
American Woodcock	*Scolopax minor*		S5B	1
Black-and-white-Warbler	*Mniotilta varia*		S5B	17
Blackburnian Warbler	*Setophaga fusca*		S5B	4
Black-capped Chickadee	*Poecile atricapillus*		S5	8
Black-throated Blue Warbler	*Setophaga caerulescens*		S5B	5
Black-throated Green Warbler	*Setophaga virens*		S5B	9
Blue Jay	*Cyanocitta cristata*		S5	7
Blue-headed Vireo	*Vireo solitarius*		S5B	8
Broad-winged Hawk	*Buteo platypterus*		S5B	3
Brown Creeper	*Certhia americana*		S5	3
Cedar Waxwing	*Bombycilla cedrorum*		S5B	3
Chesnut Sided Warbler	*Setophaga pensylvanica*		S5B	18
Common Yellowthroat	*Geothlypis trichas*		S5B	6
Dark-eyed Junco	*Junco hyemalis*		S5	1
Downy Woodpecker	*Dryobates pubescens*		S5	1
Eastern Wood Pewee	*Contopus virens*	Special Concern	S3B	1
Golden-crowned Kinglet	*Regulus satrapa*		S5	11
Gray Catbird	*Dumetella carolinensis*		S4B	2
Hairy Wood pecker	*Dryobates villosus*		S5	1
Hermit Thrush	*Catharus guttatus*		S5B	2
Least Flycatcher	*Empidonax minimus*		S4S5B	5
Magnolia Warbler	*Setophaga magnolia*		S5B	6
Nashville Warbler	*Leiothlypis ruficapilla*		S4S5B,S5M	5
Northern Flicker	*Colaptes auratus*		S5B	3
Northern Parula	*Setophaga americana*		S5B	10
Ovenbird	*Seiurus aurocapilla*		S5B	25
Philidelphia Vireo	*Vireo philadelphicus*		S5B	1
Pine Warbler	*Setophaga pinus*		S5B	9
Purple Finch	*Haemorhous purpureus*		S4S5B,SUN,S5M	1
Red-breated Nuthatch	*Sitta canadensis*		S5	1
Red-eyed Vireo	*Vireo olivaceus*		S5B	20
Song Sparrow	*Melospiza melodia*		S5B	3
Swainson's Thrush	*Catharus ustulatus*		S4S5B	3
Swamp Sparrow	*Melospiza georgiana*		S5B	1
Veery	*Catharus fuscescens*		S4B	19
White-throated Sparrow	*Zonotrichia albicollis*		S5B	16
Wild Turkey	*Meleagris gallopavo*		SNA	1
Yellow Warbler	*Setophaga petechia*		S5B	10
Yellow-rumped Warbler	*Setophaga coronata*		S5B	3

Mitigation - Migratory Birds

To avoid harmful effects on migratory and SAR birds in the implementation of the project, it will be necessary to avoid clearing within the breeding season (May 15th August 31st) to

the extent possible. If any clearing is required within this window, the area should be searched for evidence of breeding birds prior to disturbance and any active nests protected with a no-disturbance buffer. If during any stage of construction, evidence of an active nest is encountered, CWS and or NBNRED will be contacted, and work will not progress in that area until the young have fledged and are clear of the nesting area. The loss of habitat within the PDA is not anticipated to have a detrimental effect on populations of the bird species encountered in the Study Area as the conditions on the site are not limiting at the landscape level, with the possible exception of the mature cedar/hemlock forest which is somewhat unusual. However, no bird SAR or SOCC were encountered using that habitat during the survey and no species encountered should require additional specific mitigation as long as clearing is conducted outside the breeding season and all disturbance around active nests is avoided.

There were no Schedule 1 protected nests under the Migratory Bird Regulation present.

Kind Regards,

Greg Quinn
Senior Terrestrial Ecologist
Boreal Environmental
506 461-0443

Appendix B

Project Communications

NOTICE

Registration of Undertaking
Environmental Impact Assessment Regulation
Clean Environment Act

Opportunity for Public Comment

On DATE Department of National Defence registered the following project with the Department of Environment and Local Government in accordance with Section 5(1) and Schedule "A" of the Environmental Impact Assessment Regulation: **Gagetown Renewable Energy Agreement**.

The Government of Canada is committed to using 100% clean electricity by 2025 and through the Pan Canadian Framework on Clean Growth and Climate Change, will produce and purchase new renewable electricity that will displace production of the high carbon portion of the electricity grid. The Government of Canada is also targeting industry to reduce greenhouse gases (GHGs) and look to the electricity sector as a priority for this reduction. To respond to this goal, the Department of National Defence proposes to issue a request for proposal for the development of a second solar farm to be located at the 5th Canadian Division Support Base (5 CDSB) Gagetown, also known as Base Gagetown. The second solar farm is expected to be 9 MW in size, with a 5 MW battery storage system and will partially supply the electricity requirements of the Base.

The proponent's registration document can be examined at: 5 CDSB Gagetown, 238 Champlain Ave., Oromocto, NB and at the Dept. of Environment and Local Government, Environmental Impact Assessment Branch, 2nd floor, 20 McGloin Street, Fredericton, NB.

To help inform this decision, the Department of National Defence is inviting comments from the public on the project and its potential effects on the environment. You can comment by email, or by post on or before DATE, and direct your correspondence to:
Jon Parker, P.Eng
Senior Project Manager, Real Property Operations Detachment (Gagetown)
Post Office Box 17000 Station Forces, Oromocto New Brunswick, E2V 4J5
E-mail Address: Jon.Parker@forces.gc.ca

Additional information about the proposal and the public information process is available at: INSERT LINK WHEN AVAILABLE Notice Placed by: Department of National Defence.

AVIS

Enregistrement d'un ouvrage en vertu du Règlement sur les études d'impact sur l'environnement
Loi sur l'assainissement de l'environnement
Occasion de faire des commentaires

Le DATE, le Ministère de la Défense nationale a enregistré l'ouvrage suivant auprès du ministère de l'Environnement et des Gouvernements locaux conformément au paragraphe 5(1) et à l'annexe A du Règlement sur les études d'impact sur l'environnement : Accord d'achat d'énergie verte à la 5e Division du Canada Gagetown.

Le gouvernement du Canada s'est engagé à utiliser si possible 100% d'électricité propre d'ici 2022 et, par l'entremise du Cadre pancanadien sur la croissance propre et les changements climatiques, va produire et acheter une nouvelle électricité renouvelable qui remplacera celle qui est produite par la portion riche en carbone du réseau électrique. Le gouvernement du Canada cible également l'industrie pour réduire les gaz à effet de serre (GES) et considère le secteur de l'électricité comme une priorité pour cette réduction. Pour répondre à cet objectif, le ministère de la Défense nationale propose de lancer une demande de proposition pour le développement d'un parc solaire qui sera situé à la base de soutien de la 5e Division du Canada Gagetown, également connue sous le nom de Base Gagetown. Le parc solaire devrait avoir une taille de 5 MW et couvrira partiellement les besoins en électricité de la base qui a une demande de pointe d'environ 7,5 MW.

Le document d'enregistrement du promoteur peut être examiner aux lieux suivants: 5CDSB Gagetown, et au ministère de l'Environnement et des Gouvernements locaux, Direction des études d'impact sur l'environnement, 20, rue McGloin, Fredericton (N.-B.). Il est aussi accessible sur le site Web du ministère de l'Environnement et des Gouvernements locaux à l'adresse : http://www2.gnb.ca/content/gnb/fr/ministeres/egl/environnement/content/etude_d_impact environnemental/enregistrements.html.

Le Ministère de la Défense nationale a l'intention de déterminer si la réalisation du projet est susceptible d'entraîner des effets négatifs importants sur l'environnement. Afin de contribuer à une prise de détermination éclairée, le Ministère de la Défense nationale invite le public à formuler des commentaires jusqu'au DATE sur cette détermination. Les commentaires écrits peuvent être présentés à:

Ministère de la Défense nationale
Jon Parker, Gestionnaire principal de projet, Real Property Operations Detachment (Gagetown)
Case postale Succursale Bureau-chef 17000
Oromocto (Nouveau-Brunswick) E2V 4J5
Courriel : Jon.Parker@forces.gc.ca

Des renseignements supplémentaires au sujet de la proposition et du Règlement sur les études d'impact sur l'environnement sont accessibles en visitant le INSÉRER LE LIEN LORSQU'IL EST DISPONIBLE, sous la rubrique « Ministères » > « Environnement et Gouvernements locaux » > « Étude d'impact environnemental » > « Projets à l'étude ».

Avis publié par: Ministère de la Défense nationale