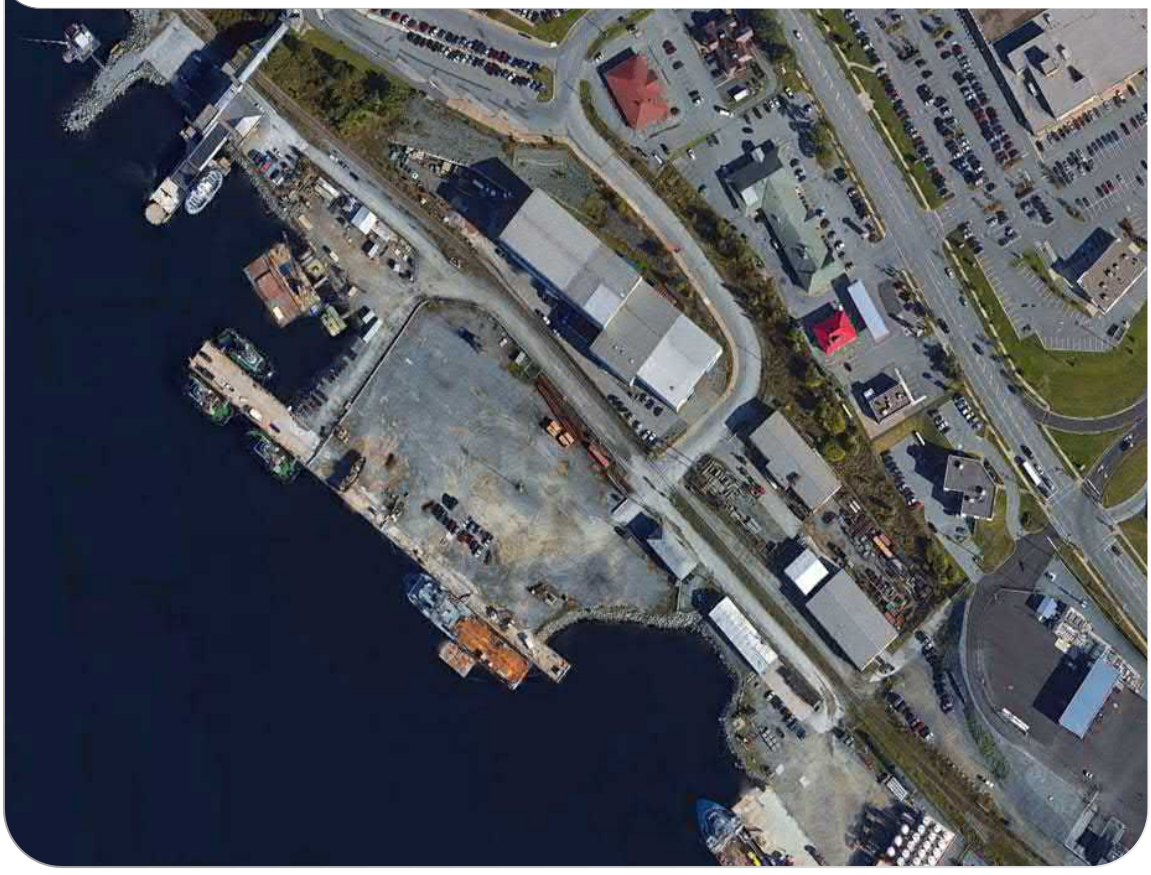
DILLON CONSULTING

IRVING SHIPBUILDING INC.

Environmental Assessment (EA) Registration

Temporary Material Staging Facility (TMSF)

Woodside, Dartmouth, Nova Scotia



January 2024

January 17, 2024

137 Chain Lake Drive
Suite 100 Halifax,
Nova Scotia,
Canada
B3S 1B3
Telephone
902.450.4000
Fax
902.450.2008

Nova Scotia Environment and Climate Change
Environmental Assessment Branch
Suite 2085, 1903 Barrington Street
Halifax, NS
B3J 3L6

Attention: Bridget Tutty, M.Sc.
Manager, Environmental Assessment Branch

RE: Environmental Assessment (EA) Registration: Temporary Material Staging Facility (TMSF) Project at Woodside, Deepwater Drive, Nova Scotia

On behalf of Irving Shipbuilding Inc. (ISI), Dillon Consulting Limited (Dillon) is pleased to submit this environmental assessment (EA) registration document for the proposed temporary materials staging facility Project at Woodside on Deepwater Drive in Dartmouth, Nova Scotia, for your review and consideration.

Dillon looks forward to your timely review of the documentation. Please contact the undersigned if you have any questions or require additional information.

Sincerely,

DILLON CONSULTING LIMITED

Geoff Allaby
Partner

GMA:jmt

Enclosure

Our file: 23-5763

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Executive Summary

This document is an environmental assessment registration document (EARD) herein referred to as Environmental Assessment (EA) for a proposed Temporary Material Staging Facility (TMSF) developed by Irving Shipbuilding Inc. (ISI) in Dartmouth, Nova Scotia (**Figure 1**). The Project involves the receipt, temporary storage, sorting, and dewatering of dredge material sourced from the ISI Land Level Expansion Project in Halifax, Nova Scotia.

The Project will separate debris from dredge sediment and is thus deemed an "undertaking" under item (E.2) of Schedule A of the Nova Scotia *Environmental Assessment Regulations –Environment Act* (EA Regulations) ["*(E.2) A facility for treating, processing or disposing of contaminated materials that is located at a site other than where the contaminated materials originated"*]. As such, the Nova Scotia Department of Environment and Climate Change (NSECC) has determined that the Project must be registered as a Class I EA.

This EA has been developed to initiate the regulatory process for a TMSF in one of two adjacent and nearly identical locations in Woodside, Dartmouth (the Project). While ISI is seeking to permit two locations (Woodside Lot and Mobil Lot) for the construction of the facility, only one site will be selected for eventual use. The registration document has been prepared by Dillon and the Proponent, ISI, in alignment with the publication titled "A Proponent's Guide to Environmental Assessment" (NSE 2018).

To evaluate potential interactions and pathways between the Project and the surrounding environment, the following valued components (VC's) were assessed:

- Marine Environment

No other pathways between the Project and valued components (VCs) were identified for the Project, given activities will occur in an existing industrial site. Where interactions exist, mitigation measures for minimizing environmental effects were developed to limit project-environment interactions.

The assessment of potential environmental interactions concluded that, with the application of mitigation and appropriate site management practices, adverse residual environmental effects from the Project are unlikely to be substantive and should not be significant in nature. VC interactions and mitigations are discussed in further detail in **Section 3.0**.

Registration Requirements Concordance Table

Requirement:	Section
Name of the proposed undertaking	1.0 Introduction
The location of the proposed undertaking	2.1 Project Location
The name, address and identification of the proponent	1.0 Introduction
List of contact persons for the proposed undertaking and their contact information	1.0 Introduction
The name and signature of the Chief Executive Officer or a person with signing authority, if the proponent is a corporation	10.1 Signature
Details of the nature and sensitivity of the area surrounding the proposed undertaking	2.0 Project Description 3.3 Interactions Between the Project and the Environment 3.4.2 Existing Conditions
The purpose and need for the proposed undertaking	1.1 The Undertaking
The proposed construction and operation schedules for the undertaking	2.5 Project Schedule
A description of the proposed undertaking	2.0 Project Description
Environmental baseline information	3.4.2 Existing Conditions
A list of the licenses, certificates, permits, approvals and other forms of authorization that will be required for the proposed undertaking	1.2 Regulatory Context
All sources of any public funding for the proposed undertaking	2.6 Funding
Steps taken by the proponent to identify the concerns of the public and aboriginal people about the adverse effects or the environmental effects of the proposed undertaking	6.0 Public, Stakeholder, and Indigenous Involvement
Concerns expressed by the public and aboriginal people about the adverse effects or the environmental effects of the proposed undertaking	6.0 Public, Stakeholder, and Indigenous Involvement

Requirement:	Section
Steps taken or proposed to be taken by the proponent to address concerns of the public and aboriginal people identified under subclause (xiv)	6.0 Public, Stakeholder, and Indigenous Involvement

1.0 Introduction

Irving Shipbuilding Inc. (ISI) is planning a "land level" expansion of its Halifax Shipyard, to enable the fabrication, launching, and maintenance of the Canadian Surface Combatant (CSC) ships. Construction of the land level expansion will involve dredging, placing concrete caissons, and filling the area behind the caissons. This area will be subsequently developed with necessary buildings and equipment to enable the fabrication, launching, and maintenance of the next class of CSC vessels that are being developed under the National Shipbuilding Strategy. The land level site is located on federal lands and accordingly was reviewed under Section 82 of the federal Impact Assessment Act. It was determined that the proposed Halifax Shipyard Land Level Expansion is not likely to cause significant adverse environmental effect (see https://iaac-aeic.gc.ca/050/evaluations/proj/83755). In addition, the following regulatory approvals were issued for the planned activities at the Land Level project site:

- Ministerial approval under the Canadian Navigable Waters Act (https://nwar-rlen.tc.canada.ca/files-dossiers/2009-200525?s=land%20level&m=true&f=e30=&GoCTemplateCulture=en-CA)
- An authorization was issued under the Fisheries Act (https://far-rlp.dfo-mpo.gc.ca/files-dossiers/22-HMAR-00287?s=land%20level&m=true&f=eyJzb3VyY2UiOiJERk8tTVBPIn0=&GoCTemplateCulture=en-CA) .

Dredging of approximately 330,000 m^3 of sediments is required to remove compressible soft sediments to provide a stable base for the land level infrastructure. Project planning recently determined that the dredged sediment needs to be sorted to remove Construction and Demolition (C&D) debris. The dredge sediments will be initially saturated with water and will be temporarily stockpiled to provide time for dewatering prior to transport to an approved land-based disposal facility. Currently there is no approved facility within the vicinity of the Halifax harbour capable of receiving marine sediments for sorting and dewatering. Accordingly, ISI has decided to construct a Temporary Material Staging Facility (TMSF). This temporary facility will be located on provincial lands along the Dartmouth waterfront.

The Project may be identified as the "TMSF in Woodside". The proponent of the Project is Irving Shipbuilding Inc. The Proponent's contact information is provided in **Table 1** below.

Table 1: Proponent Information

Name of Project:	Temporary Material Staging Facility in Woodside
Name of Proponent:	Irving Shipbuilding Inc.
Mailing Address of Proponent:	P.O. Box 9110, 3099 Barrington Street Halifax, Nova Scotia B3K 5M7
Proponent's Contact Person for the purposes of this EA Registration:	James Ragan Project Manager Mobile: 902-478-3908 Email: Ragan.James@irvingshipbuilding.com Website: irvingshipbuilding.com
Environmental Consultant that led the preparation of this EA Registration:	Dillon Consulting Limited Geoff Allaby Office: (902) 450-4000 Email: gallaby@dillon.ca

1.1 The Undertaking

A high-level description of the undertaking is provided in this section.

1.1.1 Project Overview (Nature of the Undertaking)

The proposed Project consists of the short-term sorting and dewatering of dredged material from the Halifax Harbour to facilitate disposal at an appropriate offsite facility. These planned activities will occur within a bermed area underlain with a geomembrane liner for the temporary containment of dredged sediments and elutriate water produced from dewatering. The two properties under consideration would see the TMSF constructed and operated using the same practices, equipment, and materials. Two sites are being considered due to limited wharf capacity and therefore, site selection will depend on availability at the time dredging operations commence. For a summary of the proposed facilities refer to **Section 2.3** and for site plans refer to **Appendix A.**

Project activities include receiving materials at the TMSF via scow or barge from the ISI Land Level Expansion Project, which will be unloaded into the TMSF. Within the TMSF, the dredged material will be screened to remove large debris and C&D material. The screened and sorted materials will then be stockpiled within the bermed management area to allow for dewatering prior to final transport and disposal via truck to a provincially licensed waste facility.

Water that collects in the TMSF will be collected in a sump and pumped as required into a small water containment area for eventual discharge into the Halifax Harbour provided water quality monitoring results are within the acceptable parameters. If the water is identified as not meeting the discharge water quality objectives, it will be transferred to a provincially licensed wastewater treatment facility for further treatment, or a temporary onsite treatment skid will be installed.

IRVING SHIPBUILDING INC.

TEMPORARY MATERIALS STAGING FACILITY (TMSF)

PROJECT LOCATION

FIGURE 1

★ Site Location

SCALE 1:50,000

0 600 1,200 2,400 m

MAP DRAWING INFORMATION:
DATA PROVIDED BY ISI, ESRI

MAP CREATED BY: SCM
MAP CHECKED BY: APY
MAP PROJECTION: NAD 1983 CSRS UTM Zone 20N

DILLON CONSULTING

PROJECT: 235763
STATUS: DRAFT
DATE: 2023-10-05

FILE LOCATION: \\dillon.ca\DILLON_DFS_projects\GIS\2023\235763\product\Client\EA\F1_ProjectLocation.mxd

1.1.2 Purpose/Rationale/Need for the Project

The marine sediments from the ISI Land Level Expansion project retains a high moisture content when initially excavated from the dredge prism. Based on the industrial history of the dredge location, and knowledge of nearby dredge activities, the dredge material is expected to contain a significant amount of C&D debris. The proposed TMSF allows for free water/elutriate to drain and mechanical sorting of debris from dredge sediment prior to transport offsite to appropriate land-based disposal facilities.

1.2 Regulatory Context

The regulatory framework that is expected to apply to the Project, is discussed below.

1.2.1 Provincial Legislation

It has been determined by the Nova Scotia Department of Environment and Climate Change (NSECC) that the Project is subject to the Nova Scotia *Environmental Assessment Regulations* under the *Environment Act*. Further information on the applicable provincial regulatory framework for the Project is provided below.

1.2.1.1 Environmental Assessment Regulations

The Nova Scotia *Environmental Assessment Regulations* under the *Environment Act* (EA Regulations) establishes the EA process in Nova Scotia. The EA Regulation requires that all "undertakings" listed on Schedule A of the EA Regulations (including their proposed construction, operation, modification, extension, abandonment, demolition, or rehabilitation) require registration.

Schedule A of the EA Regulations establishes Class I and Class II categories of developments that are considered undertakings. Based on feedback received in August 2023, theproposedscreening, sorting and removal of debris from the dredge sediments at the TMSF is considered by NSECC to constituite a Class I undertaking according to item (E.2) of Schedule A of the EA Regulation, as follows:

> *"(E.2) A facility for treating, processing or disposing of contaminated materials that is located at a site other than where the contaminated materials originated"*.

Removal of C&D material from the dredge sediment was determined to constitute 'processing' and thus falls under item (E.2) of Schedule A. It should also be noted NSECC's review considered other activities that that may occur on the site and was determined that there are not requirements under EA regulations for the storage of uncontaminated building material, loading dredge material directly in trucks, and dewatering of dredge material.

Given this determination, this document was prepared to register the Project under the EA Regulations, and an EA review will need to be conducted by selected provincial and/or federal government agencies under the direction of NSECC.

1.2.1.2 Other Potential Provincial Authorizations, Approvals, Permits, Licenses, and Leases

It is expected that an Industrial Approval under the *Environment Act* will be required for the Project. The proponent is unaware of any other required provincial regulatory authorizations, approvals, permits, or licenses at the time of submitting this registration document.

1.2.2 Federal Legislation

The Proponent is currently unaware of any federal permits, approvals, or authorizations required to for this TMSF.

2.0 Project Description

This section provides a description of the components of the Project, as currently conceived and based on the available information at the time of writing. The key aspects of the Project are described below, including:

- The activities that will be carried out and planned mitigation for potential environmental effects;
- Project-related emissions, and other requirements and their management; and,
- Key accidents, malfunctions or unplanned events that could occur, and planned response.

2.1 Project Location

The Project area is defined in this report as the 5.6 acres of land within the parcels at 79 and 119 Deepwater Drive in Dartmouth, Nova Scotia (Parcel Identifiers [PID] 00639732, 00232785, 00638197 and 00639674), coordinates 44°38'50 N, 63°32'52 W and 44°38.45 N, 63°32,46 W respectively.

As shown in **Figure 2**, the Project location encompasess two (2) adjacent locations "Mobile Lot" and "Woodside Lot", both are active industrial sites and are further described in **Section 2.2.**

2.2 Description of Site Attributes

The Project Area was selected for the TMSF due to the following factors:

- The Site encompasses an active marine facility and receiving docks that can receive dredge material directly from the scows and/or barges.
- The location of the Project is near the Land Level Expansion Project site, where dredge sediment will be excavated and will therefore minimize the transport distance of dredged materials.
- Its location within an already heavily industrialized setting that is zoned for such purposes, on a site that has been heavily disturbed and used for industrial activities for several decades.
- The availability of the Project area, currently being unused and suitably devoid of terrestrial environmental features.
- Project activities are consistent with current and historical land use.
- The Project is located near Highway 111 expediting the transport of dredge material to the disposal site, reducing the distance traveled and sensory disturbances in residential areas.

Other favourable characteristics of the site include the following:

- Located in an area of longstanding industrial use, with setbacks from adjacent properties;
- Secured site that is not accessible to the public; and,
- Surrounding properties are serviced by the city water supply.

IRVING SHIPBUILDING INC.

TEMPORARY MATERIALS STAGING FACILITY (TMSF)

SITE LOCATION

FIGURE 2

Temporary Dredge Spoil Storage Area (approximate)

SCALE 1:2,500

0 30 60 120 m

MAP DRAWING INFORMATION:
DATA PROVIDED BY ISI, ESRI

MAP CREATED BY: SCM
MAP CHECKED BY: APY
MAP PROJECTION: NAD 1983 CSRS UTM Zone 20N

DILLON CONSULTING

PROJECT: 235763
STATUS: DRAFT
DATE: 2023-10-05

FILE LOCATION: K:\2022\224921\Product\Client\Report Figures_Oct 2023\F2_SiteLocation.mxd

2.3 Description of Project Components

The TMSF will consist of two (2) impermeable bermed containment areas, a Material Staging Area and an integrated water containment area, and an adjacent area outside of the berm to allow for the movement of equipment and material. Drawings of the TMSF's are provided in **Figure 3**, **Figure 4,** and **Appendix A**.

2.3.1 Material Staging Areas

Material Staging Areas (MSA) are the designated areas within the TMSF and will be used for the temporary storage, dewatering, and screening of dredge material. The areas are to be graded to direct water toward a dedicated sump and enclosed with berms. They will also lined with geomembrane. These measures will contain the dredge sediments and enable the collection of both elutriate and stormwater.

The proposed areas would occupy the following:

Mobil Site – 1,600 m^2

Woodside Site – 2,800 m^2

The berms will be constructed using granular fill material. The underlying liner will be installed between layers of sand to protect it from damage and an upper layer of rock will be installed to provide a working surface for heavy equipment (refer to construction specifications in **Figure 3** and **Figure 4).**

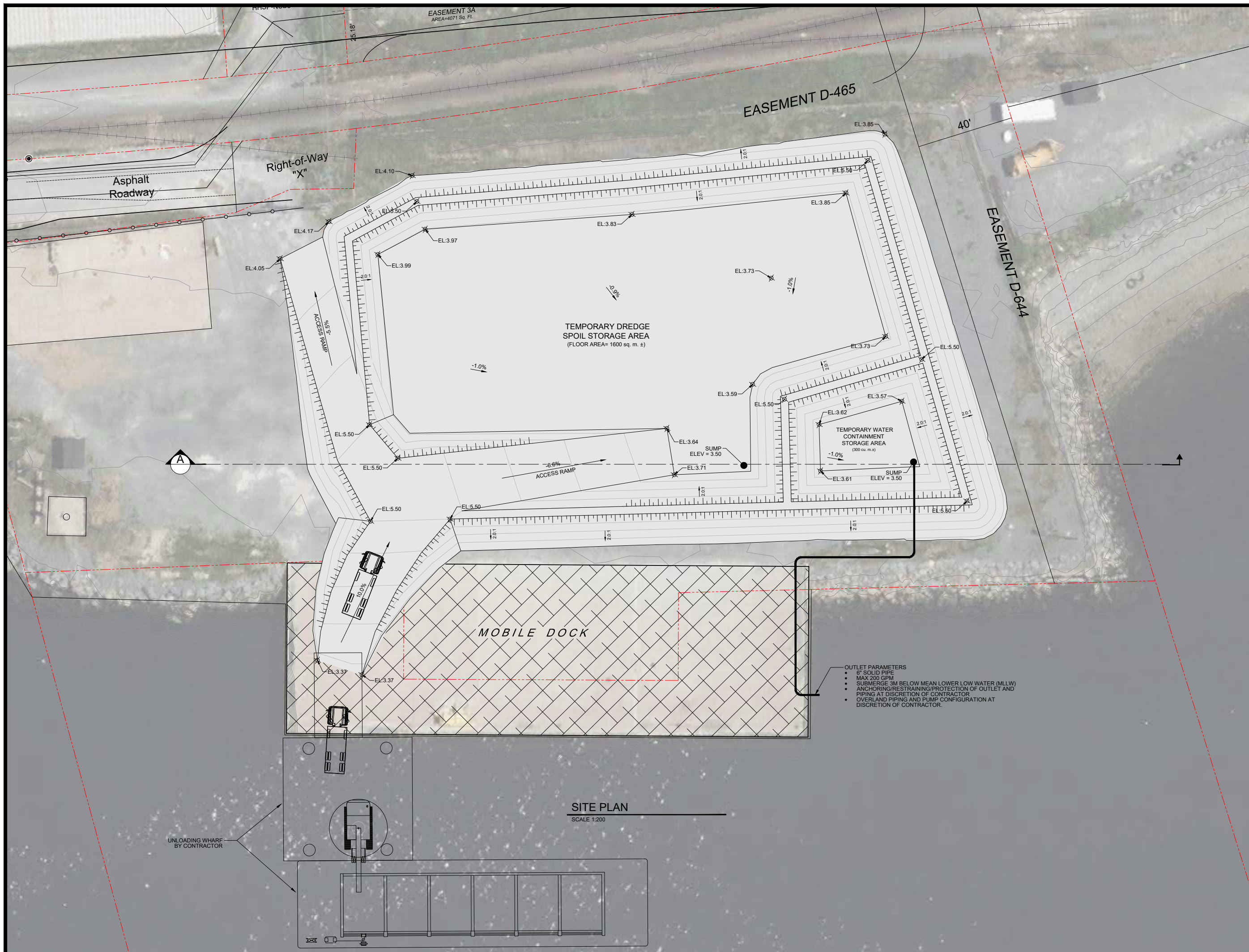
2.3.2 Water Containment Areas

Water collected in the TMSF will be transferred into adjacent water containment areas. The construction method for the Water Containment Areas is the same as the MSA's (refer to specifications in **Figure 3** and **Figure 4**). Pumps will be used to actively transfer the water from the dedicated sump in the MSA into the Water Containment Areas.

A second stage of pumps will be used to manage the water levels within the Water Containment Areas by conveying water into the Halifax Harbour. All water from the Water Containment Areas will be discharged through a dedicated outlet with an inner diameter not exceeding 150mmm (6").

2.3.3 Other Physical Components

The Project will also contain minor support facilities including an office trailer, portable washroom and on-site gravel parking for the operational workforce.



SITE PLAN
SCALE 1:200

NOTES:

GENERAL:
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED, ELEVATIONS ARE IN METRES AND ARE REFERENCED TO THE CANADIAN GEODETIC VERTICAL DATUM OF 1928.

SUBGRADE:
1. THE SUBGRADE SHALL BE REVIEWED AND APPROVED BY QUALIFIED GEOTECHNICAL PERSONNEL.

2. THE SUBGRADE SHALL BE UNIFORM, WELL-COMPACTED, AND FREE OF SHARP OR LARGE ROCK PARTICLES AND OTHER DELETERIOUS MATERIAL SUCH AS TREE ROOTS, LARGE OR PROTRUDING CONSTRUCTION DEBRIS, AND METALLIC OBJECTS.

3. THE PREPARED SUBGRADE SHALL CONSIST OF AN APPROVED SMOOTH SURFACE WITH PARTICLES LARGER THAN 100 mm REMOVED. SMOOTH, ROUNDED STONES LESS THAN 100 mm IN SIZE MAY REMAIN WITHIN THE PREPARED SUBGRADE PROVIDED THAT THEY ARE DRIVEN INTO THE SUBGRADE AND DO NOT PROTRUDE ABOVE THE FINISHED SURFACE.

4. IF THE SUBGRADE CONSISTS OF A COARSE-GRAINED MATERIAL SUCH AS GRAVEL, THE SURFACE SHALL BE PREPARED WITH THE APPLICATION OF A CUSHION LAYER SUCH AS 100 mm OF SAND OR APPROVED GEOTEXTILE.

5. THE SUBGRADE SHALL BE WELL COMPACTED.

6. ONCE PREPARED, CARE SHALL BE TAKEN TO MAINTAIN THE PREPARED SURFACE. VEHICULAR TRAFFIC ON THE COMPLETED SUBGRADE SHOULD BE LIMITED. MARKS OR RUTS LEFT IN THE SUBGRADE BY VEHICULAR TRAFFIC SHOULD BE REPAIRED AS SOON AS PRACTICAL.

7. THE SURFACE SHALL BE PREPARED IN A MANNER SUCH THAT THE INSTALLED GEOMEMBRANE REMAINS IN INTIMATE CONTACT WITH THE SUBGRADE.

GEOMEMBRANES:
1. "GEOMEMBRANE A" SHALL BE AN APPROVED 1.0 mm (40 MIL) HDPE/LLDPE LINER OR APPROVED EQUIVALENT.

2. "GEOMEMBRANE A" SHALL HAVE A ROUGHENED/TEXTURED UPPER SURFACE.

3. "GEOMEMBRANE B" SHALL BE AN APPROVED 0.5 mm (20 MIL) HDPE/LLDPE LINER OR APPROVED EQUIVALENT.

4. INSTALLATION OF GEOMEMBRANES SHALL BE PERFORMED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. DETAILS AND PROCEDURES OF INSTALLATION (INCLUDING CONNECTION DETAILS) SHOULD BE SUBMITTED TO THE ENGINEER PRIOR TO THE START OF CONSTRUCTION.

SAND:
1. SAND SHALL BE AN APPROVED HARD, GRANULAR, ROUNDED OR SUB-ROUNDED MATERIAL AND GRADED AS FOLLOWS:

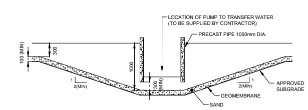
SIEVE DESIGNATION (mm)	PERCENT PASSING (%)
5.0	100
0.16	0 - 5

ROCKFILL No. 2:
1. ROCKFILL No. 2 SHALL BE AN APPROVED CRUSHED AND SCREENED, HARD, DURABLE STONE, FREE FROM CLAY AND ORGANIC MATTER AND GRADED AS FOLLOWS:

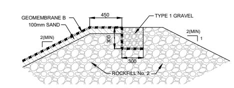
SIEVE DESIGNATION (mm)	PERCENT PASSING (%)
150	100
100	50-100
50	20-45
10	0-10

GEOTEXTILE:
1. GEOTEXTILE SHALL BE NON-WOVEN TERRAFIX 360R OR APPROVED EQUIVALENT.

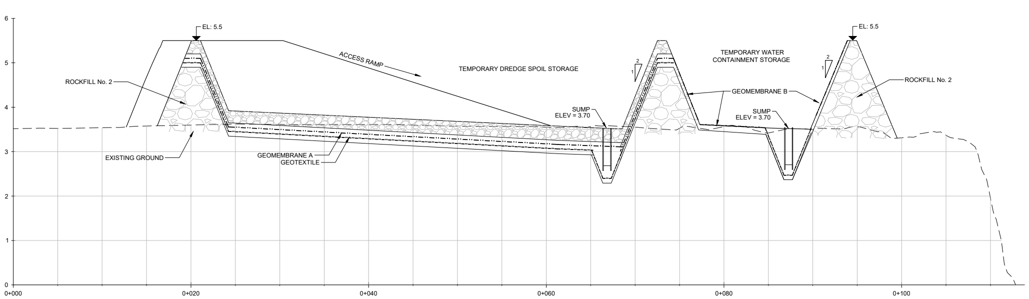
PUMPING:
1. WATER SHALL BE PUMPED FROM TEMPORARY DREDGE SPOIL STORAGE AREA TO TEMPORARY CONTAINMENT STORAGE AREA AT REGULAR INTERVALS TO PREVENT THE ACCUMULATION OF STANDING WATER.



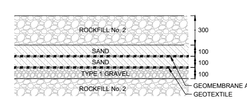
SUMP DETAIL
NTS



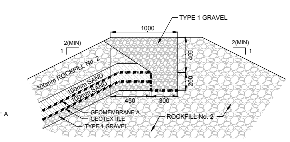
ANCHOR TRENCH DETAIL FOR TEMPORARY WATER CONTAINMENT STORAGE AREA
SCALE 1:25



A BERM SECTION
V 1:200 - H 1:40



LINER DETAIL TEMPORARY DREDGE SPOIL STORAGE AREA GEOMEMBRANE OPTION
NTS



ANCHOR TRENCH DETAIL FOR TEMPORARY DREDGE SPOIL STORAGE AREA
SCALE 1:25

GENERAL LEGEND

NORTH

DISCLAIMER

Stamp:

No.	Revision/Issue	Date	By.
A	ISSUED FOR TENDER	2023.10.04	LF

Irving Shipbuilding Inc.

Consultant's Name and Address
HATCH
1809 BARRINGTON STREET, SUITE 1009
HALIFAX, NOVA SCOTIA B3J 3K8

Consultant's Name and Address

Project Name and Address
CSC INFRASTRUCTURE - DESIGN

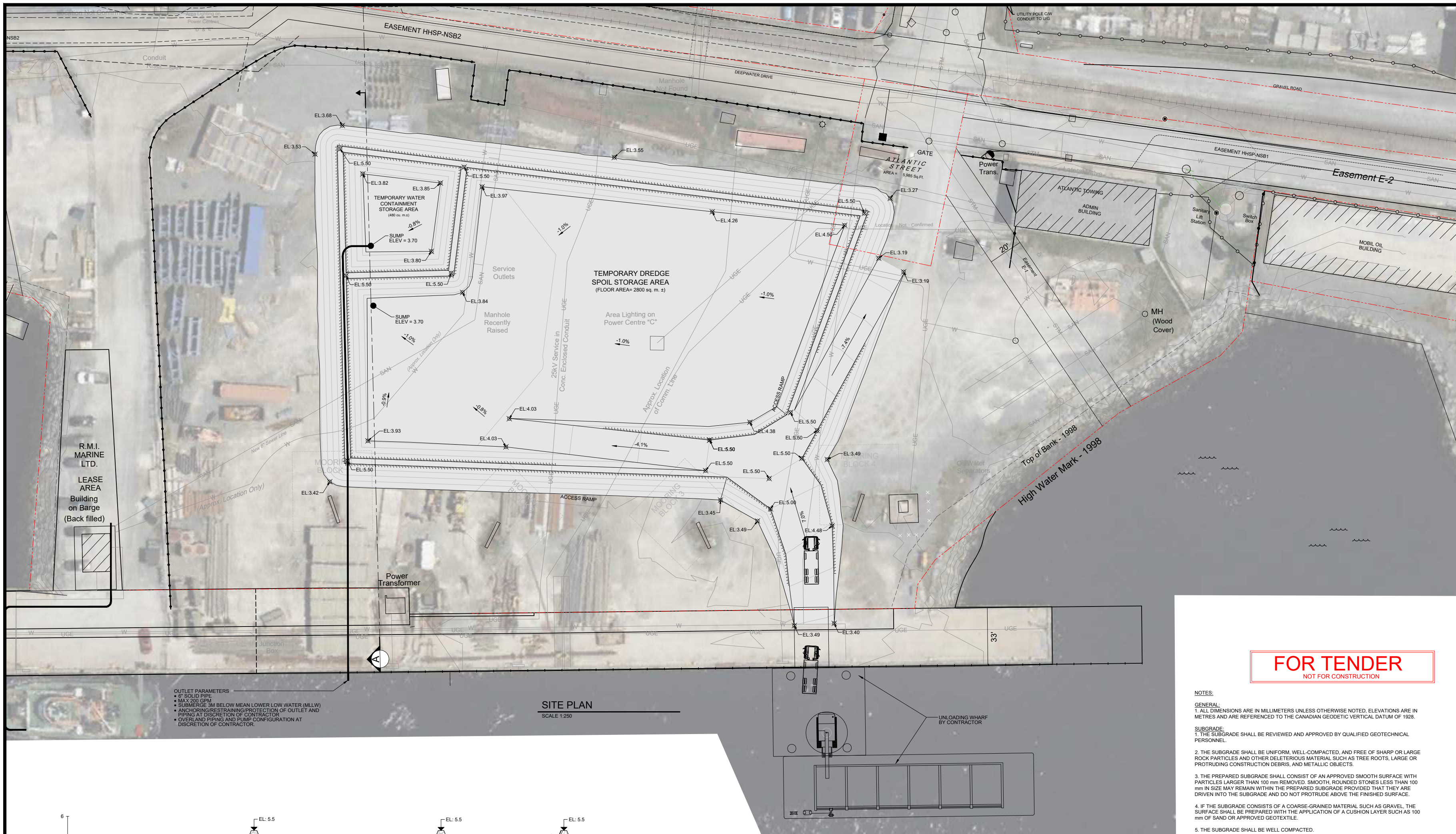
Drawing Title
MOBIL LOT
CONTAINMENT BERM
PLAN, SECTIONS, AND DETAILS

Designed By	Drawn By	Sheet
LF	BC	SK-03
Checked By: LF	Date: 2023.11.07	
Scale: 1:250		

Consultant's Drawing Number
H367584-0005-220-292-0003

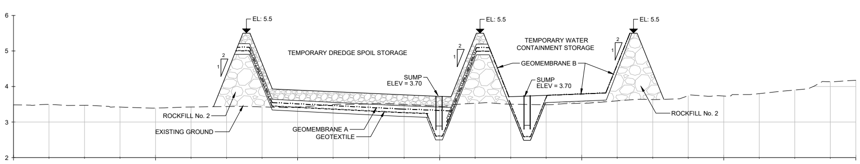
Irving Drawing Number | Rev A

Nov 22, 2023 - 7:57am Login name: COOK843274 Layout: Mobil Berm
Drawing Name: C:\pwworking\hatch-dpd-canada_central\d0178383\Mobil Berm.dwg



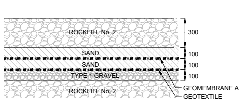
SITE PLAN

SCALE 1:250



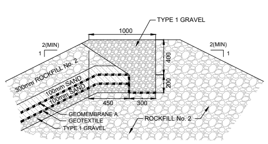
A BERM SECTION

V 1:250 - H 1:50



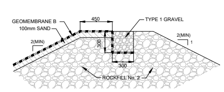
LINER DETAIL
TEMPORARY DREDGE SPOIL STORAGE AREA
GEOMEMBRANE OPTION

NTS



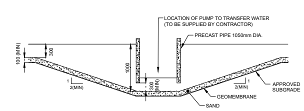
ANCHOR TRENCH DETAIL
FOR TEMPORARY DREDGE SPOIL STORAGE AREA

SCALE 1:25



ANCHOR TRENCH DETAIL
FOR TEMPORARY WATER CONTAINMENT STORAGE AREA

SCALE 1:25



SUMP DETAIL

NTS

FOR TENDER
NOT FOR CONSTRUCTION

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0.16	0 - 5

ROCKFILL No. 2:
1. ROCKFILL No. 2 SHALL BE AN APPROVED CRUSHED AND SCREENED, HARD, DURABLE STONE, FREE FROM CLAY AND ORGANIC MATTER AND GRADED AS FOLLOWS:

SIEVE DESIGNATION (mm)	PERCENT PASSING (%)
150	100
100	50-100
50	20-45
10	0-10

GEOTEXTILE:
1. GEOTEXTILE SHALL BE NON-WOVEN TERRAFIX 360R OR APPROVED EQUIVALENT.

PUMPING:
1. WATER SHALL BE PUMPED FROM TEMPORARY DREDGE SPOIL STORAGE AREA TO TEMPORARY CONTAINMENT STORAGE AREA AT REGULAR INTERVALS TO PREVENT THE ACCUMULATION OF STANDING WATER.

GENERAL LEGEND

NORTH

DISCLAIMER

Stamp:

No.	Revision/Issue	Date	By.
A	ISSUED FOR TENDER	2023.10.04	LF

IRVING
Irving Shipbuilding Inc.

Consultant's Name and Address
HATCH
1809 BARRINGTON STREET, SUITE 1009
HALIFAX, NOVA SCOTIA B3J 3K8

Consultant's Name and Address

Project Name and Address
CSC INFRASTRUCTURE - DESIGN

Drawing Title
WOODSIDE
CONTAINMENT BERM
PLAN, SECTIONS, AND DETAILS

Designed By	Drawn By	Sheet
LF	BC	SK-02
Checked By	Date	
LF	2023.10.04	
Scale		
1:250		

Consultant's Drawing Number
H367584-0005-220-292-0002

Irving Drawing Number | Rev
A

2.3.4 Property Ownership

Parcel Identifiers (PIDs) 00639732, 00232785, 00638197 and 00639674 comprise the Project area and are owned by Invest Nova Scotia. ISI currently leases these areas and is currently negotiating lease extensions to span the duration of the Project. Invest Nova Scotia is aware of ISI's plans to use the site and submit applications to NSECC to allow for the processing of dredge material.

2.4 Description of Project Phases and Activities

Project activities will be divided into construction, operation, closure, and decommissioning phases. Further information on the activities to be conducted during each Project phase is provided below.

2.4.1 Construction Phase

2.4.1.1 Construction of the TMSF

Construction of the TMSF will involve the following activities as identified in **Table 2**.

Table 2: Construction Activities

Site Activity	Description
Site Preparation	• Removal of existing materials, tools, and equipment located within the footprint of the TMSF. • Protective wrapping of immovable fixtures.
Containment Cell Construction	• Placement and shaping of granular fill using standard construction equipment. • Rock, gravel and sand (fill materials) will be used to construct berms and base of the Material Staging and Water Containment Areas. • Placement of fill material and grading of site to establish drainage gradients within the MSA. • Geosynthetic liner (geomembrane) will be installed in the Material Staging Area and Water Containment Area to render them impermeable. The liner will be installed between layers of sand to protect it from damage. • An upper layer of rock will be installed to provide a working surface for heavy equipment
Dewatering System Construction	• Installation of piping system utilizing a 150mm (6") inner diameter solid pipe. • Submersion of outflow pipe 3m below mean lower low water line.

Drawings of the TMSFs and material specifications are provided in **Figure 3**, **Figure 4,** and **Appendix A**.

2.4.2 Operation Phase

The operation phase involves the following activities as identified in **Table 3** below**.**

Table 3: Operational Activities

Activity	Description
Receiving dredged materials.	• During operation the site will receive an average of 600 m^3 (in place volume) of dredge material per day. The maximum volume of dredge material stored on-site will not exceed 20,000 m^3 at any point in time. • Dredged materials will be loaded via heavy machinery from barges in the Halifax Harbour and placed into the MSA.
Screening dredged material	• Mobile civil construction machinery will be used to screen the debris. The handling and screening will occur within the contained areas to separate large debris.
Stockpiling screened materials	• Screened materials will be separately stockpiled within the MSA. They will be loaded into trucks and transported to a provincially licensed waste management facility.
Dewatering stockpiled materials	• Due to its high initial moisture content, the dredge material will naturally dewater once piled within the MSA. To aid dewatering, the material may be moved using heavy equipment allow water to flow to the sump within the MSA. • Water released from the dredge material is referred to as *elutriate water* in this document.
Elutriate and stormwater management	• Water from the dredge spoil area (elutriate + stormwater) will be collected in the sump and pumped as required into the Water Containment Area. • Water will be pumped from the Water Containment Area to the Harbour as required. • Discharge water will be monitored as described in **Section 2.4.2.1.** • Water will be discharged at a rate of ~757 litres/min (200 imperial gallon per minute [igpm]) to the harbour. • The water containment area will be pumped out in advance of significant rain events forecasted to exceed 50mm over a 2-day period to maximize the available operational freeboard available for managing stormwater collecting within the facility. • The water containment area and pump are sized to handle a 25-year, 24-hour rainfall event, which is equivalent to 131 mm over a 24-hour period. • A full-sized spare pump will be available for additional pumping capacity or as redundancy in the event of pump failure.

Activity	Description
	• If the water results continue to show exceedances, the water will either be transported to a provincially licensed wastewater treatment facility, or a temporary treatment skid will be installed to treat the water prior to discharging to the harbour.
Loading de-watered material for off-site disposal	• Dewatered dredge material will be mechanically loaded and disposed off-site at a provincially licensed facility.

2.4.2.1 Water Discharge Criteria

To confirm there are no significant adverse effects on the local marine environment, the discharge water will be tested at a 50:1 dilution and compared to the CWQG Aquatic Life Marine (Long Term) and NS Tier I EQS Marine Surface Water limits (regulatory guidelines).

The proposed dilution factor is based on a project-specific analytical mixing zone model. A mixing zone model is standard practice for evaluating the discharge of elutriate water into receiving waters. This analysis included characterization of both elutriate water and ambient conditions (receiving water) in the harbour. The computer simulated mixing zone was developed using Cornell Mixing Expert System (CORMIX - see http://www.cormix.info) to estimate the dilution factor at the edge of the mixing zone from a discrete discharge location. Dilution ratios were computed at the edge of a 100 m mixing zone. The simulation indicates that effective dilution rates range between 61:1 and 1193:1 depending on the discharge conditions, precipitation input, outlet diameter and discharge rate. It is recommended that a conservative dilution ratio of 50:1 for a maximum discharge rate of 0.0126 m3 /s and a maximum outlet diameter of 152 mm be applied to Elutriate Discharge Objectives (EDOs) for the site. See **(Appendix C)** for the complete report including methodology and detailed results.

Water will be tested as follows:

- Samples of the discharge water will be collected weekly along with harbour background samples. The discharge water will be diluted with background harbour water at a ratio of 50:1 to create a *mixed sample that is representative of the conditions at the edge of the mixing zone*. Both the mixed and background water will be submitted to a laboratory for testing.
- The compliance limit will be the CWQG Aquatic Life Marine (Long Term) and NS Tier I EQS Marine Surface Water limits (regulatory guidelines), except in instances where background levels are above these regulatory guidelines, in which case the compliance limit will become the background.
- If the mixed water quality exceeds the compliance limit, the water will immediately be re-tested.

If the water results continue to show exceedances, the water will either be transported to a provincially licensed wastewater treatment facility, or a temporary treatment skid will be installed to treat the water prior to discharging to the harbour.

2.4.3 Closure Phases

2.4.3.1 Temporary Closure of the TMSF

The TMSF may temporarily close in between dredging phases of the Land Level Expansion Project and will require dredge materials and debris to be removed from the TMSF. During this phase, pump out of stormwater and routine monitoring for Total Suspended Solids (TSS) will be required.

2.4.3.2 Permanent Closure and Decommissioning of the TMSF

The TMSF will be decommissioned when dredging for the Land Level Expansion is complete. The surface facilities and infrastructure will be decommissioned and removed, including the removal of all lining in containment cells, berm materials, any portable office/trailers, mobile equipment, and other machinery. Fill materials used to construct the containment area and located inside the liner will be transported to an approved waste management facility. Granular materials outside the liner will be transported offsite and re-used as fill elsewhere.

2.5 Project Schedule

Construction of the cells are planned to start in February 2024 and will take approximately 1 month to complete. Decommissioning of the project will be of a similar duration.

Operation of the TMSF is coordinated with dredging activities for the Land Level Expansion Project at the Halifax Shipyard which are scheduled to occur intermittently throughout 2024 to 2026. It is currently expected that the TMSF will be in place from the beginning of 2024 and end of 2026, during this time it is anticipated to be in active use for 8 of 12 months. During periods of inactivity, the facility will be cleared of dredge materials and debris and the facility will be temporarily closed as per **Section 2.4.3**.

During operation of the TMSF, project activities may occur 24 hours a day, 7 days a week.

2.6 Funding

The Project will be funded by Irving Shipbuilding Inc. (or related private companies).

2.7 Workforce

The onsite workforce required for the Project is less than 6 individuals on site and will consist of equipment operators, labors, and a site supervisor. The site will be operated and maintained by a contractor hired by ISI.

In addition to the onsite workforce, it is anticipated that upwards of 20 truck drivers will be reporting to the site per day collecting dewatered dredge material and sorted C&D debris for off-site disposal.

During construction and decommissioning of the TMSF there will be approximately 12 individuals on site, consisting of heavy equipment operators, supervisory and management staff.

2.8 Emissions and Wastes

Air emissions for the Project will primarily originate from the combustion of fossil fuels in heavy equipment used for the movement of sediment, as well as the potential emission of fugitive dust from stored sediments within the TMSF due to wind erosion. The potential air contaminant emissions of concern include primarily particulate matter (PM, including its common size fractions PM_{10} and $PM_{2.5}$) from fugitive sources (e.g., material handling and storage), as well as combustion gas emissions such as carbon monoxide (CO), nitrogen oxides (NO_X), and sulphur dioxide (SO_2) from the combustion of fossil fuel by site equipment. There is also the potential for a low-level "mud flat" odour to be released from the sediments as they are first exposed to the atmosphere, which would diminish quickly over time as the material naturally off-gases. Measurable emissions of other air contaminants are not expected, and overall emissions are expected to be low and confined to the Project site.

Noise emissions from the Project will be associated with the operation of mobile equipment, which will be intermittent (i.e., during the movement of sediment). Given that the Project activities are occurring in an active industrialized area, noise emissions are not expected to be distinguishable from activities at other nearby facilities and largely confined to the Project site.

There will not be significant amounts of liquid wastes generated during the Project. Maintenance will be conducted onsite to prevent spills of minor quantities of waste oil and lubricants. Elutriate and stormwater will be monitored as per guidelines and accepted practices.

The project will not generate solid waste.

2.9 Accidents, Malfunctions, and Unplanned Events

Based on the nature of the Project, knowledge of the environment within which the Project is located, as well as the experience of the Proponent, the following credible accidents, malfunctions, and unplanned events have been selected for this assessment, and are described in the following sections.

2.9.1 Malfunction of Heavy Equipment

A malfunction of mobile civil construction equipment is possible during the movement of sediment that could potentially cause harm to workers on-site. A fire or fuel spill could also occur as a consequence of a malfunction of heavy equipment, potentially threatening the marine environment or birds. Particular attention will be paid to conducting Project activities in a careful and safe manner so as to reduce the risk of a serious malfunction of equipment. Equipment will be properly maintained in accordance with the manufacturer's specifications and inspected daily by operators to ensure their safe and efficient functioning. With the implementation of best practices and contingency and emergency response procedures, the potential for equipment malfunction is expected to be low.

2.9.2 Failure of Sediment Containment Measures

The malfunction or failure of the containment cell structures (including possible seepage) may cause the accidental release of stored sediment and water into the marine environment.

With the proper construction of the berms (i.e., with suitable materials and maintaining suitable slopes of the berm) and the impermeable liners, the risk of failure of the sediment containment is low. The berm will be constructed based on an engineered design to meet the appropriate standards for this Project.

3.0 Assessment of Environmental Interactions

The identification of potential interactions between the Project and the valued components (VCs) has been undertaken in consideration of the nature of the Project and its planned activities.

3.1 Scope of the Assessment

The scope of the Project to be assessed under the EA Regulations includes construction, operation and closure activities of the TMSF. It excludes the dredging activity itself as that activity is federally-regulated by Fisheries and Oceans Canada (DFO). The scope of assessment also excludes the transportation of dewatered dredge sediments or possible collection water to their disposal location as well as the disposal activities themselves at the approved receiving location.

The related Project phases, and activities to be conducted within each phase, that are subject to this EA Registration and that will be carried forward within this assessment, were defined in **Section 2.4** and are summarized in **Table 4**, below.

Table 4: Project Phases and Activities to be Carried Forward within the EA

Project Phase	Activities to be Conducted
Construction	• Construction of the TMSF, including the berms
Operation	• Placement of materials within the TMSF • Passive dewatering of dredge sediments via gravity sedimentation in readiness for transportation and disposal of dewatered sediment and water (as applicable) at approved facilities • Sorting of C&D from the sediments and disposed offsite at approved facilities.
Closure	• Temporary closure • Decommissioning of TMSF

3.1.1 Selection of Valued Components

Valued components (VCs) are components of the biophysical and socio-economic environments that are of value or interest to regulatory agencies, the public, other stakeholders, and/or Indigenous peoples. VCs are typically selected for assessment on the basis of regulatory issues, legislation, guidelines, policies, and requirements; consultation with regulatory agencies, the public, stakeholder groups, and Indigenous communities; field reconnaissance; and professional judgment.

The VCs selected for this EA registration and the rationale for their selection in relation to the Project are outlined in **Section 3.3**.

3.1.2 Spatial Boundaries

The spatial boundaries of the assessment, which represent the area in which a potential effect could occur, will typically be based on natural system boundaries for biophysical VCs, or administrative/ political boundaries for socioeconomic VCs. The evaluation of potential environmental interactions with the VCs encompasses two spatial boundaries: The Project Development Area (PDA) and the Local Assessment Area (LAA).

3.1.2.1 Project Development Area (PDA)

The PDA consists of an area of approximately 4.6 ha (i.e., conservatively assumed to be the entirety of PIDs 00639732 and 00639674) that includes the location of the TMSF and the surrounding areas on the properties.

3.1.2.2 Local Assessment Area (LAA)

The Local Assessment Area (LAA) is defined as the maximum area where Project-specific environmental interactions can be predicted and measured with a reasonable degree of accuracy and confidence (i.e., the "zone of influence" of the Project on each VC). The LAA, which can vary by VC, is summarized for each VC in **Table 5**.

Table 5: Local Assessment Areas (LAA) for Valued Components

Valued Component	Local Assessment Area (LAA)
Marine Environment (fish and fish habitat)	A 0.5 km buffer around the PDA

3.1.3 Temporal Boundaries

The temporal boundaries for the Project correspond to the timing of the construction and closure phases. These dates are provided in **Section 2.5**.

3.1.4 Mitigation

Mitigation is identified for each interaction and/or effect in an attempt to reduce the severity, magnitude, or duration of the interaction. Best management practices (based on industry guidelines and regulatory guidance documents) have been identified as appropriate mitigation measures. In addition, several acts, codes, regulations, and guidelines may require appropriate actions be conducted as mitigation measures prior to or during the interaction.

3.1.5 Characterization of Residual Effects

To determine the significance of the residual effect of the Project interaction with each VC after mitigation measures were applied, the residual effects were characterized using the following questions as a guide:

1. What is the magnitude of the effect?

2. What is the geographic extent of the effect?
3. What is the duration (short or long term) of the effect?
4. What is the frequency of the effect?
5. How does the net residual effect compare to the existing environment? Does it represent a substantive or order of magnitude negative change in baseline conditions?
6. Is there a substantive public, government or agency concern?
7. What is the ecological and/or social context for the effect?
8. Is the effect reversible?

The residual effects were then characterized using the rankings outlined in **Table 6**.

Table 6: Criteria for Characterizing the Significance of Environmental Effects

Characterization Criteria	Criteria Definition	Range of Criteria
Duration	The length of time the residual effect is expected to persist. The temporal ranges for the assessment of duration criteria take into consideration of the timing of the project phases.	**Short-term**: Effect lasts less than 6 months. **Medium-term**: Effect lasts between 6 months and two years (i.e., the duration of the construction phase of the Project). **Long-term**: Effect lasts greater than 2 years until the end of useful life of the Project.
Magnitude	A factor that accounts for size, intensity, concentration, importance, volume and social or monetary value. Due to the extensive historical and existing anthropogenic usage of the PDA, magnitude will be considered in comparison with baseline conditions rather than background conditions.	**Negligible**: No detectable changes from baseline conditions. **Small**: Relative to baseline levels (i.e., change that is not likely to have a definable, detectable, or measurable effect above baseline, potential effect is within a normal range of variation) or is below established thresholds of acceptable change (e.g., water quality guideline). **Moderate**: Relative to baseline levels (i.e., change that is definable, measurable, or detectable and differs from the average value for baseline conditions and approaches the limits of natural variation but is equal to or only marginally above standards/guidelines or established thresholds of acceptable change). **Large**: Relative to baseline levels (i.e., change that is easily definable, measurable, or detectable and from baseline conditions, exceeding guidelines or established thresholds of acceptable change and results in changes beyond the natural range of variation).

Characterization Criteria	Criteria Definition	Range of Criteria
Geographic Extent	The spatial area over which the residual effect on the VC is anticipated to occur	**Immediate**: Effects are confined to Project site (i.e., occurs within the PDA). **Local**: Effects beyond immediate Project site but not regional in scale (i.e., effect extends beyond the PDA but not beyond the LAA). **Regional**: Effects on a wide scale (i.e., effect occurs beyond the LAA).
Frequency	How often the residual effect occurs	**Once**: Effect occurs once. **Intermittent**: Effect occurs occasionally at irregular intervals. **Continuous**: Effect occurs at regular basis and regular intervals.
Reversibility	The degree of permanence of a residual effect and whether or not the residual effect can be reversed once the physical activity or activity causing the disturbance ceases	**Reversible**: Effects can be reversed (i.e., effect ceases when the activity causing it ceases, and is readily reversible over a short period of time. **Irreversible**: Effects are permanent (i.e., effect that persists even after the activity causing it ceases and cannot be reversed).
Ecological or Socioeconomic Context	The sensitivity and resilience of a VC to changes caused by the Project given existing conditions, cumulative effects of other projects and activities, and the impact of natural and human-caused trends on the condition of the VC	**High context**: The VC has high resilience to disruption in the receiving environment and can adapt to the effect. Or the characteristics of the area are relatively pristine and have not been significantly affected by human activities. **Neutral context**: The VC has neutral sensitivity and resilience to disruption in the receiving environment and may be able to adapt to effect. Or the characteristics of the area have been somewhat affected by human activities. **Low context**: The VC has low resilience to disruption in the receiving environment and will not easily adapt to effect. Or the characteristics of the area have been significantly affected by human activities.

3.2 Dredge Material Characterization

Characterization of the dredge material was important for two main reasons in relation to this EA registration:

1. To confirm that approved waste management facilities can accept the material as the TMSF is intended to the hold the material temporarily.
2. To understand the characteristics of the sediment elutriate and stormwater run-off to determine if direct discharge to the harbour is appropriate.

Laboratory testing was completed to chemically characterize the sediment and discharge water quality and assess the potential risk to human and ecological health. The following Constituents of Potential Concern (COPC) were included in the laboratory testing program:

Benzene, toluene, ethylbenzene, total xylenes (BTEX) and petroleum hydrocarbons;

- Polycyclic aromatic hydrocarbons (PAHs);
- Polychlorinated biphenyls (PCBs);
- Total Suspended Solid (TSS); and,
- Trace metals.

3.2.1 Sediment Quality

Dillon was commissioned by Hatch Limited (Hatch) on behalf of ISI to conduct a sediment sampling program (SSP) for proposed dredging associated with the Land Level Expansion Project at the Halifax Shipyard. In June 2022, sediment samples were collected from within the dredge prism using a geotechnical drill mounted on a barge. The purpose of this program was to characterize the sediment to evaluate acceptable on-land disposal options for the dredged sediments. COPC for the SSP were selected with reference to the Environment and Climate Change Canada (ECCC)'s "Guidance Document on Collection and Preparation of Sediments for Physicochemical Characterization and Biological Testing, December 1994" (ECCC 1994), and supplemented, where necessary, with parameters listed in the acceptance criteria of potential disposal facilities. The acceptance criteria of potential disposal facilities selected were:

- R3 Environmental Systems (i.e., Envirosoil) Acceptance Criteria (**Appendix D**); and
- NS Acceptance Parameters for Contaminated Soil as presented in the "Guidelines for Disposal of Contaminated Solids in Landfills" (NSE 1992, revised 2016).

The full SSP report is available in **Appendix D**. A brief summary of the results is presented as follows. Collected sediments were observed to have variable concentrations of COPC over a limited area with many samples with reported concentrations of one or more COPCs exceeding threshold values. This is likely reflective of the disturbed nature of the sediments in the Halifax Harbour; industrial activity has been occurring in this area for over a hundred years.

Since the dredge sediments exceeded COPC thresholds, a subsequent leachate extraction analysis was undertaken to determine suitability for disposal. For NS Landfills, should any parameters exceed the leachate acceptance criteria the material can only be disposed of in a designated hazardous waste landfill. Analyzed leachates were compared to the following regulatory benchmark:

- NS Acceptance Parameters for Contaminated Soil Leachate Analysis –as presented in the "Guidelines for Disposal of Contaminated Solids in Landfills" (NSE 1992, revised 2016).

A sample from BH009 was identified as having the greatest number of parameters exceeding the threshold values listed in the applicable acceptance criteria and the highest measured trace metal concentrations. Accordingly, this sample was submitted for synthetic precipitation leaching procedure (SPLP) and toxicity characteristic leaching procedure (TCLP) to assess the potential for metals in sediment to leach into groundwater and the potential for COPCs in sediment to move and leach from the sediment matrix. The SPLP was designed to simulate material sitting in-situ (in or on top of the ground surface) exposed to rainfall (with an assumption that the rainfall is slightly acidic) then "determine the mobility of both organic and inorganic analytes present in liquids, soils, and wastes" from the leachate the material would produce. Because the SPLP simulates actual environmental precipitation, and the leaching potential of a contaminant in soil or sediment, it offers a straightforward method to assess chemical mobility in the environment.

It should be noted that benzene, toluene, ethyl benzene, xylene (BTEX), petroleum hydrocarbons (PHCs) and polycyclic aromatic hydrocarbons (PAHs) were not included in the leachate analysis since initially the data was to only be compared the R3 Environmental Systems Acceptance Criteria, which do not include upper limits for these parameters.

The reported metal concentrations in the leachate sample were less than the "NS Guidelines for Disposal of Contaminated Soils in Landfills "(Leachates). The testing indicates that the material meets the NS Guidelines for Disposal of Contaminated Soils in Landfills and R3 Environmental System's acceptance criteria. ISI has confirmed with R3 that the facility is able and willing to accept the dredge material.

3.2.2 Water Quality Sampling

In January 2023, bulk sampling was conducted as part of a pilot study to assess the efficacy of dewatering dredged materials from Halifax Harbour. Materials were dredged from the harbour using a crane mounted clamshell sampler operating on the wharf platform at the Halifax Shipyard. Dredged sediments were allowed to drain in the cranes bucket to remove most of the water prior to placement in containment cells. Elutriate water discharged from the sediments and background water samples from the Harbour were collected and characterized to assess if returning the elutriate water to the harbour would have significant negative impacts on the environment.

3.2.2.1 Elutriate Quality Sampling

During the pilot, two (2) bulk sediment samples were collected. *Layer 1* represents the upper layer of sediment collected during dredging activities, and *Layer 2* represents the lower layer of sediment. Each bulk sample consisted of approximately 6 m^3 of material. Layer 1 and Layer 2 samples were placed on different collection pans and the decant water (elutriate) samples were collected on Day 0 (first day of sampling). Runoff water from the samples were also collected on Day 10 (tenth day after sampling). It

should be noted that precipitation occurred between Days 0 and Day 10 of sediment consolidation; therefore, Day 10 water samples include runoff from precipitation.

Elutriate from each sediment sample was submitted to a laboratory for analysis of the COPCs and compared to the following criteria:

- Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines (CWQG) for Protection of Aquatic Life Marine (Long Term)
- NS Tier I Environmental Quality Standards (EQS) Marine Surface Water

Criteria selected represent both the federal and provincial guidelines for marine surface water. In place of site-specific discharge criteria, the two selected criteria are appropriate for generic screening.

The results for Layer 1 elutriate and Layer 2 elutriate are shown in **Appendix B, Table 1**. Concentrations of parameters are shown next to a control sample (i.e. water samples taken directly from the harbour) and the limits imposed by CWQG and NS Tier I. Elutriate values exceeding environmental limits are shown in red. Elutriate values below the lab detection limits are shown in grey. Laboratory certificates are available upon request.

Overall, Layer 1 and Layer 2 sediment elutriate and runoff samples showed similar characteristics, with both Day 0 elutriate samples showing exceedances in arsenic, boron, cobalt, lead, nickel, benzo(a)pyrene, and pyrene, and both Day 10 runoff samples showing exceedances in boron, cobalt, lead, and pyrene (**Table 7**). COPCs in Day 0 elutriate samples were generally higher in concentration than Day 10 runoff samples, indicating that elutriate concentrations are highest during the initial dewatering and decrease over time. It is noted that the baseline control sample indicated that typical harbour water contains levels of boron (4.0 mg/L) that exceed the NS Tier I limit of 1.2 mg/L, and that elutriate and runoff concentrations from the sediment samples were generally lower than baseline.

Table 7: Exceedances in Sediment Elutriate/Runoff Samples

Elutriate type	Sample	Exceedances
Layer 1 (Upper Layer)	Day 0	Arsenic, Boron, Cobalt, Copper, Lead, Nickel, Benzo(a)pyrene, Pyrene
	Day 10	Boron, Copper, Lead, Pyrene
Layer 2 (Lower Layer)	Day 0	Arsenic, Boron, Cadmium, Cobalt, Lead, Nickel, Benzo(a)pyrene, Pyrene
	Day 10	Boron, Cobalt, Lead, Pyrene
Control	-	Boron

3.2.2.2 Lethality Testing

As water samples collected during the bulk sediment sampling program exceeded some of the environmental criteria, lethality testing was conducted to assess the potential risk to marine ecological health of the elutriate and the requirement (if any) for treatment of the water prior to discharging to the harbour. The results of lethality testing are shown in **Table 8**.

Table 8: Threespine Stickleback 96hr 100% Concentration Results for Collected Elutriate and Runoff Samples

Sediment Type	Water Sample	Total Mortality (%)	Acutely Lethal?
Layer 1 (Upper Sediment Layer)	Day 0	0	No
	Day 10	10	No
Layer 2 (Lower Sediment Layer)	Day 0	0	No
	Day 10	0	No

None of the water samples were found to be acutely lethal to threespine stickleback after 96 hours at 100% concentration. The highest mortality rate was 10% for the Layer 1 Day 10 sample. Lab certificates are available upon request.

3.2.2.3 Predicted Water Quality in Mixing Zone

Using a 50:1 mixing ratio, the maximum concentrations tested in the elutriate water samples, and recent samples taken from the Halifax Harbour, the expected water quality at the fringe of the mixing zone was estimated (**Appendix B, Table 2**)**.** The results indicate that discharge water is below or analytically equivalent to the CWQG Aquatic Life Marine (Long Term) and NS Tier I EQS Marine Surface Water limits regulatory guidelines. The output confirms that in several instances the incremental change in water quality within the mixing zone is below the laboratory instrumental method precision and accuracy and thus, it is difficult to accurately compare to the regulatory guidelines. Note the baseline control sample indicated that typical harbour water contains levels of boron that exceed the NS Tier 1 limit.

Refer to **Section 2.4.2.1** for the 50:1 mixing ratio and discharge criteria justification as well as the proposed management procedure of the discharge water.

3.3 Interactions Between the Project and the Environment

Interactions between the Project activities and valued components are identified in this section (3.2) and assisted by a qualitative project interaction matrix in **Table 9**. The rationale for interaction inclusion or exclusion provided in **Sections 3.2.1 – 3.2.8**.

Table 9: Potential Interactions Between the Project and the Environment

Valued Component (VC)	Construction Phase (Construction of the TMSF)	Operation Phase (Placement of Materials within the TMSF)	Closure Phase (Decommissioning of the TMSF)
Atmospheric environment	-	-	-
Water resources	-	-	-
Marine environment (fish and fish habitat)	✓	✓	✓
Vegetation and wetlands	-	-	-
Wildlife and wildlife habitat	-	-	-
Socioeconomic environment	-	-	-
Heritage resources	-	-	-
Traditional land and resource use	-	-	-

Legend: ✓ = Potential interaction - = No interaction

VC's for which an interaction occurs and require further assessment are identified below in **Table 10.**

Table 10: Valued Component Inclusions

Valued Component	*Interaction & Rationale for Further Evaluation*
Marine Environment (Fish & Fish Habitat)	The Project may interact with the marine environment (i.e., fish and fish habitat) from accidental release of elutriate water from the dredged sediments. Decant/elutriate and runoff water from the dredged sediments will be pumped into a water containment area within the TMSF. The water will be subsequently pumped out of the water containment area and released to the marine environment provided that compliance monitoring demonstrates the water quality meets environmental screening criteria. Releases of potential water or sediment particles with elevated concentrations of COPCs is not anticipated to occur for the Project as planned. However, an interaction between the Project and the marine environment is nonetheless carried forward for further assessment, as a conservative measure.

VC's for which an interaction is not anticipated to occur and are not further assessed are identified in **Table 11**.

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Table 11: Valued Component Exclusions

Valued Component	*Interaction & Rationale for Exclusion*
Atmospheric Environment	Emissions of combustion gases and sound related to mobile equipment may occur during the construction of the containment cells during construction and during the placement of materials at the TMSF. Minor emissions of particulate matter (particularly dust) and potentially some mudflat-like odour may occur until the sediment has been transported off-site, but those emissions would decrease as the surface of the sediment layer is exposed to wind. These interactions are not considered to be substantive given this is a temporary facility and therefore assessment is not carried forward for further assessment.
Water Resources	Given the adjacent Halifax Harbour is a marine environment, the Project is not expected to interact with freshwater resources (i.e., groundwater or surface water). The nearest surface water bodies include an unnamed tributary to the Halifax Harbour, located approximately 400 m northeast, and a second unnamed harbour tributary, located approximately 1,300 m north of the PDA. There are no groundwater wells located around or near the Project, as potable water is provided to residents of the Halifax Regional Municipality via municipal services (i.e., protected watersheds and wellfields). As such, potential interactions between the Project and freshwater water resources are not expected and are not carried forward for further assessment.
Vegetation and Wetlands	The Project is not expected to interact with vegetation and wetlands since most of the PDA consists largely of gravel or impermeable surfaces (i.e., paved). The Project area is located within a heavily industrialized area, and there are no vegetation communities directly within or adjacent to the property. The area surrounding the proposed TMSF site hosts small pockets of shrubs, small trees, and herbaceous vegetation, including most likely common native species, exotic species, or invasive species indicative of disturbance that colonize available non-paved areas. There are no wetlands present within 500 m of the Project area. Therefore, potential interactions between the Project and vegetation and wetlands are not expected and are not carried forward for further assessment.

Valued Component	*Interaction & Rationale for Exclusion*
Heritage Resources	The Project will likely not interact with heritage resources. While waterfront land likely has a high potential to harbour heritage resources due to likely past occupation by Indigenous peoples, the PDA is located within a heavily industrial setting that has been used for industrial purposes for several decades and is covered by gravel or pavement such that the presence of artifacts is highly unlikely. Heritage resources are typically found during excavation within the first few metres of soil below ground surface. The proposed Project will not involve excavation below recently disturbed soils, therefore, potential interactions between the Project and heritage resources are not expected and are not carried forward for further assessment. Furthermore, with the above justification, it was concluded that an Archeology Study was not necessary for this Project.
Traditional Land and Resource Use	The Project is not expected to interact with traditional land and resource use. While the lands of Nova Scotia are unceded traditional territory of the Mi'kmaq and the area was likely used by Indigenous people since time immemorial, the PDA is located within a heavily industrial setting that has been used for industrial purposes for several decades. Traditional resource use is not expected to have occurred since the industrialization of the Project area and its surrounding area. Therefore, potential interactions between the Project and traditional land and resource use are not expected and are not carried forward for further assessment. Furthermore, with the above justification, it was concluded that a Mi'kmaq Ecological Knowledge Study (MEKS) was not necessary for this Project.
Socioeconomic Environment	The Project may interact with the socioeconomic environment through the release of noise and emissions from mobile equipment that will be used for constructing the TMSF and for the placement and transportation of the materials. Though unlikely due to the distance between the Project-related activities and the nearest residential receptors (approximately 300 m), these interactions nonetheless have a limited potential to affect adjacent receptors. These interactions are not considered to be substantive, and the effects are anticipated to be similar to those of other industrial activities that currently occur within the area and therefore are not carried forward for further assessment.
Wildlife and Wildlife Habitat (Migratory Birds)	There is no wildlife habitat present within the Project area. The facility footprint resides entirely with an industrial setting with no vegetation, connectivity corridors or adjacent wildlife habitat. Therefore, there is limited potential for wildlife and wildlife habitat to interact with the Project, except for the potential incidental presence of migratory birds.

Valued Component	Interaction & Rationale for Exclusion
	There is a low potential for migratory and other birds (particularly common species of gull that regularly use the surrounding area) to incidentally occur within the TMSF. The temporarily stored materials will however not offer food sources or preferential habitat characteristics, and therefore, it is unlikely that birds will use the TMSF for any length of time, including for foraging or breeding/nesting purposes – therefore potential interaction between the Project and birds is not carried forward for further assessment. Interactions with other forms of wildlife or wildlife habitat are not likely to occur and are not carried forward for further assessment.

3.4 Marine Environment

3.4.1 Scope of VC

The marine environment includes aquatic life (such as fish, marine mammals, and benthic macro-invertebrate species/populations) and the habitat that supports them, including coastal wetlands, estuaries, bays, channels, open ocean, and other marine habitats. The marine environment is considered a valued component (VC) of the environment because of the importance of supporting marine aquatic life as a fisheries resource for humans, as a food source for other wildlife, and in providing recreational opportunities, which are of importance to the public, stakeholders, and First Nation communities.

The marine environment was selected as a VC due to the possible environmental effects of:

- The planned discharge of water from the TMSF to the marine environment
- An unplanned release of water or sediment from the TMSF to the marine environment;
- Spillage and re-suspension of sediment in the water column as the dredge material is transferred from the barge/scow to the TMSF; and,
- Related potential effects to aquatic species listed under the federal *Species at Risk Act* (SARA) and/or the Nova Scotia *Endangered Species Act* (NS ESA).

3.4.1.1 Boundaries

Spatial and temporal boundaries were defined in **Section 3.1**.

3.4.1.2 Significance Threshold

A significant adverse residual environmental effect on the marine environment is one that:

- Results in an unauthorized destruction of fish by any means other than fishing as required in Section 32 of the *Fisheries Act*;

- Results in an unmitigated or non-compensated net loss of fish habitat as required in a *Fisheries Act* authorization;
- Results in the death of fish by means other than fishing;
- Results in a non-permitted contravention of any of the prohibitions stated in Sections 32-36 of *SARA*; or
- Alters the marine habitat within the assessment boundaries physically, chemically, or biologically, in quality or extent, in such a way as to cause a change or decline in the distribution or abundance of a viable marine population of special status that is dependent upon that habitat.

3.4.2 Existing Conditions

The Project is located within the Halifax Harbour, which is also home to one of the largest and busiest ports in Atlantic Canada. It is subject to a typical lunar tide cycle, with one high tide every 12 hours and 24 minutes, and a tidal range of approximately 1 m (DFO 2023a).

3.4.2.1 Marine Water Quality

Marine water quality monitoring continues to be conducted regularly by Halifax Regional Municipality (HRM), as well as Bedford Institute of Oceanography (BIO), at various stations throughout the Halifax Harbour and Bedford Basin (GOC 2023b).

Historically, the water quality within the Halifax Harbour has been poor (e.g., high suspended solids, high bacterial counts, high nutrient loading, etc.). This is in part due to disposal of urban waste materials in the harbour since the founding of the City of Halifax in 1749 (Dabbous and Scott 2012).

The primary sources of pollution to the Halifax Harbour historically were untreated sewage from private homes, light industry, government and university laboratories, military bases, and hospitals (Buckley et al. 1995; Scott et al. 2005). These outfalls reportedly discharged 181 million litres per day of organic and inorganic pollutants into the harbour (HRM 2006). Large amounts of trace metals, including an estimated 10,700 kg of copper, 36,000 kg of zinc, 34,600 kg of lead, and 185 kg of mercury, entered the harbour annually from a variety of sources including sewage outfalls, shipyards, and the former municipal landfill (Morales-Caselles et al. 2016).

Two surface water grab samples and a duplicate grab sample were collected on September 14, 2023, at the Woodside and Mobile properties (refer to **Table 12** for locations). Water samples were submitted to ALS Environmental Laboratory (ALS) in Halifax, Nova Scotia. ALS holds a Canadian Association for Laboratory Accreditation (CALA) as well as being accredited by the Standards Council of Canada (SCC).

Table 12: **Water Quality Sample Locations**

Sample Site	UTM Zone 20 (WGS84)	
	Easting (m)	Northing (m)
Woodside SW	456462.76	4943933.17
Mobile SW	456684.4	4943710.22

Samples were submitted for analysis of metals, nutrients, petroleum hydrocarbons (PHCs), polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs). The results of the surface water quality laboratory analyses are provided in Appendix B, Table 2. The concentration of most COPCs were below laboratory detection limits. There was one exceedance of the environmental screening criteria for metals (Boron).

The in-situ water quality parameters were also collected at the same locations as the grab samples. In-situ water quality parameters were measured within the top 0.5 m from the surface of the water using a calibrated YSI Pro Plus multimeter. The water quality parameters measured are summarized in Table 13 below.

Table 13: In-Situ Water Quality Results

Parameter	Sample Site	
	Woodside SW	Mobile SW
Temperature (°C)	20.2	20.2
Dissolved Oxygen (%)	95.7	90.7
Dissolved Oxygen (mg/L)	7.15	6.77
Specific Conductivity (ms/cm)	51.8	51.8
Total Dissolved Solids (mg/L)	33,676	-
Salinity (ppt)	34.14	34.15
pH	8.12	8.13
ORP (mV)	181.4	168

Legend: mg/L = milligrams per litre, ms/cm = milliseimens per centimetre, ppt = parts per thousand, ORP = oxidation/reduction potential, mV = millivolts

While the measured temperature presented in Table 13 is considered unsuitable for some species of fish, it is worth noting that these samples were only collected at the surface and suitable conditions for fish are expected to occur at greater depth within the harbour (MacMillan et al. 2005).

3.4.2.2 Marine Fish and Fish Habitat

Many marine and diadromous fish species live or complete part of their lifecycle within a marine estuary ecosystem such as the Halifax Harbour including the species of conservation interest discussed further in **Section 3.4.3.**

Although it has been identified that the Halifax Harbour supports a diverse population of fish, consistent use by fish of the habitat adjacent to the Woodside property is unlikely for many of the above-mentioned species. Given the known historic impacts, and the industrial nature of the Halifax Harbour, many nearshore marine fish species are not anticipated to enter or occupy the Halifax Harbour, or the Project site. As such, the presence of many of these species within the vicinity of the Project is anticipated to be transient and migratory in nature.

3.4.3 Marine Species of Conservation Interest

In this report, we define "species of conservation interest" as both "species at risk" (abbreviated SAR) or "species of conservation concern" (abbreviated SOCC). SAR includes species that are listed as "Extirpated", "Endangered", "Threatened", or "Special Concern" on Schedule 1 of the federal *Species at Risk Act* (SARA) or on the Nova Scotia *Endangered Species Act* (NS ESA). SOCC includes species that are not SAR but are listed in other parts of NS ESA, SARA, or the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).

A custom Atlantic Canada Conservation Data Centre (AC CDC) data report (refer to **Appendix E**) was obtained for a 5 km radius around the Project site. According to the AC CDC records review, there is one record of marine mammal SOCC that has been historically observed within 5 km of the Project: harbour porpoise (northwest Atlantic population; *Phocoena phocoena*). In addition, two fish SOCC have been historically observed within 5 km of the Project: striped bass (*Morone saxatilis*) and American eel (*Anguilla rostrata*).

The Fisheries and Oceans Canada (DFO) aquatic species at risk mapping (DFO 2023b) identified the following SAR as potentially occurring within the Halifax Harbour: fin whale (*Balaenoptera physalus*), blue whale (*Balaenoptera musculusI)*, North Atlantic right whale (*Eubalaena glacialis*), leatherback sea turtle (*Dermochelys coriacea)*, white shark (*Carcharodon carcharias*), and northern wolffish (*Anarhichas denticulatus*). These are all listed as "Endangered" under Schedule 1 of SARA, excepting the fin whale and northern wolffish (listed as "Special Concern" and "Threatened", respectively). The DFO aquatic species at risk mapping did not identify any critical habitat directly within the Harbour. Further details on fish and marine mammal species of conservation interest that may incidentally occur within the Halifax Harbour are provided in the subsections below.

3.4.4 Assessment of Potential Interactions between the Project and the Marine Environment

The environmental effects of the Project on the marine environment are assessed in this section.

3.4.4.1 Potential Interactions

Without mitigation, the Project could interact with the marine environment through:

- A change in local surface water quality in Halifax Harbour due to the potential release of deleterious substances; and,
- The marine environment may be impacted by elevated noise levels during transportation of materials via barge/scow, causing sensory disturbance to fish or marine mammals.

3.4.4.2 Mitigation

The following mitigation measures will be implemented:

- The bermed and impermeable Material Staging Area will be constructed to contain dredge sediment and separate it from the surrounding environment;
- The Material Staging Area and Water Containment Area will be constructed based on an engineered design to ensure they are structurally adequate and capable to containing the dredge material and water;
- Elutriate and run-off water will be collected and regularly tested to confirm it meets the discharge water quality objectives. If the water is identified as not meeting the discharge water quality objectives, it will be transferred to a provincially licensed wastewater treatment facility for further treatment, or a temporary onsite treatment skid will be installed;
- The weather forecast will be monitored for precipitation and water within the Water Containment Area will be managed to prevent overflow;
- Movement and placement of sediment will be scheduled to avoid periods of heavy precipitation and high winds;
- Unloading of dredge material will occur over a concrete wharf deck and the area will be maintained in a tidy manner to prevent spillage of dredge material during unloading; and,
- Equipment will be checked for leakage of lubricants or fuel and must be in good working order. Refueling must be done on an impermeable surface. Basic petroleum spill clean-up equipment must be on-site, and all spills or leaks must be promptly contained, cleaned up, and reported to the 24-hour environmental emergencies reporting system at 1-800-565-1633.

3.4.4.3 Characterization of Potential Interactions Following Mitigation

With respect to the marine environment, interactions with the Project are expected to be limited to incidental releases into the marine environment. Implementation of proposed procedures regarding material management and equipment cleaning will result in a low residual risk of introducing or transferring COPCs. Residual effects from operations will not be substantially different than current operations in the harbour.

Considering the above and information on discharge water found in **Section 2.4.2.1**, the residual effects on the marine environment were characterized as follows:

- **Magnitude**: small
- **Geographic extent**: immediate
- **Duration**: short term
- **Frequency**: intermittent
- **Reversibility**: reversible
- **Ecological or Socioeconomic Context**: low

3.4.5 Summary

The effects of the Project on the marine environment are expected to be localized and minimal, using standard and site-specific mitigation as identified. Appropriate measures will be taken to confirm the discharge water meets the risk-based screening criteria and thus not a risk to fish and fish habitat.

In light of the above, and in consideration of the nature of the Project, its anticipated environmental effects, and the implementation of mitigation and best practices that are known to reduce environmental effects, the residual environmental effects of the Project on the marine environment during all phases of the Project are rated not significant, with a high level of confidence. No follow-up or monitoring is proposed.

4.0 Cumulative Effects Assessment

The evaluation of potential cumulative environmental interactions with the VCs encompasses two spatial boundaries: the PDA and the LAA, which are defined in **Section 3.1.2**. The temporal scope for evaluation of potential cumulative environmental effects encompasses each of the Project phases and associated potential effects. The temporal boundaries for the Project are further defined in **Section 3.1.3** and correspond to the timing of the Project phases as were defined in the Project schedule in **Section 2.5**.

A review of the Canadian Impact Assessment Registry indicates that there are projects in various stages of review proposed in or near Halifax Harbour, including:

- Halifax Shipyard – Land Levels Expansion Project;
- South End Container Terminal Crane Tie Downs;
- South End Container Terminal Building Removal and Stacking Yard Area Increase Project;
- Tank Modifications – Halifax Harbour Terminal;
- Boat School at the Maritime Museum of the Atlantic;
- Dredging at Former Jetty – Canadian Forces Base Halifax; and
- Ocean Based Heat Pump for Building D201 – Canadian Forces Base Halifax.

A review of NS ECC's Environmental Assessment Registry indicates that there is one project with approval in the vicinity of the project: the Envirosoil Limited - Waste Oil Recycling and Water Treatment Facility Project, located at 750 Pleasant Street, approximately 2 km southeast of the PDA. The project received approval from the Minister in January of 2023.

While these future and ongoing project activities may well result in effects to VCs, those effects are not likely to overlap those of the Project either spatially or temporally in any measurable way. The overall effects of the interactions have been deemed to be not significant.

As such, the residual cumulative environmental effects of the Project in combination with other projects or activities that have been or will be carried out on marine environment during all phases of the Project are rated not significant, with a high level of confidence. No follow-up or monitoring is proposed.

5.0 Effects of the Environment on the Project

5.1 Scope of the Assessment

Effects of the environment on the project are those effects related to risks of natural hazards and influences of the natural environment on the Project. Potential effects of the environment on any project are a function of project or infrastructure design in the context of its receiving environment, and ultimately how the project is affected by the natural environment. These effects may arise from physical conditions, landforms, and site characteristics or other attributes of the environment which may act on the project such that the project components, schedule, and/or costs could be substantively and adversely changed.

With any project, there exists a potential for the project to be affected by environmental influences such as severe weather, climate change, and other factors. The potential effects have been considered in the siting, design, and implementation of the Project to minimize the possibility and magnitude of environmental effects.

5.1.1 Climate Change and Extreme Weather

During the lifespan of the Project, there is the potential for extreme weather events (i.e., hurricane, extreme rainfall, storm surge and storm tides) to interact with the project. Extreme precipitation and storms can occur in Nova Scotia throughout the year and are considered when developing mitigation measures (i.e., water containment area and pump will be sized to handle a 25-year, 24-hour rainfall event).

Given the short life span of the Project, longer term impacts resulting from sea level rise as a result of climate change is not likely to have a negative impact.

5.2 Assessment of Potential Effects of the Environment on the Project

5.2.1 Potential Effects

To assess the environmental effects of climate on the Project, current climate must be considered. Current climate conditions have been established by compiling relevant historical data and establishing a climatological background for the Project Area.

Recent climate trends (1981-2010 averages and extremes) and projection trends (current to 2100) have been assessed to determine the likelihood, and effect, of severe and extreme weather events on the Project so that they may be accounted for in both the Project design, as well as timelines of various Project components. The most relevant climate changes that could potentially have effects on the Project include:

- Increased frequency and magnitude of extreme storms accompanied by heavy precipitation, thunderstorms, and strong winds; and increased incidence of storm surge and erosion.

Each of these effects must be considered in terms of how they may adversely affect the Project if they are not accounted for in the planning, engineering and design. The environmental attributes described have the potential to affect the Project in several ways, including but not limited to:

- Barges cannot be unloaded during periods of high wind or large waves;
- Precipitation will delay dewatering of dredge material;
- A reduction in visibility and an inability to manoeuvre heavy equipment;
- Changes to the ability of workers to access the work site;
- Damage to heavy equipment and site infrastructure;
- Extreme snowfall can affect winter Project activities by causing delays in the movement of materials in and out of the PDA; and,
- During lightning storms, fault currents (defined as a current that is several times larger in magnitude than the current that normally flows) may result from a lightning strike and could result in danger to personnel and damage to infrastructure. Lightning strikes could also result in power outages from damage to power lines.

5.2.2 Mitigation

Mitigation strategies for minimizing the likelihood of a significant effect of the environment on the Project are inherent in the planning process being conducted, the application of engineering design codes and standards, construction practices, and monitoring.

The following mitigation measures will be implemented to prevent effects of climate change and extreme weather on the Project:

- The weather forecast will be monitored, and project activities will be scheduled accordingly;
- Extreme weather events are an expected work condition, and the Project schedule allows for weather conditions typical for the Nova Scotia region;
- The water containment area should be pumped out in advance of significant rain events exceeding 50 mm over a 2-day period to maximize the available operational freeboard available to manage stormwater collecting within the facility;
- Site operations will be temporarily suspended including the removal of dredge sediments and C&D material, in advance of extreme weather events involving rain events exceeding the operational design criteria for the facility (i.e., 1:25 year storm even or 131mm of rain over 24 hrs);
- Equipment will be secured to avoid damage or unplanned release of materials during the storm;

- Snow clearing and removal will be conducted to provide access to the facility; and,
- The equipment used on site will not be reliant on utility power so power outages should not significantly impact operations at the facility.

6.0 Public, Stakeholder, and Indigenous Involvement

The planned approach to public, stakeholder, and Indigenous involvement in respect of the EA of the Project is described in this section.

In accordance with the EA Regulations, direct communication with stakeholders is required. Within seven (7) days of registration, a notice will be published in a local newspaper having general circulation and in a newspaper with province-wide circulation. Where a local newspaper is not available, the notice will be posted in the local municipal buildings, post offices or other public buildings. The notice will state that written comments may be submitted to the NSECC within 30 days following the date of publication. Copies of the notice will be filed with NSECC within seven days of the publication date.

An electronic copy of the EA registration document will be made available on the NSECC EA webpage, (https://novascotia.ca/nse/ea/). Questions, comments and concerns can be submitted in writing to NSECC. All comments received from the public consultation will be posted on the department's website for public viewing.

6.1 Engagement Activities

6.1.1 Indigenous Engagement

Direct written communications regarding this project were issued to First Nations communities that engaged with ISI during the Federal regulatory review for the Land Level Expansion project. The letters found in Appendix F were sent to the following Indigenous communities and organizations on September 5, 2023: Membertou, Millbrook, Sipekne'katik, Kwilmu'kw Maw-Klusuaqn (KMK), and Maritime Aboriginal Peoples Council (MAPC). The letters informed the communities that a provincial EA may be filed in relation to the same project but pertaining to temporary staging of dredged material on provincial land. ISI did not receive any communications from the communities in response to these letters.

Follow-up letters will be sent to above listed communities on registration date informing the communities that a Provincial EA was submitted. The letter also provided a general description of the TMSF and planned activities and introduced the option to discuss the project in more detail. The province will be copied on these letters.

6.1.2 Public Engagement

ISI does not anticipate significant public concern since the PDA is located within a heavily industrial setting and the proposed project is temporary. As described above, ISI will be posting the EA registration document in public locations and inviting feedback from the community. At that time, ISI will address

questions, comments and concerns submitted in writing to NSECC and post responses to the departments' website.

7.0 Other Information

7.1 Project Related Documents

Other than this EA registration document and the appended information, there are no additional Project-related documents that are publicly accessible.

8.0 Conclusion

This registration document provided an evaluation of the potential environmental effects associated with the construction, operation, closure, and decommissioning of the proposed TMSF as per the requirements outlined in the Nova Scotia Environmental Assessment Act and associated regulations. Through this evaluation it was determined that the TMSF is unlikely to have significant adverse effects on the environment with the mitigation measures identified in this assessment.

9.0 Closing

This report was prepared by Dillon Consulting Limited (Dillon) on behalf of Irving Shipbuilding Inc. Dillon has used the degree of care and skill ordinarily exercised under similar circumstances at the time the work was performed by reputable members of the environmental consulting profession practicing in Canada. Dillon assumes no responsibility for conditions which were beyond its scope of work. There is no warranty expressed or implied by Dillon.

The material in the report reflects Dillon's best judgment in light of the information available to Dillon at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Dillon accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

This report has been prepared by a team of Dillon professionals on behalf of Irving Shipbuilding Inc.

Respectfully submitted,

DILLON CONSULTING LIMITED

Geoff Allaby

Geoff Allaby

9.1 Signature

This document is submitted on behalf of Irving Shipbuilding Inc.

11 Andrew Davies VP Finance for Dirk Lesko

Dirk Lesko (or designate)
President, Irving Shipbuilding

17th January 2024.

Date of Signature

Appendix A

Site Plan & TMSF Drawings

IRVING SHIPBUILDING INC.

TEMPORARY MATERIALS STAGING FACILITY (TMSF)

PROJECT LOCATION

FIGURE 1

★ Site Location

SCALE 1:50,000

0 600 1,200 2,400 m

N W E S

MAP DRAWING INFORMATION:
DATA PROVIDED BY ISI, ESRI

MAP CREATED BY: SCM
MAP CHECKED BY: APY
MAP PROJECTION: NAD 1983 CSRS UTM Zone 20N

DILLON CONSULTING

PROJECT: 235763
STATUS: DRAFT
DATE: 2023-10-05

FILE LOCATION: \\dillon.ca\DILLON_DFS_projects\GIS\2023\235763\product\Client\EA\F1_ProjectLocation.mxd

IRVING SHIPBUILDING INC.

TEMPORARY MATERIALS STAGING FACILITY (TMSF)

SITE LOCATION

FIGURE 2

Temporary Dredge Spoil Storage Area (approximate)

SCALE 1:2,500

0 30 60 120 m

N W E S

MAP DRAWING INFORMATION:
DATA PROVIDED BY ISI, ESRI

MAP CREATED BY: SCM
MAP CHECKED BY: APY
MAP PROJECTION: NAD 1983 CSRS UTM Zone 20N

DILLON CONSULTING

PROJECT: 235763
STATUS: DRAFT
DATE: 2023-10-05

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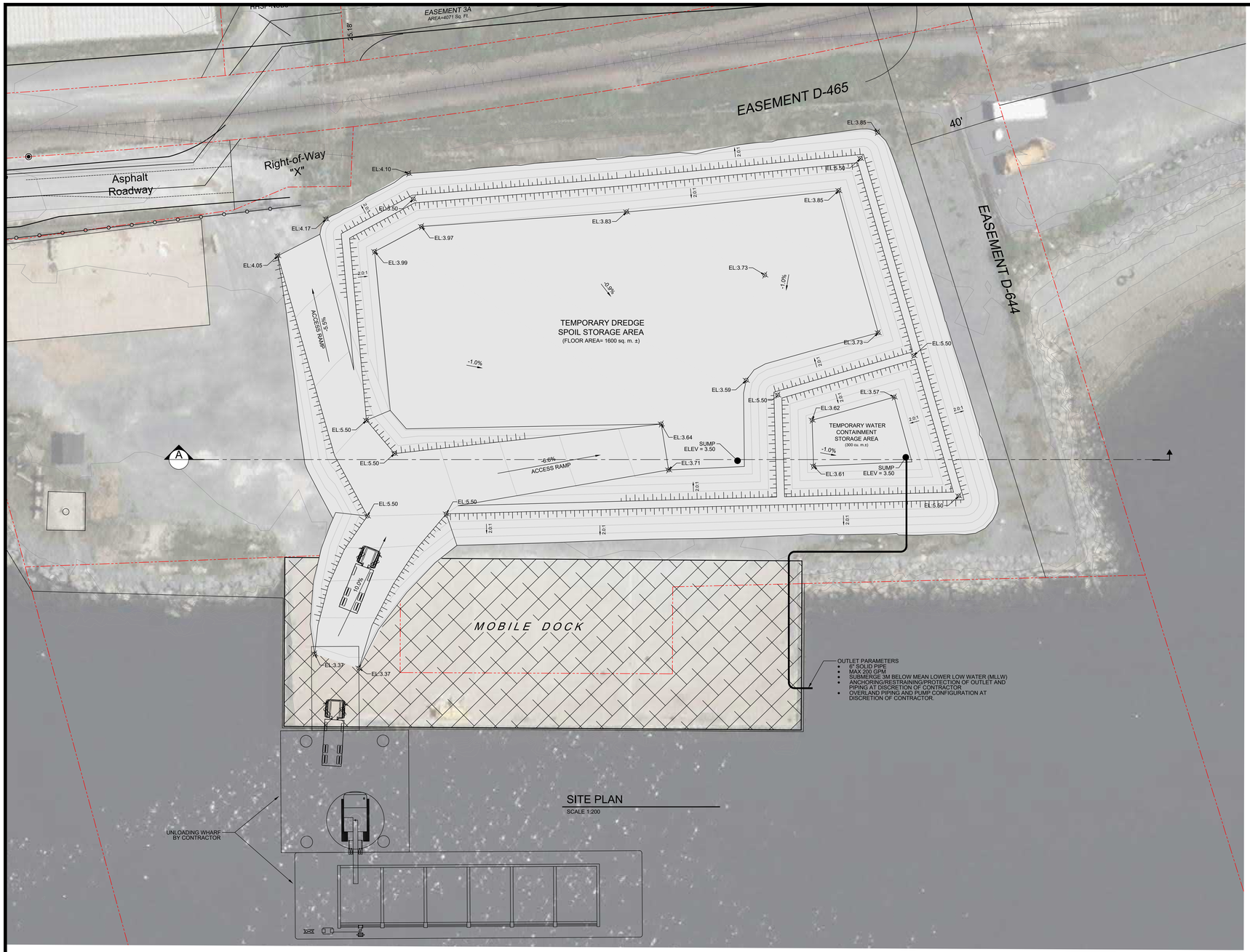
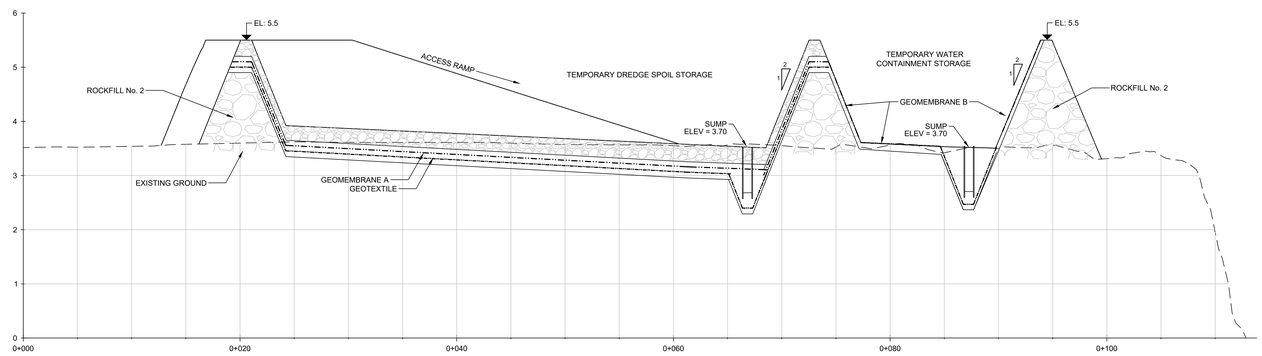


SITE PLAN
SCALE 1:200



A BERM SECTION
V 1:200 - H 1:40

FOR TENDER
NOT FOR CONSTRUCTION

NOTES:

GENERAL:
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED, ELEVATIONS ARE IN METRES AND ARE REFERENCED TO THE CANADIAN GEODETIC VERTICAL DATUM OF 1928.

SUBGRADE:
1. THE SUBGRADE SHALL BE REVIEWED AND APPROVED BY QUALIFIED GEOTECHNICAL PERSONNEL.

2. THE SUBGRADE SHALL BE UNIFORM, WELL-COMPACTED, AND FREE OF SHARP OR LARGE ROCK PARTICLES AND OTHER DELETERIOUS MATERIAL SUCH AS TREE ROOTS, LARGE OR PROTRUDING CONSTRUCTION DEBRIS, AND METALLIC OBJECTS.

3. THE PREPARED SUBGRADE SHALL CONSIST OF AN APPROVED SMOOTH SURFACE WITH PARTICLES LARGER THAN 100 mm REMOVED. SMOOTH, ROUNDED STONES LESS THAN 100 mm IN SIZE MAY REMAIN WITHIN THE PREPARED SUBGRADE PROVIDED THAT THEY ARE DRIVEN INTO THE SUBGRADE AND DO NOT PROTRUDE ABOVE THE FINISHED SURFACE.

4. IF THE SUBGRADE CONSISTS OF A COARSE-GRAINED MATERIAL SUCH AS GRAVEL, THE SURFACE SHALL BE PREPARED WITH THE APPLICATION OF A CUSHION LAYER SUCH AS 100 mm OF SAND OR APPROVED GEOTEXTILE.

5. THE SUBGRADE SHALL BE WELL COMPACTED.

6. ONCE PREPARED, CARE SHALL BE TAKEN TO MAINTAIN THE PREPARED SURFACE. VEHICULAR TRAFFIC ON THE COMPLETED SUBGRADE SHOULD BE LIMITED. MARKS OR RUTS LEFT IN THE SUBGRADE BY VEHICULAR TRAFFIC SHOULD BE REPAIRED AS SOON AS PRACTICAL.

7. THE SURFACE SHALL BE PREPARED IN A MANNER SUCH THAT THE INSTALLED GEOMEMBRANE REMAINS IN INTIMATE CONTACT WITH THE SUBGRADE.

GEOMEMBRANES:
1. "GEOMEMBRANE A" SHALL BE AN APPROVED 1.0 mm (40 MIL) HDPE/LLDPE LINER OR APPROVED EQUIVALENT.

2. "GEOMEMBRANE A" SHALL HAVE A ROUGHENED/TEXTURED UPPER SURFACE.

3. "GEOMEMBRANE B" SHALL BE AN APPROVED 0.5 mm (20 MIL) HDPE/LLDPE LINER OR APPROVED EQUIVALENT.

4. INSTALLATION OF GEOMEMBRANES SHALL BE PERFORMED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. DETAILS AND PROCEDURES OF INSTALLATION (INCLUDING CONNECTION DETAILS) SHOULD BE SUBMITTED TO THE ENGINEER PRIOR TO THE START OF CONSTRUCTION.

SAND:
1. SAND SHALL BE AN APPROVED HARD, GRANULAR, ROUNDED OR SUB-ROUNDED MATERIAL AND GRADED AS FOLLOWS:

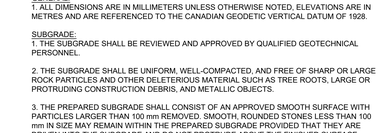
SIEVE DESIGNATION (mm)	PERCENT PASSING (%)
5.0	100
0.16	0 - 5

ROCKFILL No. 2:
1. ROCKFILL No. 2 SHALL BE AN APPROVED CRUSHED AND SCREENED, HARD, DURABLE STONE, FREE FROM CLAY AND ORGANIC MATTER AND GRADED AS FOLLOWS:

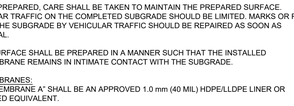
SIEVE DESIGNATION (mm)	PERCENT PASSING (%)
150	100
100	50-100
50	20-45
10	0-10

GEOTEXTILE:
1. GEOTEXTILE SHALL BE NON-WOVEN TERRAFIX 360R OR APPROVED EQUIVALENT.

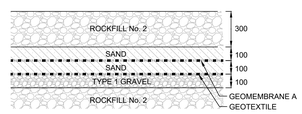
PUMPING:
1. WATER SHALL BE PUMPED FROM TEMPORARY DREDGE SPOIL STORAGE AREA TO TEMPORARY CONTAINMENT STORAGE AREA AT REGULAR INTERVALS TO PREVENT THE ACCUMULATION OF STANDING WATER.



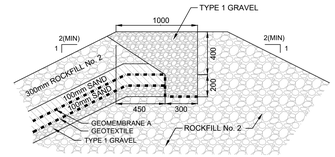
SUMP DETAIL
NTS



ANCHOR TRENCH DETAIL
FOR TEMPORARY WATER
CONTAINMENT STORAGE AREA
SCALE 1:25



LINER DETAIL
TEMPORARY DREDGE SPOIL
STORAGE AREA
GEOMEMBRANE OPTION
NTS



ANCHOR TRENCH DETAIL
FOR TEMPORARY DREDGE SPOIL
STORAGE AREA
SCALE 1:25

GENERAL LEGEND

NORTH

DISCLAIMER

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Stamp:

No.	Revision/Issue	Date	By.
A	ISSUED FOR TENDER	2023.10.04	LF

IRVING
Irving Shipbuilding Inc.

Consultant's Name and Address
HATCH
1809 BARRINGTON STREET, SUITE 1009
HALIFAX, NOVA SCOTIA B3J 3K8

Consultant's Name and Address

Project Name and Address
CSC INFRASTRUCTURE - DESIGN

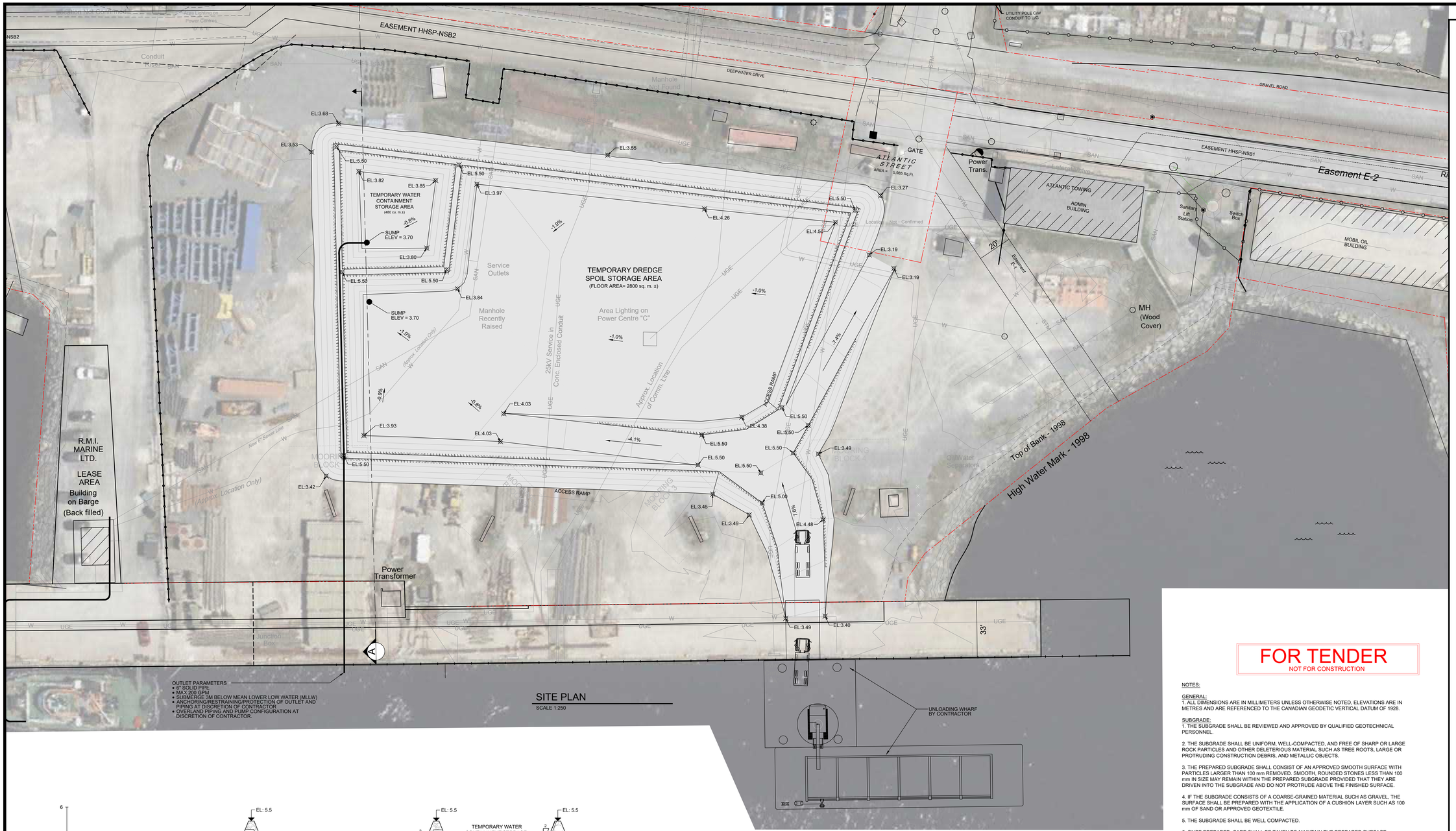
Drawing Title
MOBIL LOT
CONTAINMENT BERM
PLAN, SECTIONS, AND DETAILS

Designed By	Drawn By	Sheet
LF	BC	SK-03
Checked By	Date	
LF	2023.11.07	
Scale		
1:250		

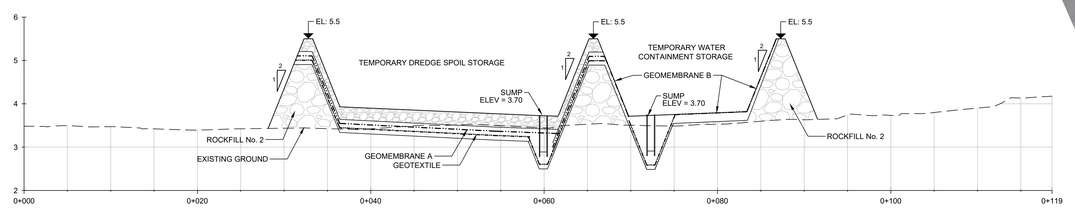
Consultant's Drawing Number
H367584-0005-220-292-0003

Irving Drawing Number | Rev
A

Nov 22, 2023 - 7:57am Login name: COOK843274 Layout: Mobil Berm
Drawing Name: C:\ppworking\hatch-dpd-canada_central\d0178383\Mobil Berm.dwg



SITE PLAN
SCALE 1:250



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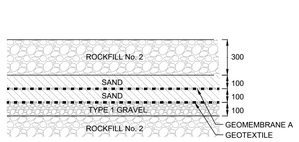
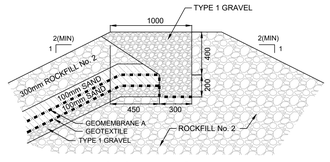
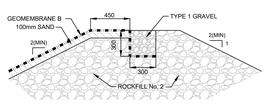


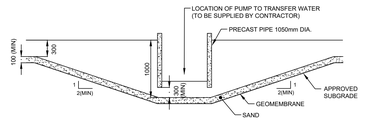
LINER DETAIL
TEMPORARY DREDGE SPOIL STORAGE AREA GEOMEMBRANE OPTION
NTS



ANCHOR TRENCH DETAIL FOR TEMPORARY DREDGE SPOIL STORAGE AREA
SCALE 1:25



ANCHOR TRENCH DETAIL FOR TEMPORARY WATER CONTAINMENT STORAGE AREA
SCALE 1:25



SUMP DETAIL
NTS

FOR TENDER
NOT FOR CONSTRUCTION

NOTES:

GENERAL:
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED, ELEVATIONS ARE IN METRES AND ARE REFERENCED TO THE CANADIAN GEODETIC VERTICAL DATUM OF 1928.

SUBGRADE:
1. THE SUBGRADE SHALL BE REVIEWED AND APPROVED BY QUALIFIED GEOTECHNICAL PERSONNEL.

2. THE SUBGRADE SHALL BE UNIFORM, WELL-COMPACTED, AND FREE OF SHARP OR LARGE ROCK PARTICLES AND OTHER DELETERIOUS MATERIAL SUCH AS TREE ROOTS, LARGE OR PROTRUDING CONSTRUCTION DEBRIS, AND METALLIC OBJECTS.

3. THE PREPARED SUBGRADE SHALL CONSIST OF AN APPROVED SMOOTH SURFACE WITH PARTICLES LARGER THAN 100 mm REMOVED. SMOOTH, ROUNDED STONES LESS THAN 100 mm IN SIZE MAY REMAIN WITHIN THE PREPARED SUBGRADE PROVIDED THAT THEY ARE DRIVEN INTO THE SUBGRADE AND DO NOT PROTRUDE ABOVE THE FINISHED SURFACE.

4. IF THE SUBGRADE CONSISTS OF A COARSE-GRAINED MATERIAL SUCH AS GRAVEL, THE SURFACE SHALL BE PREPARED WITH THE APPLICATION OF A CUSHION LAYER SUCH AS 100 mm OF SAND OR APPROVED GEOTEXTILE.

5. THE SUBGRADE SHALL BE WELL COMPACTED.

6. ONCE PREPARED, CARE SHALL BE TAKEN TO MAINTAIN THE PREPARED SURFACE. VEHICULAR TRAFFIC ON THE COMPLETED SUBGRADE SHOULD BE LIMITED. MARKS OR RUTS LEFT IN THE SUBGRADE BY VEHICULAR TRAFFIC SHOULD BE REPAIRED AS SOON AS PRACTICAL.

7. THE SURFACE SHALL BE PREPARED IN A MANNER SUCH THAT THE INSTALLED GEOMEMBRANE REMAINS IN INTIMATE CONTACT WITH THE SUBGRADE.

GEOMEMBRANES:
1. "GEOMEMBRANE A" SHALL BE AN APPROVED 1.0 mm (40 MIL) HDPE/LLDPE LINER OR APPROVED EQUIVALENT.

2. "GEOMEMBRANE A" SHALL HAVE A ROUGHENED/TEXTURED UPPER SURFACE.

3. "GEOMEMBRANE B" SHALL BE AN APPROVED 0.5 mm (20 MIL) HDPE/LLDPE LINER OR APPROVED EQUIVALENT.

4. INSTALLATION OF GEOMEMBRANES SHALL BE PERFORMED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. DETAILS AND PROCEDURES OF INSTALLATION (INCLUDING CONNECTION DETAILS) SHOULD BE SUBMITTED TO THE ENGINEER PRIOR TO THE START OF CONSTRUCTION.

SAND:
1. SAND SHALL BE AN APPROVED HARD, GRANULAR, ROUNDED OR SUB-ROUNDED MATERIAL AND GRADED AS FOLLOWS:

SIEVE DESIGNATION (mm)	PERCENT PASSING (%)
5.0	100
0.16	0 - 5

ROCKFILL No. 2:
1. ROCKFILL No. 2 SHALL BE AN APPROVED CRUSHED AND SCREENED, HARD, DURABLE STONE, FREE FROM CLAY AND ORGANIC MATTER AND GRADED AS FOLLOWS:

SIEVE DESIGNATION (mm)	PERCENT PASSING (%)
150	100
100	50-100
50	20-45
10	0-10

GEOTEXTILE:
1. GEOTEXTILE SHALL BE NON-WOVEN TERRAFIX 360R OR APPROVED EQUIVALENT.

PUMPING:
1. WATER SHALL BE PUMPED FROM TEMPORARY DREDGE SPOIL STORAGE AREA TO TEMPORARY CONTAINMENT STORAGE AREA AT REGULAR INTERVALS TO PREVENT THE ACCUMULATION OF STANDING WATER.

GENERAL LEGEND

NORTH

Stamp:

No.	Revision/Issue	Date	By.
A	ISSUED FOR TENDER	2023.10.04	LF

Irving Shipbuilding Inc.

Consultant's Name and Address
HATCH
1809 BARRINGTON STREET, SUITE 1009
HALIFAX, NOVA SCOTIA B3J 3K8

Consultant's Name and Address

Project Name and Address
CSC INFRASTRUCTURE - DESIGN

Drawing Title
WOODSIDE
CONTAINMENT BERM
PLAN, SECTIONS, AND DETAILS

Designed By	Drawn By	Sheet
LF	BC	SK-02
Checked By	Date	
LF	2023.10.04	
Scale		
1:250		

Consultant's Drawing Number
H367584-0005-220-292-0002

Irving Drawing Number | Rev. A

Nov 23, 2023 - 9:26am Login name: COOKB4274 Layout: Woodside Berm
Drawing Name: C:\www\king\hatch-dpd-conods_central\p0178393\Woodside Berm.dwg

Appendix B

Halifax Harbour Water Quality Tables

Appendix B, Table 1 Elutriate Characteristics at Day 0 and Day 10

Parameter	Units	TOX-CRTL	Layer 1 DAY 0	Layer 1 DAY 10	Layer 2 DAY 0	Layer 2 DAY 10	CWQG Aquatic Life Marine - Long Term Limits	NS Tier I EQS Marine Surface Water Limits
		HFX Harbour Water (Control)	Elutriate Water, Collected first day	Runoff Water, Collected day 10	Elutriate, Collected first day	Runoff Water, Collected day 10		
Nitrate (as N)	**mg/L**	.05	-	0.05300	-	0.078	45	200
pH (Lab)	**pH Units**	7.77	-	7.33	-	7.17	7-8.7	-
Antimony	**mg/L**	<0.01	0.01	<0.01	<0.01	<0.01	-	0.25
Arsenic	**mg/L**	<0.01	0.01300	<0.01	0.016	<0.01	0.0125	0.0125
Barium	**mg/L**	0.01	0.16000	0.07000	0.086	0.059	-	0.5
Beryllium	**mg/L**	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-	0.1
Boron	**mg/L**	**4.0**	4.0	1.8	3.6	1.3	-	1.2
Cadmium	**mg/L**	<0.00010	0.00011	<0.00010	0.00018	<0.00010	0.00012	0.00012
Cobalt	**mg/L**	<0.0040	0.00960	<0.0040	0.011	0.0053	-	0.004
Copper	**mg/L**	<0.0050	0.01600	0.04300	0.19	0.034	-	0.002
Lead	**mg/L**	<0.0050	0.02300	0.00530	0.052	0.011	-	0.002
Mercury	**mg/L**	<0.000013	<0.000013	<0.000013	<0.000013	<0.000013	0.000016	0.000016
Molybdenum	**mg/L**	<0.02	0.04900	0.02800	0.036	<0.02	-	1
Nickel	**mg/L**	<0.02	0.02800	<0.02	0.044	<0.02	-	0.0083
Selenium	**mg/L**	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	-	0.002
Silver	**mg/L**	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-	0.0015
Thallium	**mg/L**	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-	0.00003
Uranium	**mg/L**	0.00280	0.00270	0.00220	0.0048	<0.0010	-	0.0085
Vanadium	**mg/L**	<0.02	<0.02	<0.02	<0.02	<0.02	-	0.005
Zinc	**mg/L**	<0.05	<0.05	<0.05	0.29	0.066	-	0.01
Benzene	**mg/L**	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.11	2.1
Toluene	**mg/L**	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.215	0.77

Parameter	Units	TOX-CRTL	Layer 1 DAY 0	Layer 1 DAY 10	Layer 2 DAY 0	Layer 2 DAY 10	CWQG Aquatic Life Marine - Long Term Limits	NS Tier I EQS Marine Surface Water Limits
		HFX Harbour Water (Control)	Elutriate Water, Collected first day	Runoff Water, Collected day 10	Elutriate, Collected first day	Runoff Water, Collected day 10		
Ethylbenzene	**mg/L**	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.025	0.32
Xylene Total	**mg/L**	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	-	0.33
1-Methylnaphthalene	**mg/L**	<0.000010	0.00014	0.00003	<0.000010	<0.000010	-	0.001
2-methylnaphthalene	**mg/L**	<0.000010	0.00008	0.00002	<0.000010	0.00001	-	0.001
Acenaphthene	**mg/L**	<0.000010	0.00024	0.00004	0.000013	<0.000010	-	0.006
Anthracene	**mg/L**	<0.000010	0.00005	<0.000010	0.000011	<0.000010	-	0.0001
Benzo(a)pyrene	**mg/L**	0.0000090	0.00007	0.0000090	0.000011	<0.0000090	-	0.00001
Chrysene	**mg/L**	0.000010	0.00005	0.000010	<0.000010	<0.000010	-	0.0001
Fluorene	**mg/L**	0.000010	0.00009	0.00003	0.000011	<0.000010	-	0.012
Fluoranthene	**mg/L**	0.000010	0.00017	0.00002	0.00003	0.000013	-	0.0002
Naphthalene	**mg/L**	0.000010	0.00021	0.00048	0.000044	0.000022	0.0014	0.0014
Phenanthrene	**mg/L**	0.000010	0.00026	0.00006	0.000033	0.000023	-	0.0003
Pyrene	**mg/L**	0.000010	0.00026	0.00004	0.000067	0.000028	-	0.00002

Laboratory Certificates are available upon request

Appendix B, Table 2: Mixing of Water from the Halifax Harbour and Elutriate from dredged sediments from the proposed Irving Shipbuilding Expansion

			General Chemistry				Metals																BTEX				Polycyclic Aromatic Hydrocarbons (PAHs)										
			Fluoride	Nitrate (as N)	pH (Lab)	Turbidity	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Silver	Thallium	Uranium	Vanadium	Zinc	Benzene	Toluene	Ethylbenzene	Xylene Total	1-Methylnaphthalene	2-methylnaphthalene	Acenaphthene	Anthracene	Benzo(e)pyrene	Chrysene	Fluorene	Fluoranthene	Naphthalene	Phenanthrene	Pyrene
			mg/L	mg/L	pH Units	NTU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
NS Tier I EQS Marine Surface Water			0.12	200	-	-	0.25	0.0125	0.50	0.10	1.20	0.00012	0.004	0.002	0.002	0.000016	1	0.0083	0.0015	0.00003	0.0085	0.005	0.01	2.1	0.77	0.32	0.33	1	1	6	0.1	0.01	0.1	12	0.2	1.4	0.3	0.02
CWQG Aquatic Life Marine - Long Term			0.12	45	7-8.7	-	-	**0.0125**	-	-	-	**0.00012**	-	-	-	**0.000016**	-	-	-	-	-	-	-	0.11	0.215	0.025	-	-	-	-	-	-	-	-	-	1.4	-	-
Field ID	**Explanation**	**Date**																																			
TOX-CRTL	HFX Harbour Water - Irving Shipbuilding Pier	10-Mar-23	-	<0.050	7.77	0.51	<0.01	<0.01	<0.01	<0.0010	4.00	<0.00010	<0.0040	<0.0050	<0.0050	<0.000013	<0.02	<0.02	<0.0010	<0.0010	0.00280	<0.02	<0.05	<0.00020	<0.00020	<0.00020	<0.00040	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.0010
Woodside SW	HFX Harbour Water - Woodide Pier	14-Sep-2023	<2.00	<2.00	7.98	0.72	<0.0100	<0.0100	<0.0100	<0.0020	3.39	<0.000500	<0.0100	<0.0500	<0.00500	<0.0000050	0.010	<0.0500	<0.00100	<0.00100	0.00271	<0.0500	<0.300	<0.00050	<0.00050	<0.00050	<0.00050	<0.010	<0.010	0.013	0.014	0.0138	0.019	0.116	0.017	<0.010	0.065	<0.071
Mobile SW	HFX Harbour Water - Mobile Shipbuilding Pier	14-Sep-2023	<2.00	<2.00	7.95	0.52	<0.0100	<0.0100	<0.0100	<0.0020	3.50	<0.000500	<0.0100	<0.0500	<0.00500	<0.0000050	0.010	<0.0500	<0.00100	<0.00100	0.00268	<0.0500	<0.300	<0.00050	<0.00050	<0.00050	<0.00050	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	0.016	<0.010	0.011	0.013	0.011
Dup - A	HFX Harbour Water -Woodside Shipbuilding Pier	14-Sep-2023	<2.00	<2.00	7.96	0.67	<0.0100	0.0171	<0.0100	<0.0020	3.67	<0.000500	<0.0100	<0.0500	<0.00500	<0.0000050	0.010	<0.0500	<0.00100	<0.00100	0.00282	<0.0500	<0.300	<0.00050	<0.00050	<0.00050	<0.00050	<0.010	<0.010	0.014	0.012	<0.0076	0.014	0.083	0.019	<0.010	0.068	<0.054
Harbour Water - Mean	**Maximum Reported Concentration**	**-**	**ND**	**ND**	**7.98**	**0.72**	**ND**	**0.017**	**ND**	**ND**	**4.00**	**ND**	**ND**	**ND**	**ND**	**ND**	**0.010**	**ND**	**ND**	**ND**	**0.003**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**0.014**	**0.014**	**0.014**	**0.019**	**0.116**	**0.019**	**0.011**	**0.068**	**0.011**
L1 - DAY 0	Decant Water, Collected first day	30-Jan-23	-	-	-	-	<0.01	0.01	0.160	<0.0010	4.0	0.00011	0.010	0.016	0.023	<0.000013	0.049	0.028	<0.0010		0.0027	<0.02	<0.05	<0.00020	<0.00020	<0.00020	<0.00040	0.1400	0.0770	0.2400	0.0470	0.0700	0.0540	0.0860	0.1700	0.2100	0.2600	0.2600
L1-D10	Decant Water, Collected day 10	10-Feb-23	-	0.05	7.33	52	<0.01	<0.01	0.070	<0.0010	1.8	<0.00010	<0.0040	0.043	0.005	<0.000013	0.028	<0.02	<0.0010		0.0022	<0.02	<0.05	<0.00020	<0.00020	<0.00020	<0.00040	0.0250	0.0210	0.0380	<0.0010	<0.0090	<0.0010	0.0290	0.0180	0.4800	0.0550	0.0400
L2 - DAY 0	Decant Water, Collected first day	31-Jan-23	-	-	-	-	<0.01	0.02	0.086	<0.0010	3.6	0.00018	0.011	0.190	0.052	<0.000013	0.036	0.044	<0.0010		0.0048	<0.02	0.29	<0.00020	<0.00020	<0.00020	<0.00040	<0.0010	<0.0010	0.0130	0.0110	0.0110	<0.0010	0.0110	0.0300	0.0440	0.0330	0.0670
DUP- A	Duplicate of Day 0 water	31-Jan-23	-	-	-	-	<0.01	0.02	0.091	<0.0010	3.7	0.00017	0.011	0.220	0.061	<0.000013	0.037	0.045	<0.0010		0.0048	<0.02	0.35	<0.00020	<0.00020	<0.00020	<0.00040	0.0110	<0.0010	0.0170	0.0110	0.0095	<0.0010	0.0110	0.0260	0.0500	0.0340	0.0690
L2-D10	Decant Water, Collected day 10	10-Feb-23	-	0.08	7.17	58	<0.01	<0.01	0.059	<0.0010	1.3	<0.00010	0.005	0.034	0.011	<0.000013	<0.02	<0.02	<0.0010		<0.0010	<0.02	0.07	<0.00020	<0.00020	<0.00020	<0.00040	<0.0010	0.0100	<0.0010	<0.0010	<0.0090	<0.0010	<0.0010	0.0130	0.0220	0.0230	0.0000
Elutriate - Max	**Maximum Reported Concentration**	**-**	**-**	**0.08**	**7.33**	**58**	**ND**	**0.02**	**0.160**	**ND**	**4.0**	**0.0002**	**0.011**	**0.22**	**0.061**	**ND**	**0.049**	**0.045**	**ND**		**0.005**	**ND**	**0.35**	**ND**	**ND**	**ND**	**ND**	**0.140**	**0.077**	**0.240**	**0.047**	**0.070**	**0.054**	**0.086**	**0.170**	**0.480**	**0.260**	**0.260**
Raw Water Dilution 50:1		**-**		**0.0016**	**8.0**	**1.87**	**ND**	**0.02****	**0.003**	**ND**	**4.0**	**0.000004**	**0.0002**	**0.0044****	**0.001**	**ND**	**0.01**	**0.0009**	**ND**		**0.003**	**ND**	**0.01**	**ND**	**ND**	**ND**	**ND**	**0.0028**	**0.0015**	**0.0185**	**0.0147**	**0.0149****	**0.0197**	**0.1154**	**0.0220**	**0.0204**	**0.0718**	**0.016**

B[a]P TPE - Benzo[a]pyrene Total Potency Equivalents

ND - Concentration of the parameter for all samples was lower than the limit of detection

34 Orange shading indicates the concentration exceeds the Nova Sactia Tier I Environmental Quality Standards for Surface Water, Marine

34 Dark Orange shading indicates the concentration exceeds the Nova Sactia Tier I Environmental Quality Standards for Surface Water, Marine and the Water Quality Guideline for the Protection of Aquatic Life, Marine, Long Term

*Dilution completed using= c1v1+c2v2=c3V3
where c1 is leachate max concentration
Where c2 is average harbour concentraion
where v1 is 1 L
where v2 is 49 L
where v3 is 50 L
Rearranged equation: c3 = (c1v1+c2v2)/v3
In cases where concentraion was non-detect in the recieving waters, the following equation was used: c3=c1/50
**within 25% of background is analytically equivalent

Appendix C

Receiving Water Analysis

Memo

To: James Ragan, Project Manager Irving Shipbuilding

From: Jeff Melanson, Dillon Consulting Limited
Sean Des Roches, Dillon Consulting Limited

cc: Geoff Allaby, P.Geo., and Becca Hulse, P.Eng., Dillon Consulting Limited

Date: November 22, 2023

Subject: **Woodside Mixing Zone Assessment**

Our File: 23-5763

The following memo provides a summary of our analysis of typical dilution ratios available in the Halifax Harbour. This exercise has been completed for the Woodside dredge material storage and de-watering site (henceforth referred to as "the Facility"). It is expected that this site will be used to temporarily store dredge material from Halifax Harbour. Surface runoff due to precipitation and dewatered elutriate from dredged materials will be collected and managed on site. Water collected on site will be discharged periodically into the harbour via a submerged discharge pipe. This study has been completed to estimate the characteristics and potential dilution expected within the mixing zone at the proposed discharge location at Woodside.

Mixing Zone Assessment

A mixing zone is the portion of the receiving water where effluent dilution occurs. Mixing zone extents should defined on a case-by-case basis that account for local conditions. For this analysis, a mixing zone of 100 m radius from the outfall was used. This limit is expected to be sufficient as it aligns with national standards (e.g., 100 m radius from outfall (Atlantic Canada Wastewater Guidelines Manual, 2006)). Given the tidal nature of the Halifax Harbour, mixing zones were considered for both rising and falling tide conditions.

A Cornell Mixing Zone Expert System (CORMIX) mixing model was used to estimate the mixing regime and to calculate dilution ratios at the edge of the mixing zone. CORMIX is a mixing zone modelling tool supported by U.S. Environmental Protection Agency (EPA), the system emphasizes the role of boundary interaction to estimate steady-state mixing behavior and plume geometry. This mixing model is the commonly accepted mixing model for near-shore applications.

Model Methodology

The shoreline of the Facility is bordered to the north and south by properties owned by Nova Scotia Business Incorporated, which are for industrial usages. These properties extend beyond the perimeter of the mixing zone. Primary contact through swimming, scuba diving etc. is not anticipated to occur in the vicinity of the Facility's temporary outlet location and the extent of the mixing zone due to the known typical uses of this marine environment and distance from nearest recreational activities.

WebTide Tidal Prediction Model (Bedford Institute of Oceanography), a modelling tool used to estimate water level and current velocity along Canada's coasts was used to gather estimates of level and velocity in the vicinity of the outfall. Simulated hourly water level and current velocity estimates were obtained from WebTide over a 20-year period. The lowest simulated water level over the past 20 years occurred on June 17, 2015. This lower water level on this date is expected to result in a smaller cross-sectional area and lower average velocity (0.043 m/s) due to the small tidal range. These conditions were chosen for the analysis since less dilution is expected during periods of low water level and reduced velocities, resulting in a critical, yet realistic scenario.

Using the ambient conditions described above, a conservative available dilution ratio was estimated for a 400 m^2 cross-sectional area of the Halifax Harbour (i.e., 100 m x 4 m average depth). In reality, the total cross-sectional area available for mixing is much greater than this since the average depth in the area is in the order of 10-15 m. This equates to a total ambient flow of 17.2 m^3/s through the assumed cross-sectional area (0.043 m/s * 400 m^2). Given that the outlet flow rate is estimated to be in the order of 0.0061 m^3/s, the maximum theoretical dilution ratio when fully mixed is in the order of 2820:1 (17.2 m^3/s / 0.0061 m^3/s).

Recognizing the dilution limit described above, CORMIX modeling was used to estimate the dilution ratio at the limit of the mixing zone (100 m from the outfall). A summary of the model inputs used are summarized in **Table 1**. It should be noted the following assumptions were made about the construction of the outfall:

- The discharge point of the outfall will be submerged at all times (including low tide), at a height of 1 m above the harbour floor (a depth of at least 3 m below water surface);
- The discharge point of the outfall is located at the shore (i.e., does not extend into the harbour) and is oriented perpendicular to the shore;
- The discharge pipe has a diameter of 152 mm (6").

This analysis has been completed for the following three discharge scenarios, which account for variations in elutriate density:

- **Scenario #1 – Pure Elutriate:** Considers the discharge of pure undiluted elutriate with a density equivalent to sea water in Halifax Harbour. This would represent discharge of elutriate from the Facility during dry periods with little to no precipitation.
- **Scenario #2 – Moderate Precipitation Event**: Considers the discharge of elutriate mixed with precipitation (density of 1000 m^3/kg) at a ratio of 3:1, resulting in an elutriate with a density of 1018 m^3/kg. This would represent discharge of elutriate from the Facility during a precipitation event of 7 mm of rain over 24 hours. The mixing ratio in this scenario was determined via sensitivity analysis in CORMIX on the non-linear relationship between rain water input and the final mixing zone dilution. It was determined that the 3:1 mixing ratio results in the lowest effective elutriate dilution. Further details are provided in the section below.

- **Scenario #3 – Extreme Precipitation Event:** Considers the discharge of elutriate mixed with precipitation (assumed density of 1000 m^3/kg) at a ratio of 1:9, resulting in an elutriate with a density of 1002.4 m^3/kg. This would represent discharge of elutriate from the Facility during an extreme (25-year) precipitation event of 131 mm of rain over 24 hours.

Table 1: Summary of CORMIX Input Parameters

Parameter	Units	Value	Source
Effluent			
Flow	m^3/s	Variable	See Table 2
Density	kg/m^3	1023.9[a] 1018[c] 1002.4[e]	Equivalent to ambient density[b]; Computed density[d] Computed density[f]
Ambient			
Average Depth	m	5.2	Schematized bounded cross section[g]
Local Depth	m	4	Schematized bounded cross section[g]
Velocity	m/s	0.043	Estimated tidal range[h]
Width	m	1000	Visual inspection on map
Density	kg/m^3	1024	Computed based on field measurment[b]
Wind Speed	m/s	4.12	Average annual hourly mean[i]
Discharge			
Distance to Nearest Bank	m	0	Visual Inspection on map
Vertical Angle	deg	90	Assumed
Horizontal Angle	deg	90/270	Assumed
Port Diameter	mm	152	Assumed
Port Above or Below Water?	n/a	Below	Assumed
Port Height Above Channel Bottom	m	1	Assumed

Note:

[a] Used for Scenario 1, discharge of pure elutriate. CORMIX does not allow for discharge water and ambient density to be exactly the same; discharge water density was slightly lowered as it is likely elutriate will be diluted by surface water prior to discharge.

[b] Ambient water density calculated based on in-situ readings of the surface water (0-1m depth) of the Halifax Harbour collected at the Facility (September 21, 2023).

[c] Used for Scenario 2, discharge of elutriate mixed with rainwater at a ratio of 3:1.

[d] Computed based on a 3:1 mixture of sea water (using measured ambient density of 1024 kg/m^3) and rainwater (density of 1000 kg/m^3).

[e] Used for Scenario 3, discharge of elutriate mixed with rainwater at a ratio of 1:9.

[f] Computed based on a 1:9 mixture of sea water (using measured ambient density of 1024 kg/m^3) and rainwater (density of 1000 kg/m^3).

[g] Cross-sections developed using bathymetry data from Navionics (2021; https://www.navionics.com/usa/).

[h] Estimated using predicted current velocities modeled by the software WebTide (2009).

[i] Average annual hourly mean calculated from historical climate data over the past 30 years, collected from various Environment Canada Automatic Weather Stations in the Halifax area.

Results

The density of the elutriate and the daily volume of water needed to be discharged at the Facility will vary significantly in response to precipitation events. In addition to the three scenarios described above, consideration was given to the usage of pumping rates for discharging elutriate mixed with varying amounts of stormwater. The following flow rates were considered:

- 0.00315 m^3/s (50 gpm);
- 0.00631 m^3/s (100 gpm);
- 0.00946 m^3/s (150 gpm);
- 0.0126 m^3/s (200 gpm).

The flow rate of 0.00631 m^3/s can be considered to be comparable to the typical day-to-day discharge rate needed to manage elutriate at the Facility. The flow rate of 0.0126 m^3/s was considered as a worse-case discharge rate which would be required when elutriate mixed large amounts of with surface runoff needs to be quickly discharged (i.e., a major precipitation event). It should be noted that in all considered instances it was assumed the discharge outlet would be nearshore and submerged.

For Scenarios 2 and 3 the elutriate is mixed with rainwater prior to discharge. Accordingly, the CORMIX computed dilution value was adjust to account for the initial rainwater input to calculate an effective dilution ratio at the edge of the 100 m mixing zone. Effective dilution values ranged from 61 to 1193. Results are presented in **Table 2**.

Table 2: CORMIX Calculated Dilution Ratios at the Edge of a 100 m Mixing Zone

	Scenario 1 Pure Elutriate Discharge		Scenario 2 Moderate Precipitation Event Discharge			Scenario 3 Extreme Precipitation Event Discharge		
Discharge Rate	Ratio of Rainwater to Elutriate	Simulated Mixing Zone Dilution	Ratio of Elutriate to Rainwater (RE)	Simulated Mixing Zone Dilution (MD)	Effective Elutriate Dilution* (EED)	Ratio of Elutriate to Rainwater (RE)	Simulated Mixing Zone Dilution (MD)	Effective Elutriate Dilution* (EED)
0.00315m^3/s (50gpm)	Pure Elutriate	365	3:1	168	223	1:9	119	1193
0.00631m^3/s (100gpm)	Pure Elutriate	266	3:1	79	105	1:9	61	607
0.00946m^3/s (150gpm)	Pure Elutriate	256	3:1	56	74	1:9	43	430
0.0126m^3/s (200gpm)	Pure Elutriate	215	3:1	46	61	1:9	36	356

*Effective Elutriate Dilution (EED) calculated by multiplying the Ratio of Elutriate to Rainwater (RE) by the Simulated Mixing Zone Dilution (MD). E.g., EED = RE*MD. For Scenario 1 there is no rainwater input so MD=EED.

General findings indicated that as the volumetric discharge rates increase (for example in response to storm events) there is a corresponding decrease in the effective dilution factor for all scenarios.

In addition, it was observed that the relationship between the initial degree of rainwater input and the final effective dilution was non-linear. A sensitivity analysis was conducted which considered both the simulated mixing zone dilution and the effective elutriate dilution over a range of ratios for the initial elutriate/rainwater mixture. Results of the analysis are presented in **Figure 1** for flow rates of 0.0126 m^3/s and 0.00631 m^3/s. The lowest effective dilution values for both pumping rates was observed at a mixture of 75% elutriate and 25% rainwater (3:1 ratio of elutriate to rainwater). As previously discussed, this mixture ratio was selected for Scenario 2 as it represents the worse-case (i.e., lowest) possible effective dilution for the conditions considered.

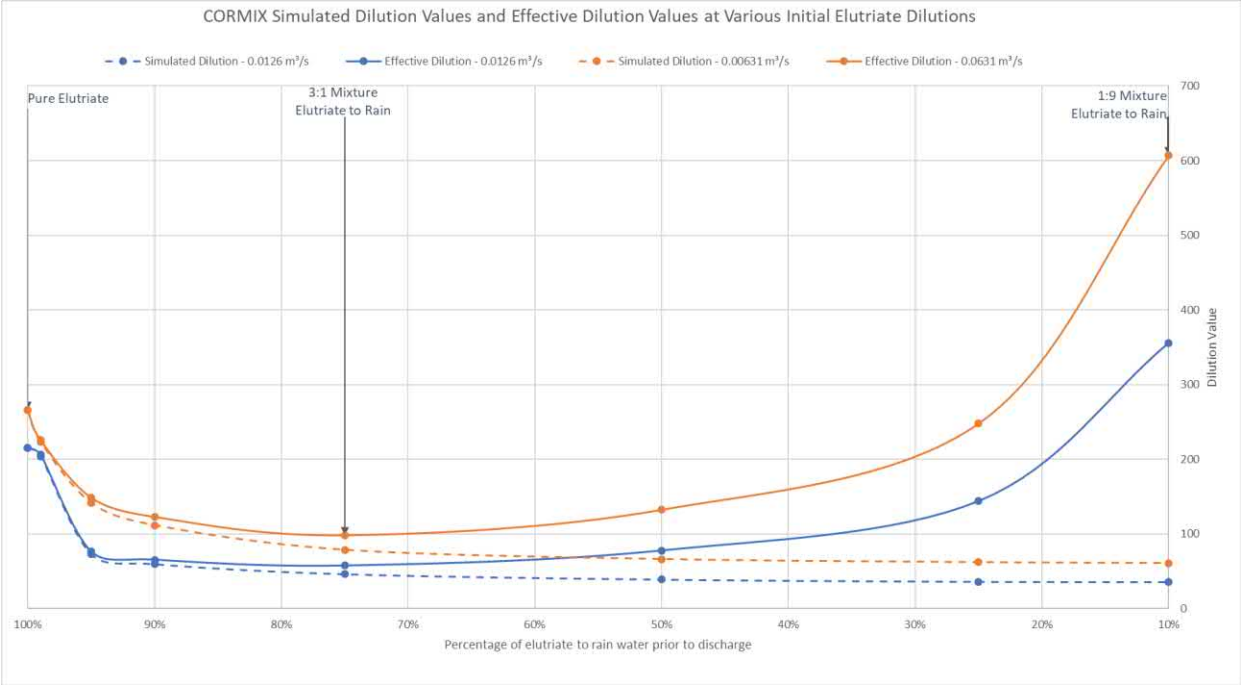


Figure 1: Comparison of variations in the CORMIX simulated dilution values at the edge of the 100 m mixing zone and final effective dilution values at various degrees of initial dilution of elutriate with rainwater. Discharge rates of 0.0126 m^3/s (200 gpm) and 0.00631 m^3/s (100 gpm) are plotted; all other input parameters are as listed in Table 1.

Conclusions

A CORMIX mixing model was used to estimate the mixing regime resultant from the discharge of elutriate generated from the dewatering of dredged materials at the Woodside dredge material storage and de-watering site. Dilution ratios were computed at the edge of a 100 m mixing zone created by the simulated discharge of elutriate from a future onsite outfall. The simulation indicates that effective dilution rates ranging between 61:1 and 1193:1 can be expected depending on the discharge conditions, outlet diameter and discharge rate. It is recommended that a conservative dilution ratio of 50:1 for a maximum discharge rate of 0.0126 m^3/s and a maximum outlet diameter of 152 mm be applied to EDOs for the site.

Appendix D

Sediment Characterization Memo

Memo

To: James Ragan, Project Manager, Irving Shipbuilding Inc.

From: Shawn Forster, P.Eng., Dillon Consulting Limited
Sean Des Roches, M.Sc., Dillon Consulting Limited

cc: Geoff Allaby, P.Geo., and Becca Hulse, P.Eng., Dillon Consulting Limited

Date: June 19, 2023

Subject: Sediment Characterization, Pier Modernization Land Levelling Project, Irving Shipyard

Our File: 23-5763

Attachments: Attachment A – Figure 1: Sample Location Plan
Attachment B – Laboratory Analytical Summary Table
i. Table B.1: Analysis of Drilling Program Sediment
ii. Table B.2: Analysis of Drilling Program Leachate
iii. Table B.3: Analysis of Pilot Study Sediment
iv. Table B.4: Additional Analysis of PHCs for Pilot Study Sediment
v. Table B.5: Analysis of Pilot Study Leachate
Attachment C – Laboratory Analytical Certificates
Attachment D – Photos
Attachment E – Disclaimer

Dillon Consulting Limited (Dillon) was commissioned by Hatch Limited (Hatch) on behalf of Irving Shipbuilding (Irving) to conduct a sediment sampling program (SSP) for proposed dredging associated with the Pier Modernization Land Levelling Project at Irving Shipyard in Halifax, Nova Scotia (NS). To facilitate the construction of new facilities on a geotechnically stable surface, approximately 330,000 m^3 of sediment is required to be dredged from the study area (**Figure 1**, attached). The purpose of this program was to characterize the sediment in order to evaluate acceptable on-land disposal options for the dredged sediment associated with the proposed project.

The sediment sampling program consisted of two (2) phases. The first phase consisted of a drilling program that initially characterized the sediment by dredge material management units (DMMU). The DMMUs within the study area were defined as follows:

i) DMMU 1 – 0 to 2 meters below sediment surface (m bss);
ii) DMMU 2 – 2 to 4 m bss;
iii) DMMU 3 – 4 to 6 m bss; and
iv) DMMU 4 – 6 to 8 m bss.

In the second phase, a pilot study was conducted to assess the efficacy of dewatering the dredged materials, also collected from the study area. Sediment samples were collected during this second phase to characterize the sediment pre- and post-filtration. During the second phase, the dredged sediments were categorized as follows:

i) Layer 1 – Uppermost sediments
ii) Layer 2 – Lowermost sediments

1 Regulatory Acceptance Criteria

Dredged sediments are planned for disposal at facilities accepting solid materials in Nova Scotia. R3 Environmental Systems (i.e. Envirosoil) and Landfills were considered as options for disposal. Contaminants of Potential Concern (COPC) were selected with reference to the Environment and Climate Change Canada (ECCC)'s Guidance Document on Collection and Preparation of Sediments for Physicochemical Characterization and Biological Testing, December 1994, and supplemented, where necessary, with parameters listed in the acceptance criteria of potential disposal facilities. The acceptance criteria of potential disposal facilities selected were:

1. R3 Environmental Systems (i.e., Envirosoil) Acceptance Criteria.
2. NS Acceptance Parameters for Contaminated Soil (Total Analysis) – Attachment B as presented in the Guidelines for Disposal of Contaminated Solids in Landfills (NSE 1992, revised 2016).

1.1 R3 Environmental Systems

Total concentration thresholds have been established for R3 Environmental Systems for metals. EC and SAR analysis were included as the dredge spoil material is anticipated to be impacted by salt. The upper limits for metal parameters for the R3 Environmental Systems Acceptance Criteria are equivalent to the NS Tier 1 EQS for Soil (Potable, Industrial, Coarse). Benzene, toluene, ethylbenzene, xylenes (BTEX); petroleum hydrocarbons (PHCs); polycyclic aromatic hydrocarbons (PAHs); electrical conductivity (EC); and sodium adsorption ratio (SAR) do not have upper limits (i.e., threshold concentrations) for acceptance for disposal at the Envirosoil R3 Environmental Systems facility (per their Approval).

For R3 Environmental Systems Acceptance Criteria, in cases where the reported COPC concentrations in sediment exceed total concentration threshold values, leachate analysis must be conducted on representative sample(s) to identify appropriate treatment pathways and acceptability of the material.

Analyzed leachates were compared to the following regulatory benchmark:

1. NS Acceptance Parameters for Contaminated Soil Leachate Analysis) – Attachment C as presented in the Guidelines for Disposal of Contaminated Solids in Landfills (NSE 1992, revised 2016).

1.2 Landfills

NS Guidelines for Disposal of Contaminated Soils in Landfills provides a framework for assessing the suitability of specific contaminated soils and solid wastes for disposal in landfills. The guideline recommends a sampling and analysis program suitable for the source of material, and provides threshold total concentrations for selected metal parameters; BTEX; PAHs; and PCBs. Threshold concentrations are also listed for aliphatic petroleum hydrocarbons. Historically, aromatic hydrocarbons and aliphatic hydrocarbons were analyzed and reported individually, but the Guidelines for Disposal have not been updated to reflect current analytical methods. In cases where the analytical laboratory

reports do not distinguish between the two types, conservatively, detected hydrocarbons are considered aliphatic.

Where material exceeds these threshold total concentrations for a COPC, leachate extraction analysis of the material is required to determine suitability for disposal. For NS Landfills, should any parameters exceed the leachate acceptance criteria the material can only be disposed of in a designated hazardous waste landfill.

Analyzed leachates were compared to the following regulatory benchmark:

1. NS Acceptance Parameters for Contaminated Soil Leachate Analysis) – Attachment C as presented in the Guidelines for Disposal of Contaminated Solids in Landfills (NSE 1992, revised 2016).

2 2022 Drilling Program, First Phase

2.1 Methodology

Between June 14 and 26, 2022, a drilling program, consisting of the advancement of fifteen (15) boreholes, was conducted in the area to be dredged from the Halifax Harbour. Logan Drilling Group (Logan) of Stewiacke, NS conducted the drilling as representatives of Hatch and Dillon monitored the drilling operations. Sediment samples were collected from boreholes drilled using a geotechnical drill rig located on a floating marine plant (barge) and drilling over the edge of the wharf platform at Pier 8. Sampling locations are indicated in **Attachment A - Figure 1**.

A Dillon technician was on site to monitor and document the drilling program and to collect samples from applicable boreholes. A description of the samples, including visual observations of the split spoon samples, notes on odours, and photographs of the sediment samples were recorded by the technician during the sampling program. The sample collection, preparation, and analyses were conducted in accordance ECCC's publication Guidance Document on Collection and Preparation of Sediments for Physicochemical Characterization and Biological Testing, December 1994.

The marine sediment samples from the various DMMUs (2 m intervals from sediment surface) within each borehole were composited and stored in the laboratory supplied jars and containers, placed in a cooler on ice and brought to the Bureau Veritas (BV) laboratory in Bedford, NS for select chemical analysis. Samples were analyzed for the following COPCs and other parameters:

- Grain size;
- BTEX and PHCs;
- PAHs;
- Metals including mercury;
- EC, SAR, Total Organic Carbon (TOC) and pH;

BV is accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for each of the analytical methods utilized, and have in-house quality assurance/quality control (QA/QC) programs to govern sample analysis and analytical data quality assurance. The laboratory analytical certificates are attached.

2.2 Laboratory Analytical Results – First Phase, Drilling Program

2.2.1 Grain Size Analysis

The available laboratory analytical results for the grain size of the analyzed sediment samples are summarized in **Table B.1** (attached).

It should be noted that the sampling method employed (drilling using split spoons) applies a bias to the grainsize of the collected sediments as the finer grained sediments tend to flow out from the collected materials. Collection of samples for chemical analysis excludes any material coarser then gravel. Suitability for disposal of the sediments should be confirmed prior to their removal from the site.

2.2.2 BTEX and Petroleum Hydrocarbons

The available laboratory analytical results for BTEX and petroleum hydrocarbons in sediment are summarized in **Table B.1** (attached).

The R3 Environmental Systems Acceptance Criteria does not have an upper limit for BTEX or petroleum hydrocarbon concentrations in soil. Concentrations of BTEX parameters did not exceed the NS Guidelines for Disposal of Contaminated Soils in Landfills.

As presented in **Table 1** (section 2.2.7), results indicate that concentrations of PHCs exceed the total concentration threshold values listed in the NS Guidelines for Disposal of Contaminated Soils in Landfills as follows (maximum reported concentrations and associated sampling locations are provided in brackets):

- EPH>C16-C21 (2022 BH007 0-2M: 600 mg/kg);
- EPH>C21-C32 (2022 BH003 0-2M: 1,200 mg/kg).

As previously discussed, the guidelines values for PHCs are specifically for aliphatic hydrocarbons; the distinction between aliphatic and aromatic hydrocarbons was not included in the analysis.

For both the R3 Environmental Systems Acceptance Criteria and the NS Guidelines for Disposal of Contaminated Soils in Landfills, in cases where the reported COPC concentrations in sediment exceed the total concentration threshold values listed in the applicable criteria, leachate analysis must be conducted on representative sample(s). Results of leachate analysis are presented in section 2.2.8.

2.2.3 Polycyclic Aromatic Hydrocarbons

The analytical results for PAHs in sediment are summarized in **Table B.1** (attached).

The R3 Environmental Systems Acceptance Criteria does not have an upper limit for PAH concentrations in sediment. Reported total PAH concentrations in the analyzed sediment samples did not exceed the NS Guidelines for Disposal of Contaminated Soils in Landfills criteria.

2.2.4 Metals

The laboratory analytical results for metals in sediment are presented in **Table B.1** (attached).

Metals exhibiting concentrations that exceed the total concentration threshold values listed in the R3 Environmental Systems Acceptance Criteria (equivalent to the NS Tier 1 EQS Industrial Standards – Potable Groundwater Use) and the NS Guidelines for Disposal of Contaminated Soils in Landfills are presented in **Table 1** (section 2.2.7). The following metals were reported in one or more samples at

concentrations that exceed total concentration threshold values listed in at least one (1) of the two (2) acceptance criteria (maximum reported concentrations and associated sampling locations are provided in brackets):

- Antimony (2022 BH009 0-2M: 98 mg/kg);
- Arsenic (2022 BH009 0-2M: 170 mg/kg);
- Cadmium (2022 BH003 0-2M: 1.9 mg/kg);
- Cobalt (2022 BH009 0-2M: 140 mg/kg);
- Copper (2022 BH012 0-2M: 1,800 mg/kg);
- Lead (2022 BH009 0-2M: 1,500 mg/kg);
- Molybdenum (2022 BH003 0-2M: 79 mg/kg);
- Nickel (2022 BH009 0-2M: 300 mg/kg);
- Selenium (2022 BH009 0-2M: 2.5 mg/kg);
- Silver (2022 BH012 0-2M: 460 mg/kg);
- Vanadium (2022 BH013 0-2M: 170 mg/kg);
- Zinc (2022 BH009 0-2M: 9,800 mg/kg).

For both the R3 Environmental Systems Acceptance Criteria and the NS Guidelines for Disposal of Contaminated Soils in Landfills, in cases where the reported COPC concentrations in sediment exceed the total concentration threshold values listed in the applicable criteria, leachate analysis must be conducted on representative sample(s). Results of leachate analysis are presented in section 2.2.8.

Other reported metal concentrations in the remaining laboratory analyzed sediment samples were less than both the R3 Environmental Systems Acceptance Criteria and NS Guidelines for Disposal of Contaminated Soils in Landfills.

2.2.5 Total Polychlorinated Biphenyls

The laboratory analytical results for PCBs in sediment are summarized in **Table B.1** (attached).

Reported total PCB concentrations in sediment in the laboratory analyzed sediment samples were less than both the R3 Environmental Systems Acceptance Criteria and NS Guidelines for Disposal of Contaminated Soils in Landfills criteria.

2.2.6 Electrical Conductivity, Sodium Absorption Ratio and pH

The available laboratory analytical results for EC, SAR and pH in soil are summarized in **Table B.1** (attached).

Reported EC in sediment ranged from 1,200 to 22,000 µS/cm; SAR in sediment ranged from 29 to 76; TOC in sediment ranged from 530,000 to 110,000,000 mg/kg; and pH in sediment ranged from 6.06 to 8.92.

The R3 Environmental Systems Acceptance Criteria and the NS Guidelines for Disposal of Contaminated Soils in Landfills do not have an upper limit for EC, SAR, or TOC concentrations in sediment.

2.2.7 Summary of Samples Requiring Leachate Analysis

Table 1 below provides a summary of sediment samples collected from the proposed dredge area within the study area with COPCs exceeding the total concentration threshold values for one of the applicable acceptance criteria.

Table 1: Summary of sediment samples with COPC exceeding total concentration threshold values listed in acceptance criteria and requiring further analysis

Dredged Material Management Unit		DMMU 1		DMMU 2		DMMU 3		DMMU 4	
Depth		0 - 2 m		2 - 4 m		4 - 6 m		6 - 8 m	
Borehole ID	BH001								
	BH002								
	BH003								
	BH004								
	BH005								
	BH006								
	BH007								
	BH008								
	BH009								
	BH010								
	BH011								
	BH012								
	BH013								
	BH014								
	BH015								

Notes:

Blank cells denote that COPCs were not reported at concentrations exceeding the applicable criteria.

	denotes that COPCs were reported at concentrations exceeding the total concentration threshold values listed in the R3 Environmental Systems Acceptance Criteria, further assessment required.
	denotes that COPCs were reported at concentrations exceeding the total concentration threshold values listed in the NS Guidelines for Disposal of Contaminated Soils in Landfills, further assessment required.
	denotes sample not collected as bedrock was encountered.

Collected sediments were observed to have variable concentrations of COPC over a limited area. This is likely reflective of the highly disturbed nature of the sediments in the Halifax Harbour; industrial activity has been occurring in this area for over a hundred years and as such sediments can have highly variable quality over a relatively small footprint. Further, given the history of industrial activities at the site it is

anticipated that varying amounts of refuse (steel, timbers, chain, cable, concrete, and other materials associated with shipbuilding and marine infrastructure) is also interbedded with the sediments.

2.2.8 Leachate Analysis – First Phase

On the basis of the above analytical results, sample BH009 (0.6 - 1.2M) was identified as having the greatest number of parameters exceeding the total concentration threshold values listed in the applicable acceptance criteria and the highest measured metal concentrations. Accordingly, sample BH009 was submitted for synthetic precipitation leaching procedure (SPLP) and toxicity characteristic leaching procedure (TCLP) to assess the potential for metals in sediment to leach into groundwater and the potential for COPCs in sediment to move and leach from the sediment matrix. The generated leachate was analyzed for metals and the results are presented in **Table B.2** (attached). It should be noted that BTEX, PHCs and PAHs were not included in the leachate analysis since initially the data was to only be compared the R3 Environmental Systems Acceptance Criteria, which do not include upper limits for these parameters.

The reported metal concentrations in the leachate sample were less than the NS Guidelines for Disposal of Contaminated Soils in Landfills (Leachates).

3 Pilot Study Sediment Collection – Second Phase

3.1 Methodology – Pilot Study Sediment Sampling

Between January 30 and 31, 2023, dredging was conducted as part of a pilot study to assess the efficacy of dewatering dredged materials from Halifax Harbour. Materials were dredged from the harbour using a crane operating on the wharf platform near Pier 8. Dredged sediments were allowed to drain in the cranes bucket to remove the majority of the water prior to placement in containment cells. Two (2) types of material were dredged from the harbour; Layer 1 representing the uppermost sediments and Layer 2 representing the sediments immediately below. Irving and Dillon staff were onsite for the majority of the dredging. Dillon personnel collected sediment samples for chemical analysis after dredging. An additional sample was collected from materials that were submitted for geotechnical testing. The marine sediment samples from each layer were stored in the laboratory supplied jars and containers, placed in a cooler on ice and brought to the Bureau Veritas (BV) laboratory in Bedford, NS for select chemical analysis. The sample collection, preparation, and analyses were conducted in accordance ECCC's publication *Guidance Document on Collection and Preparation of Sediments for Physicochemical Characterization and Biological Testing, December 1994*. Samples were analyzed for the following contaminants of potential concern (COPCs) and other parameters:

- Grain size;
- BTEX and PHCs;
- PAHs;
- Metals including mercury;
- PCBs; and
- EC, SAR, TOC and pH.

BV is accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for each of the analytical methods utilized, and have in-house quality assurance/quality control (QA/QC) programs to govern sample analysis and analytical data quality assurance. The laboratory analytical certificates are attached.

3.2 Field Observations

During dredging Dillon staff were on site and documented the appearance of the collected sediment, as follows:

- Layer 1 was observed to be a black colored sediment with grain sizes ranging from silt to clay that exhibited a relatively high water content and had an odor of rotting organics. The dredged material also contained various debris including concrete and demolition (C/D) wastes, scrap metals and lumber.

- Layer 2 was observed to be a red/brown clay that was competent and had no odor. Similar debris as found in Layer 1 was present, though to a lesser extent.

Additionally, throughout site characterization exercises, when Dillon staff collected sediment samples they did not observe materials that are Designated Material Banned from Destruction or Disposal in Landfills and Incinerator as identified in Schedule B of Nova Scotia Environment's Solid Waste Resource Management Regulation made under section 102 of the Environment Act.

Photos of collected materials are presented in **Attachment D**.

3.3 Laboratory Analytical Results – Second Phase, Pilot Study

3.3.1 Grain Size Analysis

Laboratory analytical results for the grain size of the analyzed sediment samples are summarized in **Table B.3** (attached).

It should be noted that the sampling method employed (dredging using a crane) applies a bias to the grainsize of the collected sediments as the finer grained sediments tend to flow out from the collected materials. Materials collected during the pilot study came from a limited area and may not be representative of the entire site. Collection of samples for chemical analysis excludes any material coarser then gravel. Suitability for disposal of the sediment should be confirmed prior to their removal from the site.

3.3.2 BTEX and Petroleum Hydrocarbons

Laboratory analytical results for BTEX and petroleum hydrocarbons in sediment are summarized in **Table B.3** (attached).

The R3 Environmental Systems Acceptance Criteria does not have an upper limit for BTEX or PHCs in sediment. Concentrations of BTEX parameters in the samples do not exceed the NS Guidelines for Disposal of Contaminated Soils in Landfills.

Table 2 (section 3.2.7) provides a summary of the samples with PHCs reported at concentrations that exceed the total concentration threshold values listed in the NS Guidelines for Disposal of Contaminated Soils in Landfills as follows (maximum reported concentrations and associated sample are provided in brackets):

- EPH>C10-C16 (L1-DAY 0-SED (A)): 260 mg/kg);
- EPH>C16-C21 (L1-DAY 0-SED (A)): 900 mg/kg);
- PHC F3 (>C10-C16) (L1-DAY 0-SED (A)): 1600 mg/kg);
- PHC F4 (>C34-C50) (L1-DAY 0-SED (A)): 630 mg/kg).

As previously discussed, the guidelines values for PHCs are specifically for aliphatic hydrocarbons; the distinction between aliphatic and aromatic hydrocarbons was not include in the initial analysis.

Additional hydrocarbon fractionation was conducted on sample L1-DAY0-SED (A), which had the highest measured concentrations of PHCs. Results are presented in **Table B.4** (attached). Results indicate that the sample exceeds total concentration threshold values listed in the NS Guidelines for Disposal of Contaminated Soils in Landfills for aliphatic hydrocarbons for the following parameter:

- >C21-<C32 (L1-DAY0-SED (A): 400 mg/kg).

For both the R3 Environmental Systems Acceptance Criteria and the NS Guidelines for Disposal of Contaminated Soils in Landfills, in cases where the reported COPC concentrations in sediment exceed the total concentration threshold values listed in the applicable criteria, leachate analysis must be conducted on representative sample(s). Results of leachate analysis are presented in section 3.3.8.

3.3.3 Polycyclic Aromatic Hydrocarbons

The available laboratory analytical results for PAHs in sediment are summarized in **Table B.3** (attached).

The R3 Environmental Systems Acceptance Criteria does not have an upper limit for PAHs in sediment. The reported total PAH concentrations in the analyzed sediment samples did not exceed the NS Guidelines for Disposal of Contaminated Soils in Landfills.

3.3.4 Metals

The available laboratory analytical results for metals in sediment are summarized in **Table B.3** (attached).

Table 2 (section 3.3.7) provides a summary of the samples with metals reported at concentrations that exceed the total concentration threshold values listed in the R3 Environmental Systems Acceptance Criteria (equivalent to the NS Tier 1 EQS Industrial Standards – Potable Groundwater Use) for the following parameters (maximum reported concentrations and associated sample are provided in brackets):

- Arsenic (SED.UPPER_LAYER.PRE-PROCESSING: 24 mg/kg);
- Cobalt (SED.UPPER_LAYER.PRE-PROCESSING: 34 mg/kg);
- Lead (SED.UPPER_LAYER.PRE-PROCESSING: 200 mg/kg);
- Molybdenum (L1-DAY0-SED(A): 16 mg/kg);
- Nickel (SED.UPPER_LAYER.PRE-PROCESSING: 100 mg/kg);
- Selenium (SED.UPPER_LAYER.PRE-PROCESSING: 0.73 mg/kg); and
- Zinc (SED.UPPER_LAYER.PRE-PROCESSING: 530 mg/kg).

For both the R3 Environmental Systems Acceptance Criteria and the NS Guidelines for Disposal of Contaminated Soils in Landfills, in cases where the reported COPC concentrations in sediment exceed the total concentration threshold values listed in the applicable criteria, leachate analysis must be conducted on representative sample(s). Results of leachate analysis are presented in section 3.3.8.

Other reported metal concentrations in the remaining laboratory analyzed sediment samples were less than the R3 Environmental Systems Acceptance Criteria and the NS Guidelines for Disposal of Contaminated Soils in Landfills.

3.3.5 Total Polychlorinated Biphenyls

The available laboratory analytical results for PCBs in sediment are summarized in **Table B.3** (attached).

Reported total PCB concentrations in sediment in the laboratory analyzed sediment samples were less than both acceptance criteria.

3.3.6 Electrical Conductivity, Sodium Absorption Ratio, Total Organic Carbon and pH

The available laboratory analytical results for EC, SAR and pH in soil are summarized in **Table B.3** (attached).

Reported EC in sediment ranged from 1,600 to 10,000 µS/cm; SAR in sediment ranged from 19 to 49; TOC ranged from 2,300-10,000 mg/kg; and pH in soil ranged from 7.75 to 8.17.

The R3 Environmental Systems Acceptance Criteria and the NS Guidelines for Disposal of Contaminated Soils in Landfills do not have an upper limit for EC, and SAR or TOC concentrations in sediment.

3.3.7 Summary of Samples Requiring Further Analysis

Table 2 provides a summary of sediment samples collected from the proposed dredge area within the study area with COPCs exceeding the total concentration threshold values listed in one of the applicable acceptance criteria.

Table 2: Summary of sediment samples with COPC at levels greater then those listed in the acceptance criteria and require further analysis

Sample ID		L1-DAY 0- SED (B)		L1-DAY 0-SED (A)		SED.UPPER_LAYER.PRE-PROCESSING		L2-DAY 0-SED		SED.LOWER_LAYER.PRE-PROCESSING	
Parameter Group	BTEX										
	PHCs										
	Metals										
	PAHs										
	PCBs										

Notes:

Blank cells denote that COPCs were not reported at concentrations exceeding the acceptance criteria.

denotes that COPCs were reported at concentrations exceeding the total concentration threshold values listed in the R3 Environmental Systems Acceptance Criteria, further assessment required.

denotes that COPCs were reported at concentrations exceeding the total concentration threshold values listed in the NS Guidelines for Disposal of Contaminated Soils in Landfills, further assessment required.

3.3.8 Leachate Analysis

During the initial dewatering of the dredged sediments, samples were collected from both Layer 1 and Layer 2 for leachate analysis in anticipation of COPC possibly exceeding total concentration threshold values listed in the R3 Environmental Systems Acceptance Criteria or the NS Guidelines for Disposal of Contaminated Soils in Landfills. For the most part only samples from Layer 1 required leachate analysis (arsenic was nominally above the threshold value for one sample from Layer 2); samples were submitted for Syntenic Leachate Leaching Procedure (SPLP) and results for both layers are present in **Table B.5** (attached).

Reported concentrations of BTEX, PHCs, PAHs, metals, and PCBs in the laboratory analyzed leachate samples did not exceed the NS Guidelines for Disposal of Contaminated Soils in Landfills.

4 Conclusions and Recommendations

On the basis of the laboratory analytical results (sediment and leachate) and comparison to R3 Environmental Systems Acceptance Criteria and the NS Guidelines for Disposal of Contaminated Soils in Landfills, sediment proposed to be dredged from the study area (i.e., Halifax Harbour) can be disposed of at the R3 Environmental Systems soil disposal facility or other landfills in the province of Nova Scotia with appropriate documentation and analytical characterization including leachate analysis, as presented herein.

This report and the associated attachments provide appropriate documentation and analytical characterization of the sediment and must be presented to the R3 Environmental Systems (or, a provincially licensed landfill) prior to initiating the removal of the dredge spoil material from the study area for disposal.

Dillon has prepared this report for the exclusive use of Irving Shipbuilding Inc. and its agents for specific application to this site. The Dillon investigation was conducted in accordance with Dillon's scope of work and accepted environmental practices. Limitations to this report are included in the disclaimer presented in **Attachment E.** No other warranty, expressed or implied, is made.

Attachment A

Figure 1: Sample Location Plan

HATCH LIMITED

Sediment Characterization, Pier Modernization Land Levelling Project

SEDIMENT SAMPLE LOCATION PLAN
FIGURE 1

Sediment Sample Location

N
W E
S

SCALE 1:5,500

0 80 160 320 km

DILLON CONSULTING

MAP DRAWING INFORMATION:Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

MAP CREATED BY: RP
MAP CHECKED BY: SF
MAP PROJECTION: NAD 1983 UTM ZONE 20N
PROJECT: 21-3117 STATUS: DRAFT DATE: 2022-08-10

FILE LOCATION: K:\2021\213117\Product\Client\213117_HalifaxShipyard_Fig1_SedimentSampleLocations.mxd

Attachment B

Laboratory Analytical Summary Tables

Table B.1 - Sediment (Borehole sampling program) Analytical Summary

Location Code			BH001		BH002	BH003				BH004	BH005	BH006	BH007	
Depth			0 - 2	2 - 4	0 - 2	0 - 2	2 - 4	4 - 6	6 - 8	0 - 2	0 - 2	0 - 2	0 - 2	
Grain Size			Coarse	Coarse	Coarse	Fine	Coarse	Fine	Coarse	Fine	Coarse	Coarse	Coarse	
Sediment Type			Lower Till	Lower Till	Lower Till	Upper Organic	Lower Till	Upper Organic	Lower Till	Upper Organic	Lower Till	Lower Till	Lower Till	
Sample Type			Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	
Date			15 Jun 2022	15 Jun 2022	15 Jun 2022	14 Jun 2022	14 Jun 2022	14 Jun 2022	14 Jun 2022	16 Jun 2022	17 Jun 2022	18 Jun 2022	19 Jun 2022	
	Unit	R3 Environmetal Systems Acceptance Criteria[A]	NS Disposal of Contaminated Solids											
General Chemistry														
Fraction Organic Carbon (FOC)	g/g	-	-	0.028	0.011	0.0095	0.062	0.013	0.0015	0.0010	0.011	0.0072	0.025	0.022
Total Organic Carbon (TOC)	mg/kg	-	-	28,000,000	11,000,000	9,500,000	62,000,000	13,000,000	1,500,000	1,000,000	11,000,000	7,200,000	25,000,000	22,000,000
Chloride	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-
Electrical Conductivity (Lab)	µS/cm	-	-	5,500	2,900	2,600	22,000	3,500	3,500	1,500	2,700	2,700	5,600	2,700
pH (Lab)	pH Units	-	-	8.71	6.06	8.69	8.18	8.46	7.28	7.16	8.92	7.87	8.15	8.17
Sodium Adsorption Ratio (SAR)	SAR	-	-	55	29	58	-	50	39	42	65	63	50	51
Sulphate	mg/L	-	-	2,700	1,600	4,800	-	1,800	1,000	1,600	3,000	3,400	2,500	6,400
Field Parameters														
% sand by hydrometer	%	-	-	36	50	57	22	47	16	62	32	42	35	41
% silt by hydrometer	%	-	-	11	4.6	17	52	12	42	13	30	26	8.6	16
Metals														
Aluminium	mg/kg	220,000	-	10,000	7,300	9,200	13,000	10,000	15,000	7,300	12,000	12,000	11,000	13,000
Antimony	mg/kg	63	40	6.2	<2.0	7.5	9.6	<2.0	<2.0	<2.0	<2.0	<2.0	4.7	2.2
Arsenic	mg/kg	10	50	50	2.6	23	48	15	16	7.1	13	32	28	98
Barium	mg/kg	350	2000	84	<5.0	120	190	100	36	15	290	50	180	250
Beryllium	mg/kg	1	8	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bismuth	mg/kg	-	-	<2.0	<2.0	<2.0	2.4	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Boron	mg/kg	24,000	2	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Cadmium	mg/kg	1	20	0.66	<0.30	<0.30	1.9	<0.30	<0.30	<0.30	<0.30	<0.30	0.83	0.34
Calcium	mg/L	-	-	320	220	370	-	220	190	430	260	210	370	500
Chromium (Total, III+VI)	mg/kg	6,700	800	36	30	31	67	20	23	24	25	25	31	30
Cobalt	mg/kg	25	300	16	5.3	23	24	11	11	5.5	16	8.6	16	11
Copper	mg/kg	250	500	530	34	160	1,200	97	25	17	90	74	390	120
Iron	mg/kg	164,000	-	82,000	44,000	35,000	66,000	29,000	40,000	25,000	29,000	80,000	43,000	64,000
Lead	mg/kg	120	1000	250	11	170	320	69	13	6.2	57	63	370	180
Magnesium	mg/L	-	-	420	350	720	-	440	350	530	610	490	550	730
Manganese	mg/kg	2,000	-	520	370	490	300	400	450	290	580	1,400	510	1,000
Mercury	mg/kg	99	10	2.3	<0.10	0.52	2.6	0.95	<0.10	<0.10	0.51	0.41	1.6	0.62
Molybdenum	mg/kg	15	40	31	16	4.2	79	8.1	2.9	3.2	2.8	9.7	18	9.0
Nickel	mg/kg	70	500	28	10	64	58	24	27	14	39	18	44	28
Potassium	mg/L	-	-	290	120	310	-	220	98	140	260	260	260	340
Selenium	mg/kg	1	10	1.6	1.5	<0.50	1.6	<0.50	<0.50	<0.50	<0.50	1.2	0.67	1.2
Rubidium	mg/kg	-	-	5.6	<2.0	7.7	12	7.3	11	5.7	13	4.6	9.8	6.2
Lithium	mg/kg	-	-	20	19	19	22	28	28	15	23	34	27	46
Silver	mg/kg	490	40	0.67	<0.50	<0.50	3.9	<0.50	<0.50	<0.50	0.53	<0.50	0.65	<0.50
Sodium	mg/L	-	-	6,300	2,900	8,300	-	5,600	3,900	5,400	8,300	7,300	6,500	7,600
Strontium	mg/kg	140,000	-	76	22	34	190	50	12	7.4	41	16	56	64
Thallium	mg/kg	1	1	0.19	<0.10	0.11	0.56	0.10	<0.10	<0.10	0.14	<0.10	0.19	0.11
Tin	mg/kg	140,000	300	24	1.6	16	72	6.8	<1.0	<1.0	6.2	1.8	27	11
Uranium	mg/kg	30	-	1.5	2.3	0.91	2.1	1.0	1.3	0.53	0.86	2.2	1.6	3.7
Vanadium	mg/kg	100	200	32	11	21	72	22	19	11	28	19	36	35
Zinc	mg/kg	200	1,500	510	45	780	1,500	200	61	37	170	92	680	190
Physical Properties														
Particle Size Distribution (Clay)	%	-	-	6.7	2.6	5.2	19	6.6	20	3.5	20	17	4.5	2.6
Particle Size Distribution (Gravel)	%	-	-	46	43	21	6.8	35	22	22	17	16	52	40
Percent Saturation	%	-	-	33	37	35	-	35	66	25	44	40	34	38
Moisture Content	%	-	-	32	17	31	69	33	16	15	31	25	18	29
Particle Size														
Particle Size Distribution (<1/128mm, 7 PHI)	%	-	-	8.5	3.2	8.3	38	7.8	25	4.4	24	21	5.5	3.8
Particle Size Distribution (<1/16mm, 4 PHI)	%	-	-	18	7.2	23	72	19	63	16	51	42	13	19
Particle Size Distribution (<1/256mm, 8 PHI)	%	-	-	6.7	2.6	5.2	19	6.6	20	3.5	20	17	4.5	2.6
Particle Size Distribution (<1/2mm, 1 PHI)	%	-	-	34[#10]	16	62[#13]	84	47[#10]	77	60	75[#10]	69	30	41
Particle Size Distribution (<1/32mm, 5 PHI)	%	-	-	16	6.3	18	68	15	52	11	43	36	11	16
Particle Size Distribution (<1/4mm, 2 PHI)	%	-	-	27[#10]	11	49	79	35	76	46	68	60	23	30
Particle Size Distribution (<1/512mm, 9 PHI)	%	-	-	3.7	1.9	3.1	14	5.0	14	2.3	9.7	2.3	3.0	1.8
Particle Size Distribution (<1/64mm, 6 PHI)	%	-	-	13	5.0	15	60	12	43	8.2	36	30	8.8	13
Particle Size Distribution (<1/8mm, 3 PHI)	%	-	-	22	8.7	35	76	26	73	28	60	51	17	23
Particle Size Distribution (<1mm, 0 PHI)	%	-	-	43[#10]	29	72[#13]	88	57[#10]	78	70	79[#10]	77[#10]	38	50[#10]
Particle Size Distribution (<2mm, -1 PHI)	%	-	-	54[#10]	57	79[#13]	93	65[#10]	78	78	83[#10]	84[#10]	48	60[#10]
BTEX														
Benzene	mg/kg	-	5	0.026	<0.0050	<0.0050	<0.0050	0.028	<0.0050	<0.0050	0.027	0.034	<0.0050	0.030
Toluene	mg/kg	-	30	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.13	<0.050	<0.050
Ethylbenzene	mg/kg	-	50	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.020	<0.010	0.026
Xylene Total	mg/kg	-	50	0.093	<0.050	0.065	<0.050	<0.050	<0.050	<0.050	0.068	0.052	<0.050	0.16
Petroleum Hydrocarbons (PHCs)														
EPH >C10-C16	mg/kg	-	150[B]	150	<10	32	120	90	<10	<10	140	130	<10	230
EPH >C16-C21	mg/kg	-	150[B]	420	<10	98	350	160	<10	<10	280	250	<10	600
EPH >C21-C32	mg/kg	-	150[B]	1,100	<15	370	1,200	430	<15	32	740	630	40	1,000
PHC F1-BTEX (C6-C10-BTEX)	mg/kg	-	150[B]	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Modified TPH (Tier 1)	mg/kg	-	-	1,700	<15	500	1,700	680	<15	32	1,200	1,000	40	1,900
Reached Baseline at C32	-	-	-	0[#11]	-	0[#11]	0[#11]	0[#11]	-	1[#1]	0[#11]	0[#11]	1[#1]	0[#11]
Hydrocarbon Resemblance	-	-	-	1[#12]	1	1[#12]	1[#2]	1[#12]	1	1[#6]	1[#12]	1[#12]	1[#2]	1[#14]
Polycyclic Aromatic Hydrocarbons (PAHs)														
1-Methylnaphthalene	mg/kg	30	10	0.032	<0.0050	0.063	-	0.12	<0.0050	<0.0050	0.073	0.064	0.0066	0.11
2-methylnaphthalene	mg/kg	30	10	0.042	<0.0050	0.081	-	0.14	<0.0050	<0.0050	0.089	0.079	0.0078	0.13
Acenaphthene	mg/kg	43,000	10	0.074	<0.0050	0.12	-	0.19	<0.0050	<0.0050	0.18	0.12	0.0082	0.21
Acenaphthylene	mg/kg	23	10	0.014	<0.0050	<0.020[#5]	-	0.086	<0.0050	<0.0050	0.028	0.041	0.0053	0.023
Anthracene	mg/kg	300,000	10	<0.19[#5]	<0.0050	0.26	-	0.72	<0.0050	<0.0050	0.38	<0.62[#5]	0.019	<0.37[#5]
Benz(a)anthracene	mg/kg	12	10	0.7	<0.0050	1.1	-	1.3	<0.0050	<0.0050	0.89	0.92	0.041	0.79
Benzo(a)pyrene	mg/kg	14	10	0.39	<0.0050	0.74	-	0.68	<0.0050	<0.0050	0.7	0.79	0.046	0.65
Benzo(b)fluoranthene	mg/kg	1.2	10	0.32	<0.0050	0.66	-	0.59	<0.0050	<0.0050	0.65	0.61	0.041	0.54
Benzo(b+j)fluoranthene	mg/kg	1.2	10	0.5	<0.010	1	-	0.93	<0.010	<0.010	1	0.92	0.065	0.82
Benzo(g,h,i)perylene	mg/kg	250	10	0.23	<0.0050	0.44	-	0.34	<0.0050	<0.0050	0.45	0.51	0.031	0.42
Benzo(j)fluoranthene	mg/kg	1.2	10	0.18	<0.0050	0.35	-	0.34	<0.0050	<0.0050	0.35	0.31	0.023	0.28
Benzo(k)fluoranthene	mg/kg	1.2	10	0.18	<0.0050	0.38	-	0.32	<0.0050	<0.0050	0.38	0.33	0.024	0.3
Chrysene	mg/kg	78	10	0.71	<0.0050	0.99	-	1.2	<0.0050	<0.0050	1.1	0.99	0.046	0.9
Dibenz(a,h)anthracene	mg/kg	8.8	10	0.057	<0.0050	0.11	-	0.093	<0.0050	<0.0050	0.11	0.1	0.0073	0.093
Fluorene	mg/kg	39,000	10	0.1	<0.0050	0.16	-	0.34	<0.0050	<0.0050	0.23	0.19	0.0096	0.24
Fluoranthene	mg/kg	50,000	10	1.2	<0.0050	1.5	-	2.5	<0.0050	<0.0050	1.5	1.5	0.076	1.5
Indeno(1,2,3-c,d)pyrene	mg/kg	98	10	0.18	<0.0050	0.36	-	0.29	<0.0050	<0.0050	0.38	0.42	0.026	0.34
Naphthalene	mg/kg	25	10	0.05	<0.0050	0.12	-	0.19	<0.0050	<0.0050	0.13	0.15	0.017	0.31
Perylene	mg/kg	-	10	0.1	<0.0050	0.17	-	0.29	<0.0050	<0.0050	0.18	0.19	0.012	0.14
Phenanthrene	mg/kg	17	10	0.54	<0.0050	0.85	-	1.8	<0.0050	<0.0050	1.4	1.1	0.05	1.5
Pyrene	mg/kg	30,000	10	1.3	<0.0050	1.6	-	2.1	<0.0050	<0.0050	1.7	1.9	0.1	1.5
Total PAHs	mg/kg	-	50	6.90	0.00	11.05	0.00	14.56	0.00	0.00	11.90	11.23	0.66	10.80
Volatile Organic Compounds (VOCs)														
Methyl tert-Butyl Ether (MTBE)	mg/kg			<0.025	<0.025	<0.025	-	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Polychlorinated Biphenyls (PCBs)														
2,4,5-Trichlorobiphenyl	mg/kg	-	-	<0.10	<0.010	<0.10	-	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10
Decachlorobiphenyl	mg/kg	-	-	<0.10	<0.010	<0.10	-	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10
Heptachlorobiphenyl	mg/kg	-	-	<0.10	<0.010	<0.10	-	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10
Hexachlorobiphenyl, 2,3,3,4,4,5- (PCB 156)	mg/kg	-	-	<0.10	<0.010	<0.10	-	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10
Hexachlorobiphenyl, 2,3,3,4,4,5- (PCB 157)	mg/kg	-	-	<0.10	<0.010	<0.10	-	<0.10	<0.010	<0.010	0.11	<0.010	<0.010	<0.10
Hexachlorobiphenyl, 3,3,4,4,5,5- (PCB 169)	mg/kg	-	-	<0.10	<0.010	<0.10	-	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10
Nonachlorobiphenyl	mg/kg	-	-	<0.10	<0.010	<0.10	-	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10
PCB 101	mg/kg	-	-	<0.10	<0.010	<0.10	-	<0.10	<0.010	<0.010	0.057	<0.010	<0.010	<0.10
PCB 118	mg/kg	-	-	<0.10	<0.010	<0.10	-	<0.10	<0.010	<0.010	0.027	<0.010	<0.010	<0.10
PCB 153	mg/kg	-	-	<0.10	<0.010	<0.10	-	<0.10	<0.010	<0.010	0.023	<0.010	<0.010	<0.10
PCB 180	mg/kg	-	-	<0.10	<0.010	<0.10	-	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10
PCB 52	mg/kg	-	-	<0.10	<0.010	<0.10	-	<0.10	<0.010	<0.010	0.027	<0.010	<0.010	<0.10
PCB-110	mg/kg	-	-	<0.10	<0.010	<0.10	-	<0.10	<0.010	<0.010	0.043	<0.010	<0.010	<0.10
PCB-128	mg/kg	-	-	<0.10	<0.010	<0.10	-	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10
PCB-149	mg/kg	-	-	<0.10	<0.010	<0.10	-	<0.10	<0.010	<0.010	0.023	<0.010	<0.010	<0.10
PCB-151	mg/kg	-	-	<0.10	<0.010	<0.10	-	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10
PCB-170	mg/kg	-	-	<0.10	<0.010	<0.10	-	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10
PCB-194	mg/kg	-	-	<0.10	<0.010	<0.10	-	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10
PCB-206	mg/kg	-	-	<0.10	<0.010	<0.10	-	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10
PCB-44	mg/kg	-	-	<0.10	<0.010	<0.10	-	<0.10	<0.010	<0.010	0.011	<0.010	<0.010	<0.10
PCB-49	mg/kg	-	-	<0.10	<0.010	<0.10	-	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10
Pentachlorobiphenyl	mg/kg	-	-	<0.10	<0.010	<0.10	-	<0.10	<0.010	<0.010	0.23	<0.010	<0.010	<0.10
Pentachlorobiphenyl, 2,3,3,4,4- (PCB 105)	mg/kg	-	-	<0.10	<0.010	<0.10	-	<0.10	<0.010	<0.010	0.013	<0.010	<0.010	<0.10
Tetrachlorobiphenyl, 3,4,4,5- (PCB 81)	mg/kg	-	-	<0.10	<0.010	<0.10	-	<0.10	<0.010	<0.010	0.050	<0.010	<0.010	<0.10
PCBs (Sum of total)	mg/kg	160	50	<0.10	<0.010	<0.10	-	<0.10	<0.010	<0.010	0.39	<0.010	<0.010	<0.10
Other														
Tributyltin	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-

Comments

Red colored cells indicate value exceeds both threshold values

A R3 Environmental System Acceptance Critiera is equivalent to the NS Tier EQS for Soil (Industrial, Potable, Coarse) for metals, but has no upper limits for General Chemistry, BTEX, PHCs, PAHs, VOCs or PCBs.

B Aliphatic hydrocarbons

#1 YES

#2 Lube oil fraction.

#3 Lube oil fraction; interference from possible PAHs.

#4 Elevated RDL(s) due to detected levels in the leachate blank.

#5 Elevated PAH RDL(s) due to matrix / co-extractive interference.

#6 Possible lube oil fraction.

#7 One product in fuel oil range. Lube oil fraction.

#8 Weathered fuel oil fraction. Lube oil fraction.

#9 One product in fuel / lube range.

#10 PSA sample observation comment: Fraction contained shells

#11 NO

#12 One product in fuel / lube range. Lube oil fraction.

#13 PSA sample observation comment: Fraction contained organic matter and shells

#14 One product in fuel / lube range. Possible lube oil fraction.

#15 PSA sample observation comment: Fraction contained rocks and shells.

#16 PSA sample observation comment: Fraction contained rocks.

#17 PSA sample observation comment: Fraction contained glass

#18 One product in the gasoline range. One product in fuel / lube range. Lube oil fraction.

#19 PSA sample observation comment: Fraction contained fish bones

#20 PSA sample observation comment: Fraction contained charcoal

#21 PSA sample observation comment: Fraction contained shells and charcoal

#22 One product in fuel / lube range. Unidentified compound(s) in fuel / lube range.

Environmental Standards

R3 Environmental Systems (i.e., Envirosoil) Acceptance Criteria

NS Acceptance Parameters for Contaminated Soil (Total Analysis) – Attachment B as presented in the Guidelines for Disposal of Contaminated Solids in Landfills (NSE 1992, revised 2005).

Table B.1 - Sediment (Borehole sampling program) Analytical Summary (continued)

Location Code				BH008			BH009							BH010		
Depth				0 - 2	2 - 4	4 - 6	0 - 2	2 - 4	2 - 4	4 - 6	6 - 8	0 - 2	2 - 4	4 - 6
Grain Size				Coarse	Fine	Fine	Coarse	Fine	Coarse	Coarse	Coarse	Coarse	Coarse	Coarse
Sediment Type				Lower Till	Upper Organic	Upper Organic	Lower Till	Upper Organic	Lower Till	Lower Till	Lower Till	Lower Till	Lower Till	Lower Till
Sample Type				Normal	Normal	Normal	Normal	Normal	Field_D	Normal	Normal	Normal	Normal	Normal
Date				23 Jun 2022	23 Jun 2022	23 Jun 2022	24 Jun 2022	24 Jun 2022	24 Jun 2022	24 Jun 2022	24 Jun 2022	22 Jun 2022	22 Jun 2022	22 Jun 2022
	Unit	R3 Environmetal Systems Acceptance Criteria[A]	NS Disposal of Contaminated Solids											
General Chemistry														
Fraction Organic Carbon (FOC)	g/g	-	-	0.0077	0.0015	0.0025	0.031	0.0028	0.0019	0.0011	0.00053	0.024	0.0030	0.0030
Total Organic Carbon (TOC)	mg/kg	-	-	7,700,000	1,500,000	2,500,000	31,000,000	2,800,000	1,900,000	1,100,000	530,000	24,000,000	3,000,000	3,000,000
Chloride	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-
Electrical Conductivity (Lab)	µS/cm	-	-	3,600	3,300	1,600	8,700	2,700	3,000	2,400	1,200	6,200	2,600	2,600
pH (Lab)	pH Units	-	-	8.05	7.65	7.99	8.15	8.32	7.83	7.79	7.52	7.95	7.37	7.15
Sodium Adsorption Ratio (SAR)	SAR	-	-	37	39	37	48	39	46	43	38	76	62	55
Sulphate	mg/L	-	-	2,500	1,100	3,700	4,900	1,400	1,300	1,500	1,000	7,000	1,600	1,600
Field Parameters														
% sand by hydrometer	%	-	-	41	37	4.9	32	33	43	15	39	54	72	23
% silt by hydrometer	%	-	-	23	41	50	15	34	32	24	7.9	24	13	15
Metals														
Aluminium	mg/kg	220,000	-	9,600	10,000	16,000	15,000	9,700	12,000	14,000	9,500	9,800	5,700	10,000
Antimony	mg/kg	63	40	3.9	<2.0	<2.0	98	11	4.6	<2.0	<2.0	9.6	2.6	<2.0
Arsenic	mg/kg	10	50	18	8.0	14	170	26	13	14	10	40	12	11
Barium	mg/kg	350	2000	93	46	47	350	71	83	42	18	170	38	30
Beryllium	mg/kg	1	8	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bismuth	mg/kg	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Boron	mg/kg	24,000	2	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Cadmium	mg/kg	1	20	0.33	<0.30	<0.30	1.6	0.30	<0.30	<0.30	<0.30	0.68	<0.30	<0.30
Calcium	mg/L	-	-	370	200	540	330	240	210	240	180	170	260	320
Chromium (Total, III+VI)	mg/kg	6,700	800	23	16	25	130	24	24	31	19	30	12	21
Cobalt	mg/kg	25	300	17	12	18	140	19	14	16	9.7	19	7.3	11
Copper	mg/kg	250	500	160	36	64	1,300	150	76	63	22	370	95	32
Iron	mg/kg	164,000	-	27,000	22,000	37,000	130,000	30,000	29,000	34,000	26,000	37,000	20,000	37,000
Lead	mg/kg	120	1000	140	11	16	1,500	180	69	16	7.7	370	54	13
Magnesium	mg/L	-	-	430	360	640	590	440	440	430	330	570	500	570
Manganese	mg/kg	2,000	-	290	390	610	760	470	510	470	540	390	270	400
Mercury	mg/kg	99	10	0.17	<0.10	<0.10	1.2	0.11	<0.10	<0.10	<0.10	0.78	0.16	<0.10
Molybdenum	mg/kg	15	40	8.9	<2.0	<2.0	50	6.6	<2.0	5.5	<2.0	20	2.3	4.7
Nickel	mg/kg	70	500	37	28	41	300	30	31	43	22	32	14	20
Potassium	mg/L	-	-	200	160	240	250	140	150	140	92	300	160	180
Selenium	mg/kg	1	10	<0.50	<0.50	<0.50	2.5	<0.50	<0.50	<0.50	<0.50	0.86	<0.50	<0.50
Rubidium	mg/kg	-	-	6.9	8.6	14	15	7.9	11	12	8.4	8.1	4.1	7.4
Lithium	mg/kg	-	-	22	26	41	22	23	27	32	22	24	17	22
Silver	mg/kg	490	40	<0.50	<0.50	<0.50	1.3	<0.50	<0.50	<0.50	<0.50	0.64	<0.50	<0.50
Sodium	mg/L	-	-	4,400	4,000	5,300	6,400	4,300	5,100	4,800	3,700	9,200	7,400	7,100
Strontium	mg/kg	140,000	-	46	13	19	250	21	21	16	9.1	88	25	14
Thallium	mg/kg	1	1	0.11	<0.10	0.12	0.35	<0.10	<0.10	0.10	<0.10	0.18	<0.10	<0.10
Tin	mg/kg	140,000	300	18	1.4	1.5	190	21	7.5	2.6	<1.0	36	9.9	<1.0
Uranium	mg/kg	30	-	0.87	0.97	1.7	2.0	0.87	0.75	1.7	0.51	1.7	0.78	1.1
Vanadium	mg/kg	100	200	20	16	23	48	19	20	20	13	31	12	16
Zinc	mg/kg	200	1,500	740	52	99	9,800	1,200	440	130	64	1,900	390	45
Physical Properties														
Particle Size Distribution (Clay)	%	-	-	8.8	18	28	4.8	16	13	26	2.4	5.2	5.7	6.8
Particle Size Distribution (Gravel)	%	-	-	27	4.4	17	49	17	12	36	50	17	8.8	55
Percent Saturation	%	-	-	39	45	43	67	21	21	40	18	72	29	32
Moisture Content	%	-	-	22	18	24	41	14	13	19	9.7	35	17	14
Particle Size														
Particle Size Distribution (<1/128mm, 7 PHI)	%	-	-	10	20	34	7.4	19	15	28	3.2	9.5	6.9	8.4
Particle Size Distribution (<1/16mm, 4 PHI)	%	-	-	32	59	78	19	50	46	49	10	29	19	22
Particle Size Distribution (<1/256mm, 8 PHI)	%	-	-	8.8	18	28	4.8	16	13	26	2.4	5.2	5.7	6.8
Particle Size Distribution (<1/2mm, 1 PHI)	%	-	-	63	90	81	35	77	78	58	32	69	80	37
Particle Size Distribution (<1/32mm, 5 PHI)	%	-	-	24	40	71	17	41	37	45	8.2	26	14	18
Particle Size Distribution (<1/4mm, 2 PHI)	%	-	-	55	84	80	28	71	68	55	20	56	64	32
Particle Size Distribution (<1/512mm, 9 PHI)	%	-	-	6.4	14	20	2.7	12	9.9	20	1.4	4.0	4.7	4.6
Particle Size Distribution (<1/64mm, 6 PHI)	%	-	-	18	31	58	14	33	27	38	6.5	23	11	14
Particle Size Distribution (<1/8mm, 3 PHI)	%	-	-	44	75	80	23	60	56	52	14	37	40	26
Particle Size Distribution (<1mm, 0 PHI)	%	-	-	68[#10]	94	82	45	81	84	61	41	77	87	41
Particle Size Distribution (<2mm, -1 PHI)	%	-	-	73[#10]	96	83	51[#15]	83[#16]	88[#16]	64[#16]	50[#16]	83[#10]	91[#10]	45[#10]
BTEX														
Benzene	mg/kg	-	5	<0.010	<0.0050	<0.0050	0.064	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Toluene	mg/kg	-	30	<0.10	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Ethylbenzene	mg/kg	-	50	0.071	<0.010	<0.010	0.17	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Xylene Total	mg/kg	-	50	0.57	<0.050	<0.050	0.79	<0.050	<0.050	<0.050	<0.050	<0.050	0.089	<0.050
Petroleum Hydrocarbons (PHCs)														
EPH >C10-C16	mg/kg	-	150[B]	13	<10	<10	72	<10	<10	<10	<10	41	<10	<10
EPH >C16-C21	mg/kg	-	150[B]	33	<10	<10	180	13	<10	<10	<10	100	14	<10
EPH >C21-C32	mg/kg	-	150[B]	120	<15	<15	680	100	27	<15	21	320	44	<15
PHC F1-BTEX (C6-C10-BTEX)	mg/kg	-	150[B]	<5.0	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Modified TPH (Tier 1)	mg/kg	-	-	170	<15	<15	940	120	27	<15	21	460	59	<15
Reached Baseline at C32	-	-	-	1[#1]	-	-	1[#1]	1[#1]	1[#1]	-	1[#1]	1[#1]	1[#1]	-
Hydrocarbon Resemblance	-	-	-	1[#14]	1	1	1[#2]	1[#2]	1[#6]	1	1[#6]	1[#12]	1[#2]	1
Polycyclic Aromatic Hydrocarbons (PAHs)														
1-Methylnaphthalene	mg/kg	30	10	0.026	<0.0050	<0.0050	0.44	0.022	0.0099	<0.0050	<0.0050	0.063	<0.0050	<0.0050
2-methylnaphthalene	mg/kg	30	10	0.029	<0.0050	<0.0050	0.5	0.027	0.012	<0.0050	<0.0050	0.075	0.007	<0.0050
Acenaphthene	mg/kg	43,000	10	0.072	<0.0050	<0.0050	1.6	0.031	0.026	<0.0050	<0.0050	0.37	0.0095	<0.0050
Acenaphthylene	mg/kg	23	10	<0.0050	<0.0050	<0.0050	0.052	<0.0050	<0.0050	<0.0050	<0.0050	0.022	0.0063	<0.0050
Anthracene	mg/kg	300,000	10	0.13	<0.0050	<0.0050	1.2	0.034	0.033	<0.0050	<0.0050	0.58	0.03	<0.0050
Benz(a)anthracene	mg/kg	12	10	0.29	<0.0050	<0.0050	2.1	0.054	0.047	<0.0050	<0.0050	1.1	0.063	<0.0050
Benzo(a)pyrene	mg/kg	14	10	0.19	<0.0050	<0.0050	1.7	0.051	0.04	<0.0050	<0.0050	0.75	0.059	<0.0050
Benzo(b)fluoranthene	mg/kg	1.2	10	0.19	<0.0050	<0.0050	1.5	0.044	0.037	<0.0050	<0.0050	0.68	0.053	<0.0050
Benzo(b+j)fluoranthene	mg/kg	1.2	10	0.28	<0.010	<0.010	2.2	0.067	0.055	<0.010	<0.010	1	0.081	<0.010
Benzo(g,h,i)perylene	mg/kg	250	10	0.12	<0.0050	<0.0050	0.97	0.033	0.023	<0.0050	<0.0050	0.43	0.042	<0.0050
Benzo(j)fluoranthene	mg/kg	1.2	10	0.095	<0.0050	<0.0050	0.75	0.023	0.019	<0.0050	<0.0050	0.35	0.028	<0.0050
Benzo(k)fluoranthene	mg/kg	1.2	10	0.1	<0.0050	<0.0050	0.74	0.022	0.018	<0.0050	<0.0050	0.36	0.028	<0.0050
Chrysene	mg/kg	78	10	0.29	<0.0050	<0.0050	2.1	0.06	0.048	<0.0050	<0.0050	1	0.064	<0.0050
Dibenz(a,h)anthracene	mg/kg	8.8	10	0.029	<0.0050	<0.0050	0.24	0.0076	<0.0050	<0.0050	<0.0050	0.095	0.0093	<0.0050
Fluorene	mg/kg	39,000	10	0.084	<0.0050	<0.0050	1.2	0.036	0.029	<0.0050	<0.0050	0.37	0.014	<0.0050
Fluoranthene	mg/kg	50,000	10	0.63	<0.0050	<0.0050	4	0.14	0.12	0.008	<0.0050	3.1	0.12	<0.0050
Indeno(1,2,3-c,d)pyrene	mg/kg	98	10	0.093	<0.0050	<0.0050	0.85	0.027	0.02	<0.0050	<0.0050	0.37	0.034	<0.0050
Naphthalene	mg/kg	25	10	0.044	<0.0050	<0.0050	0.73	0.028	0.02	<0.0050	<0.0050	0.15	0.017	<0.0050
Perylene	mg/kg	-	10	0.048	<0.0050	<0.0050	0.37	0.012	0.0096	<0.0050	<0.0050	0.19	0.015	<0.0050
Phenanthrene	mg/kg	17	10	0.42	<0.0050	<0.0050	4.1	0.14	0.13	0.0084	<0.0050	2.7	0.079	<0.0050
Pyrene	mg/kg	30,000	10	0.52	<0.0050	<0.0050	4	0.12	0.099	0.0064	<0.0050	2.4	0.13	<0.0050
Total PAHs	mg/kg	-	50	3.68	0.00	0.00	31.34	0.98	0.80	0.02	0.00	16.16	0.89	0.00
Volatile Organic Compounds (VOCs)														
Methyl tert-Butyl Ether (MTBE)	mg/kg			<0.050	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Polychlorinated Biphenyls (PCBs)														
2,4,5-Trichlorobiphenyl	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Decachlorobiphenyl	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Heptachlorobiphenyl	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Hexachlorobiphenyl, 2,3,3,4,4,5- (PCB 156)	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Hexachlorobiphenyl, 2,3,3,4,4,5- (PCB 157)	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Hexachlorobiphenyl, 3,3,4,4,5,5- (PCB 169)	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Nonachlorobiphenyl	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 101	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 118	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 153	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 180	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 52	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB-110	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB-128	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB-149	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB-151	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB-170	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB-194	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB-206	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB-44	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB-49	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Pentachlorobiphenyl	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Pentachlorobiphenyl, 2,3,3,4,4- (PCB 105)	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Tetrachlorobiphenyl, 3,4,4,5- (PCB 81)	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCBs (Sum of total)	mg/kg	160	50	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Other														
Tributyltin	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-

Comments
Red colored cells indicate value exceeds both threshold values

A R3 Environmental System Acceptance Critiera is equivalent to the NS Tier EQS for Soil (Industrial, Potable, Coarse) for metals, but has no upper limits for General Chemistry, BTEX, PHCs, PAHs, VOCs or PCBs.
B Aliphatic hydrocarbons
#1 YES
#2 Lube oil fraction.
#3 Lube oil fraction; interference from possible PAHs.
#4 Elevated RDL(s) due to detected levels in the leachate blank.
#5 Elevated PAH RDL(s) due to matrix / co-extractive interference.
#6 Possible lube oil fraction.
#7 One product in fuel oil range. Lube oil fraction.
#8 Weathered fuel oil fraction. Lube oil fraction.
#9 One product in fuel / lube range.
#10 PSA sample observation comment: Fraction contained shells
#11 NO
#12 One product in fuel / lube range. Lube oil fraction.
#13 PSA sample observation comment: Fraction contained organic matter and shells
#14 One product in fuel / lube range. Possible lube oil fraction.
#15 PSA sample observation comment: Fraction contained rocks and shells.
#16 PSA sample observation comment: Fraction contained rocks.
#17 PSA sample observation comment: Fraction contained glass
#18 One product in the gasoline range. One product in fuel / lube range. Lube oil fraction.
#19 PSA sample observation comment: Fraction contained fish bones
#20 PSA sample observation comment: Fraction contained charcoal
#21 PSA sample observation comment: Fraction contained shells and charcoal
#22 One product in fuel / lube range. Unidentified compound(s) in fuel / lube range.

Environmental Standards
R3 Environmental Systems (i.e., Envirosoil) Acceptance Criteria
NS Acceptance Parameters for Contaminated Soil (Total Analysis) – Attachment B as presented in the Guidelines for Disposal of Contaminated Solids in Landfills (NSE 1992, revised 2005).

Table B.1 - Sediment (Borehole sampling program) Analytical Summary (continued)

Location Code			BH011	BH011	BH012	BH013			BH014			BH015				
Depth			0 - 2	2 - 4	0 - 2	0 - 2	2 - 4	4 - 6	0 - 2	2 - 4	4 - 6	0 - 2		2 - 4		
Grain Size			Coarse	Fine	Coarse	Coarse	Coarse	Coarse	Coarse	Coarse	Coarse	Coarse	Coarse	Coarse		
Sediment Type			Lower Till	Upper Organic	Lower Till	Lower Till	Lower Till	Lower Till	Lower Till	Lower Till	Lower Till	Lower Till	Lower Till	Lower Till		
Sample Type			Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Field_D	Normal		
Date			21 Jun 2022	21 Jun 2022	21 Jun 2022	25 Jun 2022	25 Jun 2022	25 Jun 2022	25 Jun 2022	25 Jun 2022	25 Jun 2022	26 Jun 2022	26 Jun 2022	26 Jun 2022		
	Unit	R3 Environmetal Systems Acceptance Criteria[A]	NS Disposal of Contaminated Solids													
General Chemistry																
Fraction Organic Carbon (FOC)	g/g	-	-	0.021	0.0034	0.046	0.18	0.12	0.0060	0.016	0.0011	0.024	0.11	0.23	0.022	
Total Organic Carbon (TOC)	mg/kg	-	-	21,000,000	3,400,000	46,000,000	180,000,000	120,000,000	6,000,000	16,000,000	1,100,000	24,000,000	110,000,000	230,000,000	22,000,000	
Chloride	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Electrical Conductivity (Lab)	µS/cm	-	-	5,100	2,200	9,200	3,900	5,400	1,600	4,400	1,700	10,000	4,500	4,300	4,400	
pH (Lab)	pH Units	-	-	7.82	6.95	7.65	7.77	7.72	7.75	7.63	7.74	7.47	7.86	7.77	7.58	
Sodium Adsorption Ratio (SAR)	SAR	-	-	49	38	50	43	32	37	28	25	28	39	35	34	
Sulphate	mg/L	-	-	3,000	1,500	3,500	4,900	3,500	1,700	2,300	1,300	2,200	5,300	7,500	3,100	
Field Parameters																
% sand by hydrometer	%	-	-	17	30	41	43	23	61	70	89	13	47	50	30	
% silt by hydrometer	%	-	-	28	27	23	8.9	11	11	2.8	2.9	35	12	9.9	19	
Metals																
Aluminium	mg/kg	220,000	-	9,400	7,700	9,900	4,600	13,000	12,000	3,500	4,000	14,000	5,800	4,600	7,700	
Antimony	mg/kg	63	40	<2.0	<2.0	2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	4.1	<2.0	<2.0	
Arsenic	mg/kg	10	50	23	13	30	13	19	12	10	3.0	14	21	18	8.1	
Barium	mg/kg	350	2000	73	19	130	110	93	9.9	42	13	25	190	160	32	
Beryllium	mg/kg	1	8	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Bismuth	mg/kg	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	
Boron	mg/kg	24,000	2	<50	<50	<50	<50	<50	<50	<50	<50	50	<50	<50	<50	
Cadmium	mg/kg	1	20	0.30	<0.30	0.56	0.40	<0.30	<0.30	<0.30	<0.30	0.37	1.2	0.74	<0.30	
Calcium	mg/L	-	-	280	290	410	310	780	320	480	380	660	830	940	1,100	
Chromium (Total, III+VI)	mg/kg	6,700	800	23	17	27	16	24	19	16	7.4	27	19	27	15	
Cobalt	mg/kg	25	300	7.3	6.7	9.0	7.0	9.2	11	5.6	2.4	8.7	7.5	5.6	4.2	
Copper	mg/kg	250	500	85	34	1,800	61	22	21	80	5.5	19	230	75	15	
Iron	mg/kg	164,000	-	55,000	38,000	32,000	29,000	33,000	24,000	15,000	9,400	30,000	29,000	30,000	21,000	
Lead	mg/kg	120	1000	89	15	270	170	190	10	62	15	12	340	190	28	
Magnesium	mg/L	-	-	720	530	1,100	350	660	480	370	310	540	720	720	870	
Manganese	mg/kg	2,000	-	510	570	450	260	1,300	1,800	150	240	1,100	250	200	580	
Mercury	mg/kg	99	10	0.88	<0.10	2.4	0.36	0.18	<0.10	0.15	<0.10	<0.10	0.68	0.52	0.13	
Molybdenum	mg/kg	15	40	7.8	3.7	9.7	4.6	5.5	<2.0	3.1	<2.0	4.7	6.6	6.7	3.1	
Nickel	mg/kg	70	500	16	12	80	34	25	27	21	7.0	26	20	17	13	
Potassium	mg/L	-	-	350	150	480	200	220	120	150	110	180	280	260	330	
Selenium	mg/kg	1	10	1.2	<0.50	0.95	0.55	0.75	<0.50	<0.50	<0.50	0.80	0.73	0.73	<0.50	
Rubidium	mg/kg	-	-	6.0	5.4	8.3	3.5	5.9	4.4	2.7	2.2	9.2	4.0	3.2	5.1	
Lithium	mg/kg	-	-	23	21	27	11	38	45	10	12	42	14	10	22	
Silver	mg/kg	490	40	2.7	<0.50	460	1.1	<0.50	<0.50	<0.50	<0.50	<0.50	0.95	<0.50	<0.50	
Sodium	mg/L	-	-	6,800	4,700	8,600	4,700	5,000	4,500	3,400	2,700	4,000	6,300	5,800	6,300	
Strontium	mg/kg	140,000	-	34	16	48	100	81	14	100	11	110	100	91	34	
Thallium	mg/kg	1	1	0.11	<0.10	0.22	0.11	0.12	<0.10	<0.10	<0.10	0.14	0.19	0.16	<0.10	
Tin	mg/kg	140,000	300	6.3	1.2	18	7.6	2.3	1.1	4.9	3.2	1.2	14	12	1.3	
Uranium	mg/kg	30	-	2.7	0.92	2.1	1.0	1.7	0.56	0.47	0.26	2.0	2.0	1.4	1.1	
Vanadium	mg/kg	100	200	28	12	43	170	29	13	9.4	6.7	36	26	19	17	
Zinc	mg/kg	200	1,500	150	49	290	260	85	45	170	22	58	410	390	78	
Physical Properties																
Particle Size Distribution (Clay)	%	-	-	15	25	4.9	3.0	3.9	3.5	3.1	2.3	6.7	2.4	2.5	2.3	
Particle Size Distribution (Gravel)	%	-	-	40	19	31	45	62	24	24	5.5	46	39	38	48	
Percent Saturation	%	-	-	61	30	68	50	65	20	48	34	120	58	57	53	
Moisture Content	%	-	-	31	17	45	18	27	14	18	20	39	26	26	23	
Particle Size																
Particle Size Distribution (<1/128mm, 7 PHI)	%	-	-	23	29	7.0	4.6	6.9	4.7	3.5	2.7	17	3.3	3.4	2.8	
Particle Size Distribution (<1/16mm, 4 PHI)	%	-	-	43	52	28	12	15	15	5.9	5.2	42	14	12	22	
Particle Size Distribution (<1/256mm, 8 PHI)	%	-	-	15	25	4.9	3.0	3.9	3.5	3.1	2.3	6.7	2.4	2.5	2.3	
Particle Size Distribution (<1/2mm, 1 PHI)	%	-	-	54	71	54	38	25	46	66	85	47	45	44	44	
Particle Size Distribution (<1/32mm, 5 PHI)	%	-	-	38	46	21	11	14	12	5.2	4.4	40	13	11	20	
Particle Size Distribution (<1/4mm, 2 PHI)	%	-	-	51	66	46	22	21	29	40	50	45	29	28	39	
Particle Size Distribution (<1/512mm, 9 PHI)	%	-	-	3.8	19	2.8	1.7	2.4	2.1	2.2	1.7	4.4	2.0	2.0	2.0	
Particle Size Distribution (<1/64mm, 6 PHI)	%	-	-	33	40	15	9.1	13	9.0	4.6	3.7	36	12	9.7	18	
Particle Size Distribution (<1/8mm, 3 PHI)	%	-	-	47	58	37	14	17	20	7.5	7.8	43	17	15	25	
Particle Size Distribution (<1mm, 0 PHI)	%	-	-	56	75	61	47	30	61	71	91[#10]	49	52	52	47	
Particle Size Distribution (<2mm, -1 PHI)	%	-	-	60	81	69	55[#17]	38	76	76[#19]	94[#19]	54	61[#20]	62[#21]	52	
BTEX																
Benzene	mg/kg	-	5	0.048	<0.0050	0.022	0.25	0.72	0.043	0.050	<0.0050	<0.0050	0.54	0.44	0.077	
Toluene	mg/kg	-	30	<0.050	<0.050	<0.050	0.78	1.4	0.11	0.094	<0.050	<0.050	0.78	0.66	0.12	
Ethylbenzene	mg/kg	-	50	0.038	<0.010	<0.010	0.12	0.22	<0.010	<0.010	<0.010	<0.010	0.095	0.077	0.017	
Xylene Total	mg/kg	-	50	0.053	<0.050	<0.050	0.61	1.1	<0.050	<0.050	<0.050	<0.050	0.44	0.39	<0.050	
Petroleum Hydrocarbons (PHCs)																
EPH >C10-C16	mg/kg	-	150[B]	59	<10	100	34	<10	<10	14	<10	<10	64	55	<10	
EPH >C16-C21	mg/kg	-	150[B]	150	<10	300	80	23	<10	32	<10	<10	140	120	19	
EPH >C21-C32	mg/kg	-	150[B]	380	<15	870	240	130	<15	110	21	<15	320	330	50	
PHC F1-BTEX (C6-C10-BTEX)	mg/kg	-	150[B]	<2.5	<2.5	<2.5	2.9	5.9	<2.5	6.2	<2.5	<2.5	<2.5	3.7	<2.5	
Modified TPH (Tier 1)	mg/kg	-	-	590	<15	1,300	360	150	<15	160	21	<15	530	520	69	
Reached Baseline at C32	-	-	-	0[#11]	-	0[#11]	1[#1]	1[#1]	-	1[#1]	1[#1]	-	1[#1]	0[#11]	1[#1]	
Hydrocarbon Resemblance	-	-	-	1[#12]	1	1[#12]	1[#18]	1[#18]	1	1[#18]	1[#6]	1	1[#12]	1[#18]	1[#22]	
Polycyclic Aromatic Hydrocarbons (PAHs)																
1-Methylnaphthalene	mg/kg	30	10	0.05	<0.0050	0.18	0.38	0.31	0.014	0.049	0.0095	<0.0050	0.29	0.26	0.046	
2-methylnaphthalene	mg/kg	30	10	0.052	<0.0050	0.22	0.51	0.39	0.022	0.054	0.0075	<0.0050	0.36	0.32	0.055	
Acenaphthene	mg/kg	43,000	10	0.075	<0.0050	0.28	0.35	0.18	<0.0050	0.07	<0.0050	<0.0050	0.14	0.15	0.023	
Acenaphthylene	mg/kg	23	10	0.025	<0.0050	0.095	0.025	0.017	<0.0050	<0.0050	<0.0050	<0.0050	<0.040[#5]	<0.030[#5]	<0.0050	
Anthracene	mg/kg	300,000	10	0.24	<0.0050	0.68	0.59	0.12	<0.0050	0.13	0.0088	<0.0050	0.55	0.35	0.075	
Benz(a)anthracene	mg/kg	12	10	0.47	<0.0050	1.5	1	0.14	<0.0050	0.19	0.0079	<0.0050	0.98	0.74	0.12	
Benzo(a)pyrene	mg/kg	14	10	0.49	<0.0050	1.4	0.79	0.12	<0.0050	0.12	<0.0050	<0.0050	0.44	0.42	0.077	
Benzo(b)fluoranthene	mg/kg	1.2	10	0.42	<0.0050	1.2	0.67	0.098	<0.0050	0.11	<0.0050	<0.0050	0.41	0.37	0.067	
Benzo(b+j)fluoranthene	mg/kg	1.2	10	0.64	<0.010	1.9	1	0.15	<0.010	0.17	<0.010	<0.010	0.64	0.58	0.1	
Benzo(g,h,i)perylene	mg/kg	250	10	0.26	<0.0050	0.77	0.44	0.069	<0.0050	0.06	<0.0050	<0.0050	0.2	0.19	0.038	
Benzo(j)fluoranthene	mg/kg	1.2	10	0.22	<0.0050	0.66	0.36	0.056	<0.0050	0.063	<0.0050	<0.0050	0.23	0.22	0.038	
Benzo(k)fluoranthene	mg/kg	1.2	10	0.23	<0.0050	0.66	0.36	0.056	<0.0050	0.063	<0.0050	<0.0050	0.24	0.22	0.038	
Chrysene	mg/kg	78	10	0.48	<0.0050	1.5	0.99	0.13	<0.0050	0.18	0.0083	<0.0050	1.1	0.66	0.12	
Dibenz(a,h)anthracene	mg/kg	8.8	10	0.072	<0.0050	0.21	0.1	0.017	<0.0050	0.016	<0.0050	<0.0050	0.057	0.055	0.0096	
Fluorene	mg/kg	39,000	10	0.098	<0.0050	0.37	0.35	0.14	<0.0050	0.089	<0.0050	<0.0050	0.21	0.19	0.034	
Fluoranthene	mg/kg	50,000	10	0.86	0.0067	2.6	1.7	0.32	0.0061	0.48	0.019	<0.0050	1.6	1.3	0.28	
Indeno(1,2,3-c,d)pyrene	mg/kg	98	10	0.24	<0.0050	0.72	0.37	0.057	<0.0050	0.051	<0.0050	<0.0050	0.17	0.16	0.03	
Naphthalene	mg/kg	25	10	0.15	<0.0050	0.56	1.4	1.5	0.025	0.095	0.0097	<0.0050	0.37	0.37	0.048	
Perylene	mg/kg	-	10	0.11	<0.0050	0.27	0.17	0.027	<0.0050	0.027	<0.0050	0.0088	0.097	0.091	0.024	
Phenanthrene	mg/kg	17	10	0.6	0.0068	2.1	2.4	0.4	0.011	0.49	0.019	<0.0050	1.1	0.94	0.21	
Pyrene	mg/kg	30,000	10	1	<0.0050	3.2	2.2	0.33	<0.0050	0.44	0.026	<0.0050	1.6	1.4	0.3	
Total PAHs	mg/kg	-	50	6.78	0.01	21.08	16.16	4.63	0.08	2.95	0.12	0.01	10.78	8.99	1.73	
Volatile Organic Compounds (VOCs)																
Methyl tert-Butyl Ether (MTBE)	mg/kg			<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	
Polychlorinated Biphenyls (PCBs)																
2,4,5-Trichlorobiphenyl	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
Decachlorobiphenyl	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
Heptachlorobiphenyl	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
Hexachlorobiphenyl, 2,3,3,4,4,5- (PCB 156)	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
Hexachlorobiphenyl, 2,3,3,4,4,5- (PCB 157)	mg/kg	-	-	0.034	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
Hexachlorobiphenyl, 3,3,4,4,5,5- (PCB 169)	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
Nonachlorobiphenyl	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
PCB 101	mg/kg	-	-	0.014	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
PCB 118	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
PCB 153	mg/kg	-	-	0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
PCB 180	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
PCB 52	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
PCB-110	mg/kg	-	-	0.011	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
PCB-128	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
PCB-149	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
PCB-151	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
PCB-170	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
PCB-194	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
PCB-206	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
PCB-44	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
PCB-49	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
Pentachlorobiphenyl	mg/kg	-	-	0.034	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
Pentachlorobiphenyl, 2,3,3,4,4- (PCB 105)	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
Tetrachlorobiphenyl, 3,4,4,5- (PCB 81)	mg/kg	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
PCBs (Sum of total)	mg/kg	160	50	0.068	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
Other																
Tributyltin	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Comments

Red colored cells indicate value exceeds both threshold values

A R3 Environmental System Acceptance Critiera is equivalent to the NS Tier EQS for Soil (Industrial, Potable, Coarse) for metals, but has no upper limits for General Chemistry, BTEX, PHCs, PAHs, VOCs or PCBs.

B Aliphatic hydrocarbons

#1 YES

#2 Lube oil fraction.

#3 Lube oil fraction; interference from possible PAHs.

#4 Elevated RDL(s) due to detected levels in the leachate blank.

#5 Elevated PAH RDL(s) due to matrix / co-extractive interference.

#6 Possible lube oil fraction.

#7 One product in fuel oil range. Lube oil fraction.

#8 Weathered fuel oil fraction. Lube oil fraction.

#9 One product in fuel / lube range.

#10 PSA sample observation comment: Fraction contained shells

#11 NO

#12 One product in fuel / lube range. Lube oil fraction.

#13 PSA sample observation comment: Fraction contained organic matter and shells

#14 One product in fuel / lube range. Possible lube oil fraction.

#15 PSA sample observation comment: Fraction contained rocks and shells.

#16 PSA sample observation comment: Fraction contained rocks.

#17 PSA sample observation comment: Fraction contained glass

#18 One product in the gasoline range. One product in fuel / lube range. Lube oil fraction.

#19 PSA sample observation comment: Fraction contained fish bones

#20 PSA sample observation comment: Fraction contained charcoal

#21 PSA sample observation comment: Fraction contained shells and charcoal

#22 One product in fuel / lube range. Unidentified compound(s) in fuel / lube range.

Environmental Standards

R3 Environmental Systems (i.e., Envirosoil) Acceptance Criteria

NS Acceptance Parameters for Contaminated Soil (Total Analysis) – Attachment B as presented in the Guidelines for Disposal of Contaminated Solids in Landfills (NSE 1992, revised 2005).

Table B.2 - Leachte (Borehole sampling program) Analytical Summary

				BH009	
				0 - 2	
				Normal	
				24-06-22	
	Unit	EQL	NS Disposal of Contaminated Solids (Leachate)	TCLP	SPLP
Metals					
Aluminium	mg/L	0.01	500	<0.1	0.05
Antimony	mg/L	0.002	-	<0.02	0.042
Arsenic	mg/L	0.002	5	<0.02	0.0022
Barium	mg/L	0.005	100	0.39	0.072
Beryllium	mg/L	0.002	10	<0.02	<0.0020
Boron	mg/L	0.5	0.5	0.55	-
Cadmium	mg/L	0.0003	-	<0.0030	<0.00030
Calcium	mg/L	0.1	5	330	36
Chromium (Total, III+VI)	mg/L	0.002	5	<0.02	<0.0020
Cobalt	mg/L	0.001	100	0.1	<0.0010
Copper	mg/L	0.002	-	<0.02	<0.0020
Iron	mg/L	0.05	5	0.64	<0.05
Lead	mg/L	0.0005	-	0.0070	0.0013
Magnesium	mg/L	0.1	-	590	23
Manganese	mg/L	0.002	0.1	1.3	0.0031
Molybdenum	mg/L	0.002	5	<0.02	0.083
Nickel	mg/L	0.002	20	0.12	<0.0020
Potassium	mg/L	0.1	-	250	14
Selenium	mg/L	0.001	1	<0.01	<0.0010
Lithium	mg/L	0.002	250	0.025	0.0072
Silver	mg/L	0.0005	5	<0.0050	<0.00050
Sodium	mg/L	2.5	-	6,400	-
Strontium	mg/L	0.005	-	3	0.24
Thallium	mg/L	0.0001	-	<0.0010	<0.00010
Tin	mg/L	0.002	-	<0.02	<0.0020
Uranium	mg/L	0.0001	2	0.0067	0.0015
Vanadium	mg/L	0.002	10	<0.02	<0.0020
Zinc	mg/L	0.005	500	2.4	0.0066

Environmental Standards

NS Acceptance Parameters for Contaminated Soil (Leacahte) – Attachment C as presented in the Guidelines for Disposal of Contaminated Solids in Landfills

Table B.3 - Sediment (Pilot Study) Analytical Summary

Location Code								
Sample ID				L1-DAY 0- SED (B)	L1-DAY 0-SED (A)	SED.UPPER_LAYER.PRE-PROCESSING	L2-DAY 0-SED	SED.LOWER_LAYER.PRE-PROCESSING
Explanation				Sediments collected on first day	Sediments collected on first day	Sediment collected from geoctech testing sample	Sediments collected on first day	Sediment collected from geoctech testing sample
Date				30 Jan 2023	31 Jan 2023	08 Mar 2023	31 Jan 2023	08 Mar 2023
	Unit	R3 Environmetal Systems Acceptance Criteria[A]	NS Disposal of Contaminated Solids					
General Chemistry								
Total Organic Carbon (TOC)	mg/kg	-	-	29000000	49000000	36000	2700000	38000
Electrical Conductivity (Lab)	µS/cm	-	-	5700	10000	5500	2300	-
pH (Lab)	pH Units	-	-	8.17	8.17	7.97	7.75	7.92
Sodium Adsorption Ratio (SAR)	SAR	-	-	33	49	28	28	19
Field Parameters								
% sand by hydrometer	%	-	-	31	18	28	34	37
% silt by hydrometer	%	-	-	20	23	47	35	25
Metals								
Aluminium	mg/kg	220,000	-	12000	13000	12000	12000	12000
Antimony	mg/kg	63	40	14	3.8	3.8	<2.0	<2.0
Arsenic	mg/kg	10	50	23	21	24	11	9.5
Barium	mg/kg	350	2000	220	210	180	53	46
Beryllium	mg/kg	1	8	<1.0	<1.0	<1.0	<1.0	<1.0
Bismuth	mg/kg	-	-	<2.0	<2.0	<2.0	<2.0	<2.0
Boron	mg/kg	24,000	2	<50	<50	<50	<50	<50
Cadmium	mg/kg	1	20	0.48	0.97	0.8	<0.30	<0.30
Calcium	mg/L	-	-	120	170	-	22	-
Chromium (Total, III+VI)	mg/kg	6,700	800	54	37	47	19	22
Cobalt	mg/kg	25	300	32	17	34	10	11
Copper	mg/kg	250	500	180	280	280	22	27
Iron	mg/kg	164,000	-	42000	41000	51000	27000	26000
Lead	mg/kg	120	1000	190	160	200	16	22
Magnesium	mg/L	-	-	190	430	27	47	29
Manganese	mg/kg	2,000	-	420	1200	790	490	460
Mercury	mg/kg	99	10	0.91	0.82	0.93	<0.10	<0.10
Molybdenum	mg/kg	15	40	5.9	16	11	<2.0	<2.0
Nickel	mg/kg	70	500	97	47	100	22	26
Selenium	mg/kg	1	10	0.65	0.81	0.73	<0.50	<0.50
Rubidium	mg/kg	-	-	9.8	9	9.9	12	12
Lithium	mg/kg	-	-	24	33	-	24	-
Silver	mg/kg	490	40	0.53	2.4	1.2	<0.50	<0.50
Sodium	mg/L	-	-	2500	5300	-	1000	-
Strontium	mg/kg	140,000	-	51	73	98	14	20
Thallium	mg/kg	1	1	0.17	0.29	0.2	<0.10	<0.10
Tin	mg/kg	140,000	300	13	18	15	<1.0	<1.0
Uranium	mg/kg	30	-	1.5	1.8	1.6	0.81	0.9
Vanadium	mg/kg	100	200	37	49	41	20	19
Zinc	mg/kg	200	1,500	350	480	530	51	68
Particle Size								
Particle Size Distribution (<1/128mm, 7 PHI)	%	-	-	14	5.3	5.3	24	18
Particle Size Distribution (<1/16mm, 4 PHI)	%	-	-	32	27	52	55	40
Particle Size Distribution (<1/256mm, 8 PHI)	%	-	-	11	3.8	4.7	20	15
Particle Size Distribution (<1/2mm, 1 PHI)	%	-	-	51	32[#1]	69	81	66
Particle Size Distribution (<1/32mm, 5 PHI)	%	-	-	27	25	47	46	34
Particle Size Distribution (<1/4mm, 2 PHI)	%	-	-	44	30	65	75	58
Particle Size Distribution (<1/512mm, 9 PHI)	%	-	-	4.4	3	4.4	15	11
Particle Size Distribution (<1/64mm, 6 PHI)	%	-	-	22	23	42	38	29
Particle Size Distribution (<1/8mm, 3 PHI)	%	-	-	38	29	59	66	49
Particle Size Distribution (<1mm, 0 PHI)	%	-	-	57	36[#1]	73	85	72
Particle Size Distribution (<2mm, -1 PHI)	%	-	-	62[#6]	45[#2]	80	88	77
BTEX								
Benzene	mg/kg	-	5	0.0094	0.027	0.017	<0.0060	<0.0060
Toluene	mg/kg	-	30	0.077	0.076	0.03	<0.020	<0.020
Ethylbenzene	mg/kg	-	50	0.18	0.017	<0.010	<0.010	<0.010
Xylene (o)	mg/kg	-	-	0.27	0.023	0.021	<0.020	<0.020
Xylene (m & p)	mg/kg	-	-	0.68	0.044	0.029	<0.020	<0.020
Xylene Total	mg/kg	-	50	0.96	0.067	0.049	<0.020	<0.020
Petroleum Hydrocarbons (PHCs)								
EPH >C10-C16	mg/kg	-	150[B]	35	71	48	<10	<10
EPH >C16-C21	mg/kg	-	150[B]	120	230	160	<10	<10
EPH >C21-C32	mg/kg	-	150[B]	400	900	510	<15	<15
PHC F1 (C6-C10)	mg/kg	-	150[B]	<10	<10	<10	<10	<10
PHC F1-BTEX (C6-C10-BTEX)	mg/kg	-	150[B]	<10	<10	<10	<10	<10
PHC F2 (>C10-C16)	mg/kg	-	-	36	140	28	<10	<10
PHC F3 (>C16-C34)	mg/kg	-	-	620	1600	530	<50	<50
PHC F4 (>C34-C50)	mg/kg	-	-	330	630	210	<50	<50
Modified TPH (Tier 1)	mg/kg	-	-	986	2370	768	0	0
Reached Baseline at C32	-	-	-	1[#3]	1[#3]	0[#4]	-	-
Reached Baseline at C50	-	-	-	1[#3]	0[#4]	1[#3]	1[#3]	1[#3]
Hydrocarbon Resemblance	-	-	-	1[#5]	1[#5]	1[#5]	1[#5]	-
Polycyclic Aromatic Hydrocarbons (PAHs)								
1-Methylnaphthalene	mg/kg	-	10	0.39	0.059	0.049	0.0064	0.07
2-methylnaphthalene	mg/kg	-	10	0.58	0.074	0.062	0.0086	0.082
Acenaphthene	mg/kg	-	10	1.5	0.11	0.14	0.008	0.19
Acenaphthylene	mg/kg	-	10	0.053	0.064	0.025	<0.0050	0.027
Anthracene	mg/kg	-	10	3.4	0.4	0.28	0.022	0.38
Benz(a)anthracene	mg/kg	-	10	2.1[#7]	1.8	0.42	0.035	0.5
Benzo(a)pyrene	mg/kg	-	10	1.6	0.8	0.54	0.026	0.71
Benzo(b)fluoranthene	mg/kg	-	10	1.2	0.74	0.43	0.022	0.54
Benzo(b+j)fluoranthene	mg/kg	-	10	2	1.1	0.67	0.034	
Benzo(g,h,i)perylene	mg/kg	-	10	0.42	0.28	0.45	0.016	0.63
Benzo(j)fluoranthene	mg/kg	-	10	0.74	0.41	0.24	0.012	0.3
Benzo(k)fluoranthene	mg/kg	-	10	0.75	0.41	0.24	0.012	0.3
Chrysene	mg/kg	-	10	2.9	1.2	0.45	0.032	0.5
Dibenz(a,h)anthracene	mg/kg	-	10	0.18	0.1	0.12	<0.0050	0.18
Fluorene	mg/kg	-	10	1.6	0.17	1	0.013	1.5
Fluoranthene	mg/kg	-	10	7.5	1.9	0.11	0.066	0.17
Indeno(1,2,3-c,d)pyrene	mg/kg	-	10	0.47	0.28	0.37	0.012	0.52
Naphthalene	mg/kg	-	10	1.2	0.13	0.13	0.023	0.18
Perylene	mg/kg	-	10	0.31	0.16	0.12	0.02	0.16
Phenanthrene	mg/kg	-	10	9.3[#7]	1.2	0.81	0.073	1.1
Pyrene	mg/kg	-	10	6.2	2.3	0.89	0.082	1.2
Total PAHs	mg/kg	-	50	44.39	13.69	7.55	0.52	9.24
Polychlorinated Biphenyls (PCBs)								
Arochlor 1016	mg/kg	-	-	<0.020	<0.020	<0.010	<0.010	<0.010
Arochlor 1221	mg/kg	-	-	<0.020	<0.020	<0.010	<0.010	<0.010
Arochlor 1232	mg/kg	-	-	<0.020	<0.020	<0.010	<0.010	<0.010
Arochlor 1242	mg/kg	-	-	<0.020	0.047	<0.010	<0.010	<0.010
Arochlor 1248	mg/kg	-	-	<0.020	<0.020	0.067	<0.010	<0.010
Arochlor 1254	mg/kg	-	-	0.065	0.058	0.15	<0.010	<0.010
Arochlor 1260	mg/kg	-	-	0.06	0.052	0.063	<0.010	<0.010
PCBs (Sum of total)	mg/kg	160	50	0.14	0.16	0.28	<0.010	<0.010

Comments

Red colored cells indicate value exceeds both threshold values

A R3 Environmental System Acceptance Critiera is equivalent to the NS Tier EQS for Soil (Industrial, Potable, Coarse) for metals, but has no upper limits for General Chemistry, BTEX, PHCs, PAHs, VOCs or PCBs.

B Aliphatic Hydrocarbons

#1 PSA sample observation comment: Fraction contained organic matter.

#2 PSA sample observation comment: Fraction contained small rocks and organic matter.

#3 YES

#4 NO

#5 Lube oil fraction.

#6 PSA sample observation comment: Fraction contained small rocks and a piece of shell.

#7 Elevated PAH RDL(s) due to sample dilution.

Environmental Standards

R3 Environmental Systems (i.e., Envirosoil) Acceptance Criteria

NS Acceptance Parameters for Contaminated Soil (Total Analysis) – Attachment B as presented in the Guidelines for Disposal of Contaminated Solids in Landfills (NSE 1992, revised 2005).

Table B.4 - PHC fractionation Analytical Summary

Location Code	
Sample ID	L1-DAY 0-SED (A)
Date	31 Jan 2023

Petroleum Hydrocarbons		R3 Environmetal Systems Acceptance Criteria[A]	NS Disposal of Contaminated Solids	
Benzene	mg/kg	-	5	0.017
Toluene	mg/kg	-	30	<0.050
Ethylbenzene	mg/kg	-	50	0.037
Total Xylenes	mg/kg	-	50	<0.025
Aliphatic >C6-C8	mg/kg	-	150[B]	<1.0
Aliphatic >C8-C10	mg/kg	-	150[B]	<1.0
>C8-C10 Aromatics (-EX)	mg/kg	-	-	<0.50
Aliphatic >C10-C12	mg/kg	-	150[B]	<8.0
Aliphatic >C12-C16	mg/kg	-	150[B]	28
Aliphatic >C16-C21	mg/kg	-	150[B]	100
Aliphatic >C21-<C32	mg/kg	-	150[B]	400
Aromatic >C10-C12	mg/kg	-	-	<4.0
Aromatic >C12-C16	mg/kg	-	-	<15
Aromatic >C16-C21	mg/kg	-	-	47
Aromatic >C21-<C32	mg/kg	-	-	240
Modified TPH (Tier 2)	mg/kg	-	-	810
Reached Baseline at C32	mg/kg	-	-	Yes
Hydrocarbon Resemblance	mg/kg	-	-	COMMENT #1

Comments

A R3 Environmental System Acceptance Critiera is equivalent to the NS Tier EQS for Soil (Industrial, Potable, Coarse) for metals, but has no upper limits for General Chemistry, BTEX, PHCs, PAHs, VOCs or PCBs.

B Aliphatic hydrocarbons
#1 Lube Oil Fraction

Environmental Standards

Nova Scotia Environment, September 2021, NS Tier I EQS Soil Industrial Non-Potable Coarse

R3 Environmental Systems (i.e., Envirosoil) Acceptance Criteria

NS Acceptance Parameters for Contaminated Soil (Total Analysis) – Attachment B as presented in the Guidelines for Disposal of Contaminated Solids in Landfills (NSE 1992, revised 2005).

Table B.5 - Leachate (Pilot Study) Analytical Summary

Location Code			Layer 1 SPLP		Layer 2 SPLP	
Field ID			L1-SPLP-D6	L1-SPLP-D10	L2-SPLP-D6	L2-SPLP-D10
Sample Type			Leachte from sediment collected on day 6	Leachte from sediment collected on day 10	Leachte from sediment collected on day 6	Leachte from sediment collected on day 10
Date			17 Feb 2023	17 Feb 2023	17 Feb 2023	17 Feb 2023
	Unit	NS Disposal of Contaminated Solids (Leachate)				
Leachate Analysis						
pH (Final)	pH Units		8.35	8.12	8.65	8.25
NA						
Dry Weight	g		-	-	-	-
Metals						
Aluminium	mg/L	500	0.44	0.043	36	44
Antimony	mg/L	-	0.0032	0.0034	<0.0020	<0.0020
Arsenic	mg/L	5	<0.0020	<0.0020	0.026	0.038
Barium	mg/L	100	0.017	0.016	0.15	0.33
Beryllium	mg/L	10	<0.0020	<0.0020	<0.0020	0.0024
Cadmium	mg/L	0.5	<0.00030	<0.00030	<0.00030	<0.00030
Calcium	mg/L	-	34	63	7.7	4.2
Chromium (Total, III+VI)	mg/L	5	<0.0020	<0.0020	0.039	0.044
Cobalt	mg/L	5	<0.0010	<0.0010	0.022	0.026
Copper	mg/L	100	<0.0020	<0.0020	0.09	0.097
Iron	mg/L	-	0.42	<0.05	46	74
Lead	mg/L	5	0.0011	0.00064	0.052	0.11
Magnesium	mg/L	-	15	23	12	12
Manganese	mg/L	-	0.04	0.086	0.76	0.84
Mercury	mg/L	0.1	<0.000013	<0.000013	0.000048	0.000050
Molybdenum	mg/L	5	0.046	0.04	0.0049	0.0065
Nickel	mg/L	20	<0.0020	<0.0020	0.051	0.06
Potassium	mg/L	-	13	12	14	15
Selenium	mg/L	1	<0.0010	<0.0010	<0.0010	<0.0010
Lithium	mg/L	250	0.0099	0.015	0.048	0.051
Silver	mg/L	5	<0.00050	<0.00050	<0.00050	<0.00050
Strontium	mg/L	-	0.21	0.37	0.073	0.066
Thallium	mg/L	-	<0.00010	<0.00010	0.00031	0.00031
Tin	mg/L	-	<0.0020	<0.0020	0.0072	0.0078
Uranium	mg/L	2	0.0014	0.0014	0.0021	0.0028
Vanadium	mg/L	10	<0.0020	<0.0020	0.055	0.067
Zinc	mg/L	500	<0.0050	<0.0050	0.11	0.14
Sample Preparation						
weight of sample	g		50	50	50	50
Wet Weight	-		25	25	25	25
BTEX						
Benzene	mg/L	0.5	<0.0008	<0.0008	<0.0008	<0.0008
Toluene	mg/L	2.4	<0.0008	<0.0008	<0.0008	<0.0008
Ethylbenzene	mg/L	0.24	<0.0008	<0.0008	<0.0008	<0.0008
Xylene (o)	mg/L	-	<0.0008	<0.0008	<0.0008	<0.0008
Xylene (m & p)	mg/L	-	<0.002	<0.002	<0.002	<0.002
Xylene Total	mg/L	30	<0.002	<0.002	<0.002	<0.002
Petroleum Hydrocarbons (PHCs)						
PHC F1 (C6-C10)	mg/L	1.5	<0.4	<0.4	<0.4	<0.4
PHC F1-BTEX (C6-C10-BTEX)	mg/L	1.5	<0.4	<0.4	<0.4	<0.4
PHC F2 (>C10-C16)	mg/L	1.5	<0.1	<0.1	<0.1	<0.1
PHC F3 (>C16-C34)	mg/L	1.5	<0.2	<0.2	<0.2	<0.2
PHC F4 (>C34-C50)	mg/L	1.5	<0.2	<0.2	<0.2	<0.2
Reached Baseline at C50	-	-	1[#1]	1[#1]	1[#1]	1[#1]
Polycyclic Aromatic Hydrocarbons (PAHs)						
1-Methylnaphthalene	mg/L	-	<0.0002	0.0003	<0.0002	<0.0002
2-methylnaphthalene	mg/L	-	<0.0002	<0.0002	<0.0002	<0.0002
Acenaphthene	mg/L	-	<0.0002	0.0007	<0.0002	<0.0002
Acenaphthylene	mg/L	-	<0.0002	<0.0002	<0.0002	<0.0002
Anthracene	mg/L	-	<0.0002	<0.0002	<0.0002	<0.0002
Benz(a)anthracene	mg/L	-	<0.0002	<0.0002	<0.0002	<0.0002
Benzo(a)pyrene	mg/L	-	<0.0001	<0.0001	<0.0001	<0.0001
Benzo(b+j)fluoranthene	mg/L	-	<0.0002	<0.0002	<0.0002	<0.0002
Benzo(g,h,i)perylene	mg/L	-	<0.0002	<0.0002	<0.0002	<0.0002
Benzo(k)fluoranthene	mg/L	-	<0.0002	<0.0002	<0.0002	<0.0002
Chrysene	mg/L	-	<0.0002	<0.0002	<0.0002	<0.0002
Dibenz(a,h)anthracene	mg/L	-	<0.0002	<0.0002	<0.0002	<0.0002
Fluorene	mg/L	-	<0.0002	0.0004	<0.0002	<0.0002
Fluoranthene	mg/L	-	<0.0002	<0.0002	<0.0002	<0.0002
Indeno(1,2,3-c,d)pyrene	mg/L	-	<0.0002	<0.0002	<0.0002	<0.0002
Naphthalene	mg/L	-	<0.0002	0.0008	<0.0002	<0.0002
Phenanthrene	mg/L	-	<0.0002	0.0007	<0.0002	<0.0002
Pyrene	mg/L	-	<0.0002	<0.0002	<0.0002	<0.0002
Total PAHs	mg/L	0.01	0	0.0029	0	0
Polychlorinated Biphenyls (PCBs)						
Arochlor 1016	mg/L	-	<0.00010	<0.00010	<0.00010	<0.00010
Arochlor 1221	mg/L	-	<0.00010	<0.00010	<0.00010	<0.00010
Arochlor 1232	mg/L	-	<0.00010	<0.00010	<0.00010	<0.00010
Arochlor 1242	mg/L	-	<0.00010	<0.00010	<0.00010	<0.00010
Arochlor 1248	mg/L	-	<0.00010	<0.00010	<0.00010	<0.00010
Arochlor 1254	mg/L	-	<0.00010	<0.00010	<0.00010	<0.00010
Arochlor 1260	mg/L	-	<0.00010	<0.00010	<0.00010	<0.00010
Arochlor 1268	mg/L	-	<0.00010	<0.00010	<0.00010	<0.00010
PCBs (Sum of total)	mg/L	-	<0.00010	<0.00010	<0.00010	<0.00010

Comments
#1 YES

Environmental Standards
NS Acceptance Parameters for Contaminated Soil (Leacahte) – Attachment C as presented in the Guidelines for Disposal of Contaminated Solids in Landfills (NSE 1992, revised 2005).

Attachment C

Laboratory Analytical Certificates

AVAILABLE UPON REQUEST

Attachment D

Photos

Photo 1. Sediment from the Upper Layer, collected via dredging as part of the Pilot Study

Photo 2. Sediment from the Upper Layer, collected via dredging as part of the Pilot Study

Photo 3. Sediment from the Upper Layer, collected via dredging as part of the Pilot Study

Photo 4. Sediment from the Lower Layer, collected via dredging as part of the Pilot Study

Photo 5. Sediment from the Upper Layer, collected via dredging as part of the Pilot Study

Photo 6. Sediment from the Upper Layer, collected via dredging as part of the Pilot Study

Attachment E

Disclaimer

DISCLAIMER

Dillon Consulting Limited (Dillon) has used the degree of care and skill ordinarily exercised under similar circumstances at the time the work was performed by reputable members of the environmental consulting profession practicing in Canada. Dillon assumes no responsibility for conditions it was not authorized to investigate or which were beyond its scope of work. There is no warranty expressed or implied by Dillon that the work will discover all potential contamination since it may not be possible, even with exhaustive sampling, testing and analysis, to document all potential contamination on the site.

This report was prepared by Dillon for the sole benefit of Irving Shipbuilding Inc. The material in the report reflects Dillon's best judgment in light of the information available to Dillon at the time of preparation. Any use which a third party (i.e., a party other than Irving Shipbuilding Inc.) makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Dillon accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

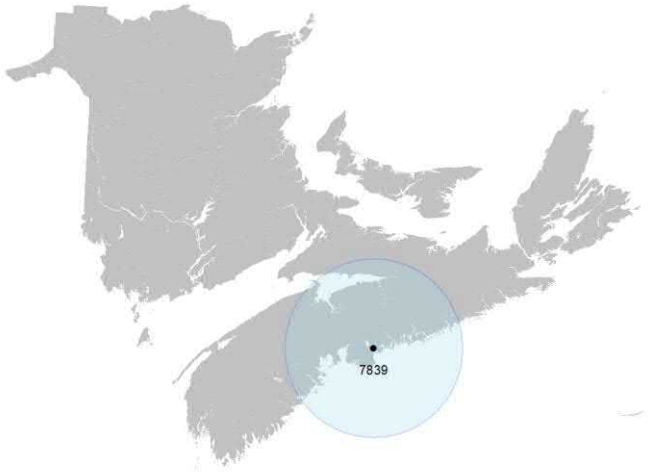
Appendix E

AC CDC Report

DATA REPORT 7839: Halifax, NS

Prepared 14 September 2023
by J. Churchill, Data Manager

CONTENTS OF REPORT



Map 1. A 100 km buffer around the study area

1.0 PREFACE

The Atlantic Canada Conservation Data Centre (AC CDC; www.accdc.com) is part of a network of NatureServe data centres and heritage programs serving 50 states in the U.S.A, 10 provinces and 1 territory in Canada, plus several Central and South American countries. The NatureServe network is more than 30 years old and shares a common conservation data methodology. The AC CDC was founded in 1997, and maintains data for the jurisdictions of New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador. Although a non-governmental agency, the AC CDC is supported by 6 federal agencies and 4 provincial governments, as well as through outside grants and data processing fees.

Upon request and for a fee, the AC CDC queries its database and produces customized reports of the rare and endangered flora and fauna known to occur in or near a specified study area. As a supplement to that data, the AC CDC includes locations of managed areas with some level of protection, and known sites of ecological interest or sensitivity.

1.1 DATA LIST

Included datasets:

Filename	Contents
HalifaxNS_7839ob.xls	Rare or legally-protected Flora and Fauna in your study area
HalifaxNS_7839ob100km.xls	A list of Rare and legally protected Flora and Fauna within 100 km of your study area
HalifaxNS_7839msa.xls	Managed and Biologically Significant Areas in your study area
HalifaxNS_7839bp.xls	Rare and common Pelagic Birds in your study area (CWS database)

1.2 RESTRICTIONS

The AC CDC makes a strong effort to verify the accuracy of all the data that it manages, but it shall not be held responsible for any inaccuracies in data that it provides. By accepting AC CDC data, recipients assent to the following limits of use:

a) Data is restricted to use by trained personnel who are sensitive to landowner interests and to potential threats to rare and/or endangered flora and fauna posed by the information provided.
b) Data is restricted to use by the specified Data User; any third party requiring data must make its own data request.
c) The AC CDC requires Data Users to cease using and delete data 12 months after receipt, and to make a new request for updated data if necessary at that time.
d) AC CDC data responses are restricted to the data in our Data System at the time of the data request.
e) Each record has an estimate of locational uncertainty, which must be referenced in order to understand the record's relevance to a particular location. Please see attached Data Dictionary for details.
f) AC CDC data responses are not to be construed as exhaustive inventories of taxa in an area.
g) The absence of a taxon cannot be inferred by its absence in an AC CDC data response.

1.3 ADDITIONAL INFORMATION

The accompanying Data Dictionary provides metadata for the data provided.

Please direct any additional questions about AC CDC data to the following individuals:

Plants, Lichens, Ranking Methods, All other Inquiries
Sean Blaney
Senior Scientist / Executive Director
(506) 364-2658
sean.blaney@accdc.ca

Animals (Fauna)
John Klymko
Zoologist
(506) 364-2660
john.klymko@accdc.ca

Data Management, GIS
James Churchill
Conservation Data Analyst / Field Biologist
(902) 679-6146
james.churchill@accdc.ca

Billing
Jean Breau
Financial Manager / Executive Assistant
(506) 364-2657
jean.breau@accdc.ca

Questions on the biology of Federal Species at Risk can be directed to AC CDC: (506) 364-2658, with questions on Species at Risk regulations to: Samara Eaton, Canadian Wildlife Service (NB and PE): (506) 364-5060 or Julie McKnight, Canadian Wildlife Service (NS): (902) 426-4196.

For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in New Brunswick, please contact Hubert Askanas, Energy and Resource Development: (506) 453-5873.

For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in Nova Scotia, please contact Donna Hurlburt, NS DLF: (902) 679-6886. To determine if location-sensitive species (section 4.3) occur near your study site please contact a NS DLF Regional Biologist:

Western: Emma Vost
(902) 670-8187
Emma.Vost@novascotia.ca

Western: Sarah Spencer
(902) 541-0081
Sarah.Spencer@novascotia.ca

Central: Shavonne Meyer
(902) 893-0816
Shavonne.Meyer@novascotia.ca

Central: Kimberly George
(902) 890-1046
Kimberly.George@novascotia.ca

Eastern: Harrison Moore
(902) 497-4119
Harrison.Moore@novascotia.ca

Eastern: Maureen Cameron-MacMillan
(902) 295-2554
Maureen.Cameron-MacMillan@novascotia.ca

Eastern: Elizabeth Walsh
(902) 563-3370
Elizabeth.Walsh@novascotia.ca

For provincial information about rare taxa and protected areas, or information about game animals, fish habitat etc., in Prince Edward Island, please contact Garry Gregory, PEI Dept. of Communities, Land and Environment: (902) 569-7595.

2.0 RARE AND ENDANGERED SPECIES

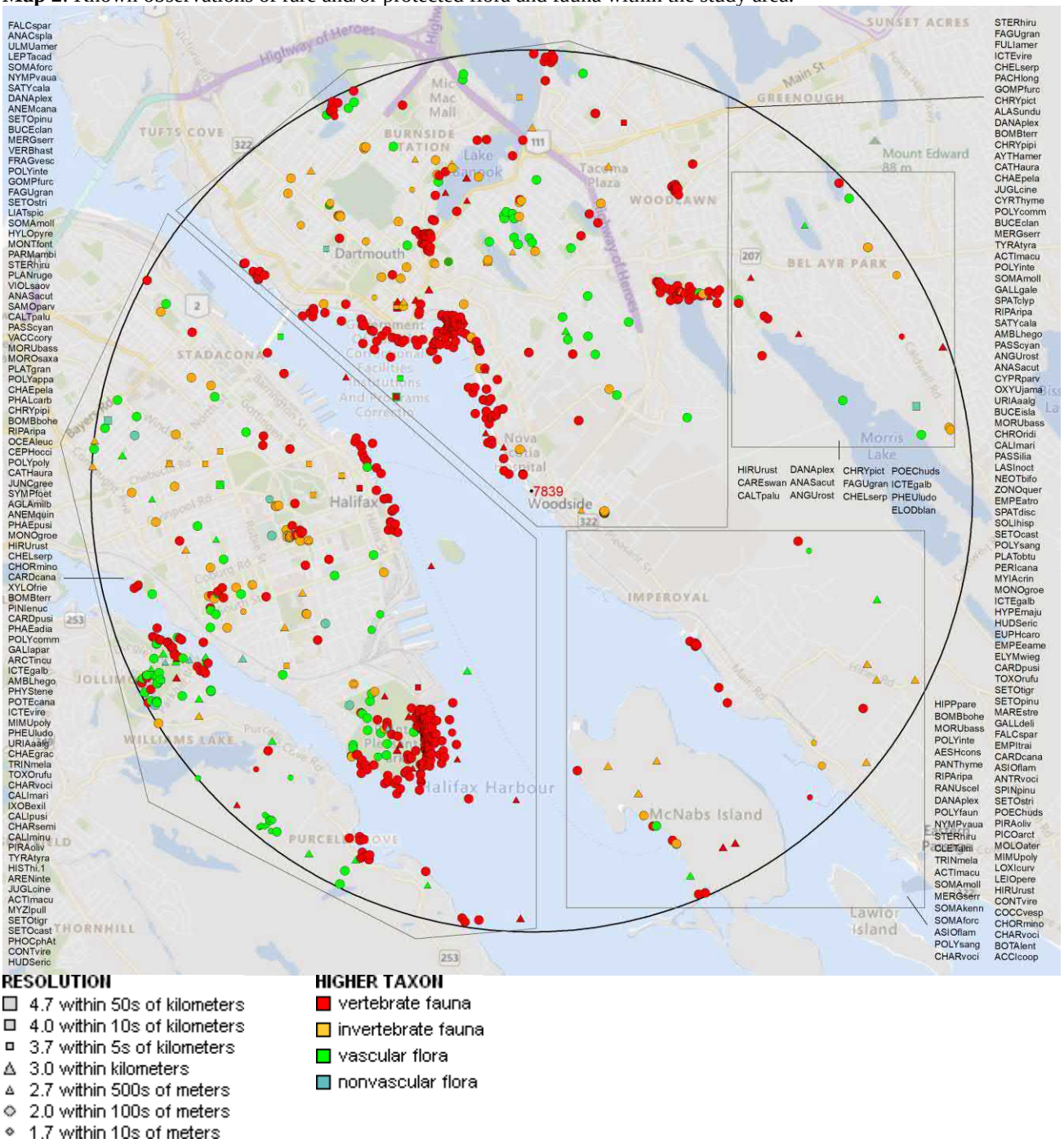
2.1 FLORA

The study area contains 155 records of 36 vascular and 15 records of 12 nonvascular flora (Map 2 and attached: *ob.xls), excluding 'location-sensitive' species.

2.2 FAUNA

The study area contains 836 records of 75 vertebrate and 217 records of 19 invertebrate fauna (Map 2 and attached data files - see 1.1 Data List), excluding 'location-sensitive species'. Please see section 4.3 to determine if 'location-sensitive' species occur near your study site.

Map 2: Known observations of rare and/or protected flora and fauna within the study area.



3.0 SPECIAL AREAS

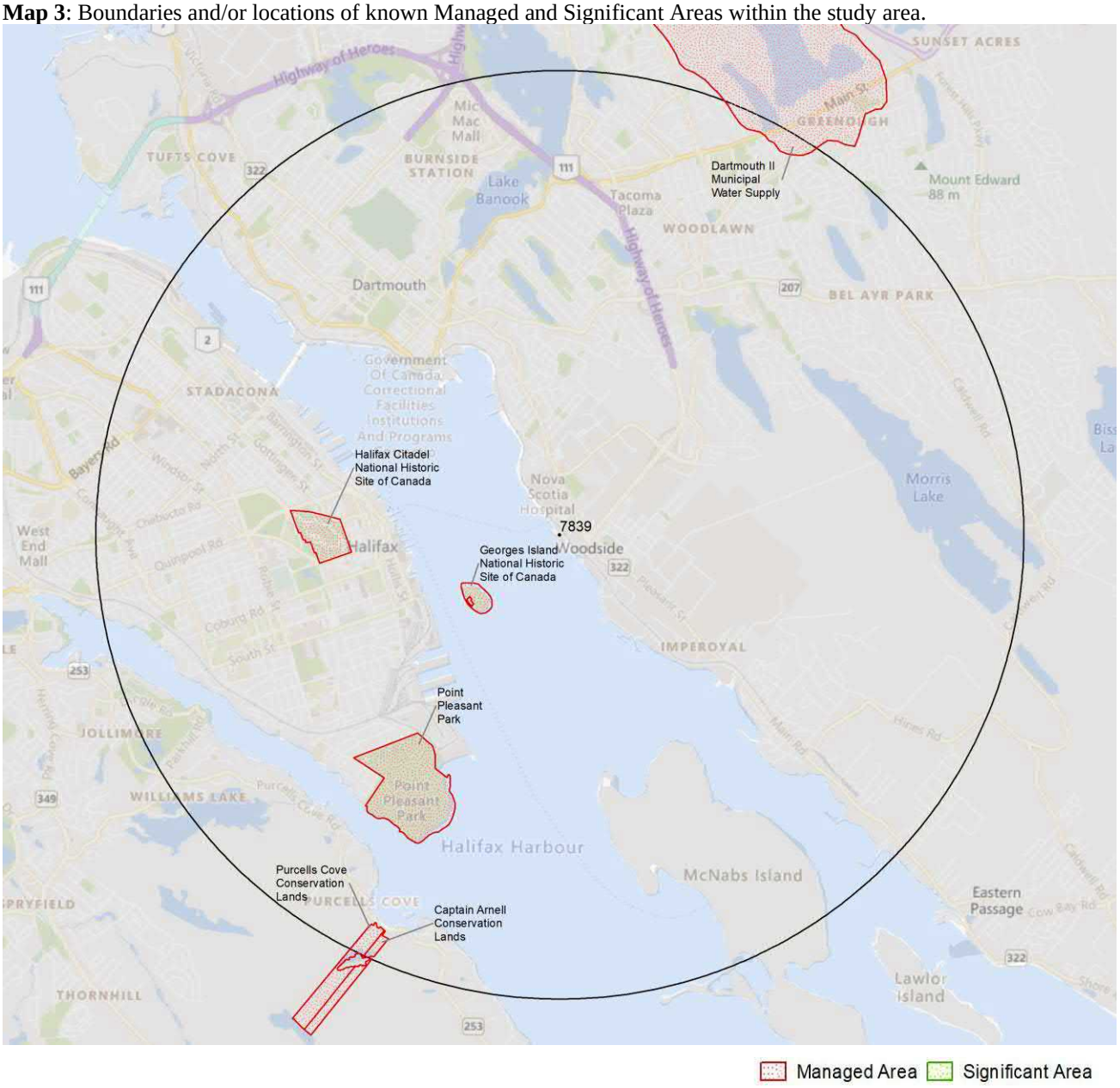
3.1 MANAGED AREAS

The GIS scan identified 6 managed areas in the vicinity of the study area (Map 3 and attached file: *msa.xls).

3.2 SIGNIFICANT AREAS

The GIS scan identified no biologically significant sites in the vicinity of the study area (Map 3).

Map 3: Boundaries and/or locations of known Managed and Significant Areas within the study area.



4.0 RARE SPECIES LISTS

Rare and/or endangered taxa (excluding “location-sensitive” species, section 4.3) within the study area listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation (± the precision, in km, of the record). [P] = vascular plant, [N] = nonvascular plant, [A] = vertebrate animal, [I] = invertebrate animal, [C] = community. Note: records are from attached files *ob.xls/*ob.shp only.

4.1 FLORA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
N	*Xylopsora friesii*	a Lichen				S1S3	2	3.1 ± 0.0
N	*Anacamptodon splachnoides*	a Moss				S2	1	4.9 ± 30.0
N	*Cyrtomnium hymenophylloides*	Short-pointed Lantern Moss				S2?	1	3.6 ± 5.0
N	*Chaenotheca gracilenta*	a lichen				S2S3	1	2.8 ± 0.0
N	*Parmeliopsis ambigua*	Green Starburst Lichen				S2S3	1	4.6 ± 0.0
N	*Phaeophyscia adiastola*	Powder-tipped Shadow Lichen				S3	1	3.0 ± 0.0
N	*Phaeophyscia pusilloides*	Pompom-tipped Shadow Lichen				S3	3	2.7 ± 0.0
N	*Elodium blandowii*	Blandow's Bog Moss				S3?	1	4.5 ± 7.0
N	*Hylocomiastrum pyrenaicum*	a Feather Moss				S3S4	1	4.3 ± 0.0
N	*Arctoparmelia incurva*	Finger Ring Lichen				S3S4	1	3.8 ± 1.0
N	*Leptogium acadiense*	Acadian Jellyskin Lichen				S3S4	1	4.5 ± 0.0
N	*Physcia tenella*	Fringed Rosette Lichen				S3S4	1	3.2 ± 0.0
P	*Clethra alnifolia*	Coast Pepper-Bush	Endangered	Threatened	Vulnerable	S2	1	4.1 ± 0.0
P	*Juglans cinerea*	Butternut	Endangered	Endangered		SNA	4	3.0 ± 0.0
P	*Liatris spicata*	Dense Blazing Star	Threatened	Threatened		SNA	2	2.2 ± 0.0
P	*Montia fontana*	Water Blinks				S1	1	4.5 ± 1.0
P	*Solidago hispida*	Hairy Goldenrod				S1?	1	1.9 ± 7.0
P	*Hudsonia ericoides*	Pinebarren Golden Heather				S2	26	1.9 ± 7.0
P	*Anemonastrum canadense*	Canada Anemone				S2	5	3.5 ± 0.0
P	*Ranunculus sceleratus*	Cursed Buttercup				S2	1	4.7 ± 2.0
P	*Juncus greenei*	Greene's Rush				S2	1	3.5 ± 10.0
P	*Elymus wiegandii*	Wiegand's Wild Rye				S2	1	1.9 ± 7.0
P	*Hypericum majus*	Large St John's-wort				S2S3	1	1.9 ± 7.0
P	*Empetrum atropurpureum*	Purple Crowberry				S2S3	1	2.0 ± 7.0
P	*Polygala polygama*	Racemed Milkwort				S2S3	1	3.5 ± 1.0
P	*Anemone quinquefolia*	Wood Anemone				S2S3	1	4.3 ± 0.0
P	*Caltha palustris*	Yellow Marsh Marigold				S2S3	3	4.6 ± 0.0
P	*Potentilla canadensis*	Canada Cinquefoil				S2S3	1	2.4 ± 0.0
P	*Mononeuria groenlandica*	Greenland Stitchwort				S3	4	1.9 ± 7.0
P	*Empetrum eamesii*	Pink Crowberry				S3	2	1.9 ± 7.0
P	*Polygala sanguinea*	Blood Milkwort				S3	3	1.9 ± 7.0
P	*Plantago rugelii*	Rugel's Plantain				S3	1	1.9 ± 0.0
P	*Samolus parviflorus*	Seaside Brookweed				S3	1	3.3 ± 5.0
P	*Cephalanthus occidentalis*	Common Buttonbush				S3	6	2.9 ± 0.0
P	*Carex swanii*	Swan's Sedge				S3	1	4.3 ± 0.0
P	*Cypripedium parviflorum*	Yellow Lady's-slipper				S3	1	2.0 ± 0.0
P	*Neottia bifolia*	Southern Twayblade				S3	1	1.7 ± 0.0
P	*Platanthera grandiflora*	Large Purple Fringed Orchid				S3	1	3.3 ± 0.0
P	*Polypodium appalachianum*	Appalachian Polypody				S3	1	4.7 ± 0.0
P	*Vaccinium corymbosum*	Highbush Blueberry				S3S4	1	4.2 ± 3.0
P	*Fagus grandifolia*	American Beech				S3S4	64	1.5 ± 0.0
P	*Fragaria vesca*	Woodland Strawberry				S3S4	1	3.7 ± 0.0
P	*Galium aparine*	Common Bedstraw				S3S4	1	2.4 ± 0.0
P	*Ulmus americana*	White Elm				S3S4	7	1.9 ± 0.0
P	*Verbena hastata*	Blue Vervain				S3S4	1	3.7 ± 0.0

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
P	*Viola sagittata var. ovata*	Arrow-Leaved Violet				S3S4	4	3.2 ± 0.0
P	*Symplocarpus foetidus*	Eastern Skunk Cabbage				S3S4	2	4.3 ± 0.0
P	*Platanthera obtusata*	Blunt-leaved Orchid				S3S4	1	1.9 ± 10.0

4.2 FAUNA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
A	*Icteria virens*	Yellow-Breasted Chat	Endangered	Endangered		SNA	3	2.8 ± 0.0
A	*Lasionycteris noctivagans*	Silver-haired Bat	Endangered			SUB,S1M	1	1.6 ± 0.0
A	*Asio flammeus*	Short-eared Owl	Threatened	Special Concern		S1B	2	1.9 ± 7.0
A	*Riparia riparia*	Bank Swallow	Threatened	Threatened	Endangered	S2B	12	2.6 ± 1.0
A	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Endangered	S2S3B,S1M	79	1.7 ± 0.0
A	*Hydrobates leucorhous*	Leach's Storm-Petrel	Threatened			S3B	1	2.0 ± 7.0
A	*Anguilla rostrata*	American Eel	Threatened			S3N	4	2.5 ± 0.0
A	*Ixobrychus exilis*	Least Bittern	Threatened	Threatened		SUB	2	3.2 ± 0.0
A	*Antrostomus vociferus*	Eastern Whip-Poor-Will	Special Concern	Threatened	Threatened	S1?B	1	1.9 ± 7.0
A	*Bucephala islandica*	Barrow's Goldeneye	Special Concern	Special Concern		S1N,SUM	2	2.0 ± 0.0
A	*Euphagus carolinus*	Rusty Blackbird	Special Concern	Special Concern	Endangered	S2B	1	1.9 ± 7.0
A	*Histrionicus histrionicus pop. 1*	Harlequin Duck - Eastern population	Special Concern	Special Concern	Endangered	S2S3N,SUM	1	3.1 ± 0.0
A	*Chelydra serpentina*	Snapping Turtle	Special Concern	Special Concern	Vulnerable	S3	19	2.7 ± 0.0
A	*Hirundo rustica*	Barn Swallow	Special Concern	Threatened	Endangered	S3B	7	1.9 ± 7.0
A	*Cardellina canadensis*	Canada Warbler	Special Concern	Threatened	Endangered	S3B	5	1.9 ± 7.0
A	*Chordeiles minor*	Common Nighthawk	Special Concern	Special Concern	Threatened	S3B	6	1.9 ± 7.0
A	*Coccothraustes vespertinus*	Evening Grosbeak	Special Concern	Special Concern	Vulnerable	S3B,S3N,S3M	3	1.9 ± 7.0
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern	Special Concern	Vulnerable	S3S4B	4	1.9 ± 7.0
A	*Phocoena phocoena*	Harbour Porpoise	Special Concern			S4	2	1.9 ± 0.0
A	*Chrysemys picta*	Painted Turtle	Special Concern	Special Concern		S4	6	2.8 ± 0.0
A	*Chrysemys picta picta*	Eastern Painted Turtle	Special Concern	Special Concern		S4	18	2.7 ± 0.0
A	*Zonotrichia querula*	Harris's Sparrow	Special Concern			SNA	1	1.3 ± 0.0
A	*Accipiter cooperii*	Cooper's Hawk	Not At Risk			S1?B,SUN,SUM	1	4.1 ± 0.0
A	*Fulica americana*	American Coot	Not At Risk			S1B	25	2.8 ± 0.0
A	*Sterna hirundo*	Common Tern	Not At Risk			S3B	14	1.4 ± 0.0
A	*Morone saxatilis*	Striped Bass	E,SC			S2S3B,S2S3N	2	3.8 ± 0.0
A	*Uria aalge*	Common Murre				S1?B	2	2.1 ± 0.0
A	*Passerina cyanea*	Indigo Bunting				S1?B,SUM	3	2.7 ± 0.0
A	*Oxyura jamaicensis*	Ruddy Duck				S1B	9	2.0 ± 0.0
A	*Gallinula galeata*	Common Gallinule				S1B	1	2.8 ± 0.0
A	*Myiarchus crinitus*	Great Crested Flycatcher				S1B	4	1.9 ± 7.0
A	*Mimus polyglottos*	Northern Mockingbird				S1B	9	1.9 ± 7.0
A	*Toxostoma rufum*	Brown Thrasher				S1B	3	1.9 ± 7.0
A	*Charadrius semipalmatus*	Semipalmated Plover				S1B,S4M	9	2.6 ± 7.0
A	*Calidris minutilla*	Least Sandpiper				S1B,S4M	7	3.0 ± 0.0
A	*Anas acuta*	Northern Pintail				S1B,SUM	21	2.4 ± 0.0
A	*Empidonax traillii*	Willow Flycatcher				S2B	1	1.9 ± 7.0
A	*Molothrus ater*	Brown-headed Cowbird				S2B	6	1.9 ± 7.0
A	*Spatula clypeata*	Northern Shoveler				S2B,SUM	5	2.7 ± 0.0
A	*Mareca strepera*	Gadwall				S2B,SUM	8	1.9 ± 7.0
A	*Piranga olivacea*	Scarlet Tanager				S2B,SUM	3	1.9 ± 7.0
A	*Phalacrocorax carbo*	Great Cormorant				S2S3B,S2S3N	21	1.6 ± 0.0
A	*Cathartes aura*	Turkey Vulture				S2S3B,S4S5M	5	2.9 ± 0.0
A	*Setophaga pinus*	Pine Warbler				S2S3B,S4S5M	4	1.9 ± 7.0
A	*Bucephala clangula*	Common Goldeneye				S2S3B,S5N,S5M	46	1.1 ± 0.0
A	*Icterus galbula*	Baltimore Oriole				S2S3B,SUM	7	1.9 ± 7.0

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
A	*Perisoreus canadensis*	Canada Jay				S3	2	1.9 ± 7.0
A	*Poecile hudsonicus*	Boreal Chickadee				S3	6	1.9 ± 7.0
A	*Spinus pinus*	Pine Siskin				S3	5	1.5 ± 0.0
A	*Spatula discors*	Blue-winged Teal				S3B	8	1.9 ± 7.0
A	*Charadrius vociferus*	Killdeer				S3B	5	1.9 ± 7.0
A	*Tyrannus tyrannus*	Eastern Kingbird				S3B	4	1.9 ± 7.0
A	*Pheucticus ludovicianus*	Rose-breasted Grosbeak				S3B	2	2.9 ± 1.0
A	*Somateria mollissima*	Common Eider				S3B,S3M,S3N	155	0.2 ± 0.0
A	*Tringa melanoleuca*	Greater Yellowlegs				S3B,S4M	6	2.9 ± 0.0
A	*Falco sparverius*	American Kestrel				S3B,S4S5M	3	1.9 ± 7.0
A	*Gallinago delicata*	Wilson's Snipe				S3B,S5M	4	1.0 ± 0.0
A	*Setophaga striata*	Blackpoll Warbler				S3B,S5M	13	1.6 ± 0.0
A	*Cardellina pusilla*	Wilson's Warbler				S3B,S5M	3	1.9 ± 7.0
A	*Pinicola enucleator*	Pine Grosbeak				S3B,S5N,S5M	2	2.7 ± 0.0
A	*Setophaga tigrina*	Cape May Warbler				S3B,SUM	2	1.9 ± 7.0
A	*Arenaria interpres*	Ruddy Turnstone				S3M	1	3.2 ± 0.0
A	*Calidris pusilla*	Semipalmated Sandpiper				S3M	5	3.1 ± 0.0
A	*Chroicocephalus ridibundus*	Black-headed Gull				S3N	6	0.7 ± 0.0
A	*Picoides arcticus*	Black-backed Woodpecker				S3S4	2	1.9 ± 7.0
A	*Loxia curvirostra*	Red Crossbill				S3S4	3	1.9 ± 7.0
A	*Botaurus lentiginosus*	American Bittern				S3S4B,S4S5M	2	1.9 ± 7.0
A	*Setophaga castanea*	Bay-breasted Warbler				S3S4B,S4S5M	2	1.9 ± 7.0
A	*Actitis macularius*	Spotted Sandpiper				S3S4B,S5M	23	1.0 ± 0.0
A	*Leiothlypis peregrina*	Tennessee Warbler				S3S4B,S5M	5	1.0 ± 0.0
A	*Passerella iliaca*	Fox Sparrow				S3S4B,S5M	2	1.6 ± 0.0
A	*Mergus serrator*	Red-breasted Merganser				S3S4B,S5M,S5N	133	0.5 ± 0.0
A	*Calidris maritima*	Purple Sandpiper				S3S4N	24	2.0 ± 0.0
A	*Morus bassanus*	Northern Gannet				SHB	8	1.6 ± 0.0
A	*Aythya americana*	Redhead				SHB	4	2.0 ± 0.0
I	*Bombus bohemicus*	Ashton Cuckoo Bumble Bee	Endangered	Endangered	Endangered	S1	8	2.2 ± 5.0
I	*Danaus plexippus*	Monarch	Endangered	Special Concern	Endangered	S2?B,S3M	129	0.5 ± 0.0
I	*Bombus terricola*	Yellow-banded Bumble Bee	Special Concern	Special Concern	Vulnerable	S3	11	1.9 ± 0.0
I	*Pachydiplax longipennis*	Blue Dasher				S1	3	2.8 ± 0.0
I	*Polygonia comma*	Eastern Comma				S1?	2	2.6 ± 0.0
I	*Pantala hymenaea*	Spot-Winged Glider				S2?B	4	4.3 ± 1.0
I	*Nymphalis l-album*	Compton Tortoiseshell				S2S3	6	2.5 ± 5.0
I	*Aglais milberti*	Milbert's Tortoiseshell				S2S3	1	2.5 ± 5.0
I	*Somatochlora kennedyi*	Kennedy's Emerald				S2S3	2	4.3 ± 1.0
I	*Alasmidonta undulata*	Triangle Floater				S2S3	1	3.6 ± 0.0
I	*Hippodamia parenthesis*	Parenthesis Lady Beetle				S3	1	4.5 ± 0.0
I	*Myzia pullata*	Streaked Lady Beetle				S3	1	3.6 ± 0.0
I	*Satyrium calanus*	Banded Hairstreak				S3	8	2.6 ± 0.0
I	*Somatochlora forcipata*	Forcipate Emerald				S3	3	4.1 ± 1.0
I	*Polygonia interrogationis*	Question Mark				S3B	28	1.9 ± 7.0
I	*Amblyscirtes hegon*	Pepper and Salt Skipper				S3S4	2	2.6 ± 2.0
I	*Polygonia faunus*	Green Comma				S3S4	2	3.6 ± 2.0
I	*Aeshna constricta*	Lance-Tipped Darner				S3S4	1	3.4 ± 1.0
I	*Gomphaeschna furcillata*	Harlequin Darner				S3S4	4	3.8 ± 0.0

4.3 LOCATION SENSITIVE SPECIES

The Department of Natural Resources in each Maritimes province considers a number of species "location sensitive". Concern about exploitation of location-sensitive species precludes inclusion of precise coordinates in this report. Those intersecting your study area are indicated below with "YES".

Nova Scotia

Scientific *Name*	Common Name	SARA	Prov Legal Prot	Known within the Study Site?
Fraxinus nigra	Black Ash		Threatened	No
Emydoidea blandingii	*Blanding's Turtle - Nova Scotia pop.*	Endangered	Endangered	No
Glyptemys insculpta	**Wood Turtle**	**Threatened**	**Threatened**	**YES**
Falco peregrinus pop. 1	**Peregrine Falcon - anatum/tundrius pop.**		**Vulnerable**	**YES**
Bat hibernaculum or bat species occurrence		**[Endangered][1]**	**[Endangered][1]**	**YES**

1 *Myotis lucifugus* (Little Brown Myotis), *Myotis septentrionalis* (Long-eared Myotis), and *Perimyotis subflavus* (Tri-colored Bat or Eastern Pipistrelle) are all Endangered under the Federal Species at Risk Act and the NS Endangered Species Act.

4.4 SOURCE BIBLIOGRAPHY

The recipient of these data shall acknowledge the AC CDC and the data sources listed below in any documents, reports, publications or presentations, in which this dataset makes a significant contribution.

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5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 39006 records of 164 vertebrate and 1944 records of 70 invertebrate fauna; 7803 records of 276 vascular and 2857 records of 186 nonvascular flora (attached: *ob100km.xls).

Taxa within 100 km of the study site that are rare and/or endangered in the province in which the study site occurs (including “location-sensitive” species). All ranks correspond to the province in which the study site falls, even for out-of-province records. Taxa are listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation (± the precision, in km, of the record).

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	*Coregonus huntsmani*	Atlantic Whitefish	Endangered	Endangered	Endangered	S1	147	86.0 ± 1.0	NS
A	*Myotis lucifugus*	Little Brown Myotis	Endangered	Endangered	Endangered	S1	271	2.6 ± 0.0	NS
A	*Myotis septentrionalis*	Northern Myotis	Endangered	Endangered	Endangered	S1	23	39.9 ± 0.0	NS
A	*Perimyotis subflavus*	Tricolored Bat	Endangered	Endangered	Endangered	S1	25	39.9 ± 0.0	NS
A	*Emydoidea blandingii*	Blanding's Turtle	Endangered	Endangered	Endangered	S1	8	5.1 ± 0.0	NS
A	*Salmo salar pop. 1*	Atlantic Salmon - Inner Bay of Fundy population	Endangered	Endangered		S1	36	24.1 ± 0.0	NS
A	*Salmo salar pop. 6*	Atlantic Salmon - Nova Scotia Southern Upland population	Endangered			S1	32	13.6 ± 0.0	NS
A	*Charadrius melodus melodus*	Piping Plover melodus subspecies	Endangered	Endangered	Endangered	S1B	1009	5.0 ± 0.0	NS
A	*Sterna dougallii*	Roseate Tern	Endangered	Endangered	Endangered	S1B	68	23.2 ± 0.0	NS
A	*Dermochelys coriacea pop. 2*	Leatherback Sea Turtle - Atlantic population	Endangered	Endangered		S1S2N	3	38.5 ± 5.0	NS
A	*Morone saxatilis pop. 2*	Striped Bass - Bay of Fundy population	Endangered			S2S3B,S2S3N	4	33.4 ± 0.0	NS
A	*Melanerpes erythrocephalus*	Red-headed Woodpecker	Endangered	Threatened		SNA	1	86.5 ± 0.0	NS
A	*Protonotaria citrea*	Prothonotary Warbler	Endangered	Endangered		SNA	1	19.8 ± 0.0	NS
A	*Icteria virens*	Yellow-Breasted Chat	Endangered	Endangered		SNA	24	2.8 ± 0.0	NS
A	*Lasiurus cinereus*	Hoary Bat	Endangered			SUB, S1M	26	16.8 ± 0.0	NS
A	*Lasionycteris noctivagans*	Silver-haired Bat	Endangered			SUB,S1M	9	1.6 ± 0.0	NS
A	*Lasiurus borealis*	Eastern Red Bat	Endangered			SUB,S1M	1	77.4 ± 0.0	NS
A	*Colinus virginianus*	Northern Bobwhite	Endangered	Endangered			7	22.7 ± 0.0	NS
A	*Asio flammeus*	Short-eared Owl	Threatened	Special Concern		S1B	31	1.9 ± 7.0	NS
A	*Glyptemys insculpta*	Wood Turtle	Threatened	Threatened	Threatened	S2	828	3.0 ± 1.0	NS
A	*Riparia riparia*	Bank Swallow	Threatened	Threatened	Endangered	S2B	1407	2.6 ± 1.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	*Thamnophis saurita*	Eastern Ribbonsnake	Threatened	Threatened	Threatened	S2S3	36	81.9 ± 1.0	NS
A	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Endangered	S2S3B,S1M	909	1.7 ± 0.0	NS
A	*Limosa haemastica*	Hudsonian Godwit	Threatened			S2S3M	102	10.0 ± 0.0	NS
A	*Acipenser oxyrinchus*	Atlantic Sturgeon	Threatened			S2S3N	12	40.4 ± 0.0	NS
A	*Hydrobates leucorhous*	Leach's Storm-Petrel	Threatened			S3B	40	2.0 ± 7.0	NS
A	*Tringa flavipes*	Lesser Yellowlegs	Threatened			S3M	934	8.3 ± 0.0	NS
A	*Anguilla rostrata*	American Eel	Threatened			S3N	115	2.5 ± 0.0	NS
A	*Sturnella magna*	Eastern Meadowlark	Threatened	Threatened		SHB	3	6.8 ± 0.0	NS
A	*Melanerpes lewis*	Lewis's Woodpecker	Threatened	Threatened		SNA	2	16.5 ± 0.0	NS
A	*Ixobrychus exilis*	Least Bittern	Threatened	Threatened		SUB	2	3.2 ± 0.0	NS
A	*Hylocichla mustelina*	Wood Thrush	Threatened	Threatened		SUB	33	35.5 ± 0.0	NS
A	*Antrostomus vociferus*	Eastern Whip-Poor-Will	Special Concern	Threatened	Threatened	S1?B	12	1.9 ± 7.0	NS
A	*Passerculus sandwichensis princeps*	Ipswich Sparrow	Special Concern	Special Concern		S1B	30	6.2 ± 0.0	NS
A	*Bucephala islandica*	Barrow's Goldeneye	Special Concern	Special Concern		S1N,SUM	20	2.0 ± 0.0	NS
A	*Euphagus carolinus*	Rusty Blackbird	Special Concern	Special Concern	Endangered	S2B	219	1.9 ± 7.0	NS
A	*Balaenoptera physalus*	Fin Whale	Special Concern	Special Concern		S2S3	3	22.3 ± 0.0	NS
A	*Phalaropus lobatus*	Red-necked Phalarope	Special Concern	Special Concern		S2S3M	11	9.8 ± 0.0	NS
A	*Histrionicus histrionicus pop. 1*	Harlequin Duck - Eastern population	Special Concern	Special Concern	Endangered	S2S3N,SUM	71	3.1 ± 0.0	NS
A	*Chelydra serpentina*	Snapping Turtle	Special Concern	Special Concern	Vulnerable	S3	374	2.7 ± 0.0	NS
A	*Hirundo rustica*	Barn Swallow	Special Concern	Threatened	Endangered	S3B	1034	1.9 ± 7.0	NS
A	*Cardellina canadensis*	Canada Warbler	Special Concern	Threatened	Endangered	S3B	928	1.9 ± 7.0	NS
A	*Chordeiles minor*	Common Nighthawk	Special Concern	Special Concern	Threatened	S3B	451	1.9 ± 7.0	NS
A	*Contopus cooperi*	Olive-sided Flycatcher	Special Concern	Special Concern	Threatened	S3B	715	8.5 ± 7.0	NS
A	*Dolichonyx oryzivorus*	Bobolink	Special Concern	Threatened	Vulnerable	S3B	579	8.5 ± 7.0	NS
A	*Coccothraustes vespertinus*	Evening Grosbeak	Special Concern	Special Concern	Vulnerable	S3B,S3N,S3M	547	1.9 ± 7.0	NS
A	*Podiceps auritus*	Horned Grebe	Special Concern	Special Concern		S3N,SUM	21	32.3 ± 0.0	NS
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern	Special Concern	Vulnerable	S3S4B	801	1.9 ± 7.0	NS
A	*Phocoena phocoena*	Harbour Porpoise	Special Concern			S4	15	1.9 ± 0.0	NS
A	*Phocoena phocoena pop. 1*	Harbour Porpoise - Northwest Atlantic Population	Special Concern			S4	2	71.8 ± 0.0	NS
A	*Chrysemys picta*	Painted Turtle	Special Concern	Special Concern		S4	72	2.8 ± 0.0	NS
A	*Chrysemys picta picta*	Eastern Painted Turtle	Special Concern	Special Concern		S4	466	2.7 ± 0.0	NS
A	*Calidris subruficollis*	Buff-breasted Sandpiper	Special Concern	Special Concern		SNA	52	9.5 ± 0.0	NS
A	*Zonotrichia querula*	Harris's Sparrow	Special Concern			SNA	1	1.3 ± 0.0	NS
A	*Anarhichas lupus*	Atlantic Wolffish	Special Concern	Special Concern		SNR	5	10.3 ± 0.0	NS
A	*Acipenser brevirostrum*	Shortnose Sturgeon	Special Concern	Special Concern			1	88.2 ± 0.0	NS
A	*Accipiter cooperii*	Cooper's Hawk	Not At Risk			S1?B,SUN,SUM	12	4.1 ± 0.0	NS
A	*Fulica americana*	American Coot	Not At Risk			S1B	41	2.8 ± 0.0	NS
A	*Chlidonias niger*	Black Tern	Not At Risk			S1B	1	23.0 ± 0.0	NS
A	*Falco peregrinus pop. 1*	Peregrine Falcon - anatum/tundrius	Not At Risk		Vulnerable	S1B,SUM	62	3.1 ± 0.0	NS
A	*Sorex dispar*	Long-tailed Shrew	Not At Risk			S2	2	92.5 ± 0.0	NS
A	*Aegolius funereus*	Boreal Owl	Not At Risk			S2?B,SUM	4	42.1 ± 7.0	NS
A	*Lynx canadensis*	Canada Lynx	Not At Risk		Endangered	S2S3	2	77.7 ± 1.0	NS
A	*Globicephala melas*	Long-finned Pilot Whale	Not At Risk			S2S3	3	10.2 ± 0.0	NS
A	*Hemidactylium scutatum*	Four-toed Salamander	Not At Risk			S3	33	5.8 ± 0.0	NS
A	*Megaptera novaeangliae*	Humpback Whale	Not At Risk			S3	2	6.9 ± 0.0	NS
A	*Sterna hirundo*	Common Tern	Not At Risk			S3B	308	1.4 ± 0.0	NS
A	*Sialia sialis*	Eastern Bluebird	Not At Risk			S3B	54	5.5 ± 0.0	NS
A	*Buteo lagopus*	Rough-legged Hawk	Not At Risk			S3N	1	9.4 ± 0.0	NS
A	*Accipiter gentilis*	Northern Goshawk	Not At Risk			S3S4	116	5.9 ± 0.0	NS
A	*Glaucomys volans*	Southern Flying Squirrel	Not At Risk			S3S4	8	34.0 ± 2.0	NS
A	*Lagenorhynchus acutus*	Atlantic White-sided Dolphin	Not At Risk			S3S4	5	14.3 ± 2.0	NS
A	*Ammospiza nelsoni*	Nelson's Sparrow	Not At Risk			S3S4B	134	8.5 ± 7.0	NS
A	*Calidris canutus rufa*	Red Knot rufa subspecies	E,SC	Endangered	Endangered	S2M	644	10.1 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	*Calidris canutus*	Red Knot	E,SC	E,T		S2M	4	9.7 ± 1.0	NS
A	*Morone saxatilis*	Striped Bass	E,SC			S2S3B,S2S3N	29	3.8 ± 0.0	NS
A	*Gadus morhua*	Atlantic Cod	E,SC,DD			SNR	11	5.9 ± 0.0	NS
A	*Salmo salar*	Atlantic Salmon	E,T,SC			S1B,S1N	14	36.4 ± 0.0	NS
A	*Alces alces americana*	Moose			Endangered	S1	53	10.4 ± 0.0	NS
A	*Alces alces*	Moose				S1	6	20.7 ± 0.0	NS
A	*Uria aalge*	Common Murre				S1?B	7	2.1 ± 0.0	NS
A	*Passerina cyanea*	Indigo Bunting				S1?B,SUM	20	2.7 ± 0.0	NS
A	*Oxyura jamaicensis*	Ruddy Duck				S1B	13	2.0 ± 0.0	NS
A	*Gallinula galeata*	Common Gallinule				S1B	8	2.8 ± 0.0	NS
A	*Myiarchus crinitus*	Great Crested Flycatcher				S1B	27	1.9 ± 7.0	NS
A	*Cistothorus palustris*	Marsh Wren				S1B	2	70.3 ± 0.0	NS
A	*Mimus polyglottos*	Northern Mockingbird				S1B	75	1.9 ± 7.0	NS
A	*Toxostoma rufum*	Brown Thrasher				S1B	15	1.9 ± 7.0	NS
A	*Charadrius semipalmatus*	Semipalmated Plover				S1B,S4M	1884	2.6 ± 7.0	NS
A	*Calidris minutilla*	Least Sandpiper				S1B,S4M	1349	3.0 ± 0.0	NS
A	*Anas acuta*	Northern Pintail				S1B,SUM	68	2.4 ± 0.0	NS
A	*Vireo gilvus*	Warbling Vireo				S1B,SUM	19	7.4 ± 0.0	NS
A	*Vespertilionidae sp.*	bat species				S1S2	201	2.9 ± 0.0	NS
A	*Pooecetes gramineus*	Vesper Sparrow				S1S2B,SUM	20	21.1 ± 7.0	NS
A	*Vireo philadelphicus*	Philadelphia Vireo				S2?B,SUM	32	5.1 ± 0.0	NS
A	*Alca torda*	Razorbill				S2B	26	5.8 ± 0.0	NS
A	*Fratercula arctica*	Atlantic Puffin				S2B	31	34.2 ± 0.0	NS
A	*Empidonax traillii*	Willow Flycatcher				S2B	25	1.9 ± 7.0	NS
A	*Molothrus ater*	Brown-headed Cowbird				S2B	141	1.9 ± 7.0	NS
A	*Spatula clypeata*	Northern Shoveler				S2B,SUM	28	2.7 ± 0.0	NS
A	*Mareca strepera*	Gadwall				S2B,SUM	35	1.9 ± 7.0	NS
A	*Piranga olivacea*	Scarlet Tanager				S2B,SUM	38	1.9 ± 7.0	NS
A	*Calidris alba*	Sanderling				S2N,S3M	1466	6.0 ± 0.0	NS
A	*Martes americana*	American Marten			Endangered	S2S3	2	22.6 ± 0.0	NS
A	*Asio otus*	Long-eared Owl				S2S3	22	8.4 ± 0.0	NS
A	*Rallus limicola*	Virginia Rail				S2S3B	19	18.5 ± 7.0	NS
A	*Rissa tridactyla*	Black-legged Kittiwake				S2S3B	16	34.2 ± 0.0	NS
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S2S3B	216	8.5 ± 7.0	NS
A	*Phalacrocorax carbo*	Great Cormorant				S2S3B,S2S3N	88	1.6 ± 0.0	NS
A	*Cathartes aura*	Turkey Vulture				S2S3B,S4S5M	96	2.9 ± 0.0	NS
A	*Setophaga pinus*	Pine Warbler				S2S3B,S4S5M	43	1.9 ± 7.0	NS
A	*Bucephala clangula*	Common Goldeneye				S2S3B,S5N,S5M	290	1.1 ± 0.0	NS
A	*Icterus galbula*	Baltimore Oriole				S2S3B,SUM	75	1.9 ± 7.0	NS
A	*Pluvialis dominica*	American Golden-Plover				S2S3M	258	10.1 ± 0.0	NS
A	*Numenius phaeopus*	Whimbrel				S2S3M	21	9.4 ± 0.0	NS
A	*Numenius phaeopus hudsonicus*	Whimbrel				S2S3M	255	9.6 ± 0.0	NS
A	*Phalaropus fulicarius*	Red Phalarope				S2S3M	4	10.1 ± 0.0	NS
A	*Perisoreus canadensis*	Canada Jay				S3	516	1.9 ± 7.0	NS
A	*Poecile hudsonicus*	Boreal Chickadee				S3	513	1.9 ± 7.0	NS
A	*Spinus pinus*	Pine Siskin				S3	424	1.5 ± 0.0	NS
A	*Salvelinus fontinalis*	Brook Trout				S3	117	5.2 ± 0.0	NS
A	*Salvelinus namaycush*	Lake Trout				S3	2	34.8 ± 0.0	NS
A	*Sorex maritimensis*	Maritime Shrew				S3	1	80.7 ± 1.0	NS
A	*Synaptomys cooperi*	Southern Bog Lemming				S3	1	92.5 ± 0.0	NS
A	*Pekania pennanti*	Fisher				S3	9	35.5 ± 0.0	NS
A	*Calcarius lapponicus*	Lapland Longspur				S3?N,SUM	6	6.2 ± 0.0	NS
A	*Spatula discors*	Blue-winged Teal				S3B	67	1.9 ± 7.0	NS
A	*Charadrius vociferus*	Killdeer				S3B	540	1.9 ± 7.0	NS
A	*Tringa semipalmata*	Willet				S3B	1843	6.0 ± 0.0	NS
A	*Sterna paradisaea*	Arctic Tern				S3B	65	13.7 ± 0.0	NS
A	*Coccyzus erythropthalmus*	Black-billed Cuckoo				S3B	40	8.5 ± 7.0	NS

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A	*Tyrannus tyrannus*	Eastern Kingbird				S3B	183	1.9 ± 7.0	NS
A	*Pheucticus ludovicianus*	Rose-breasted Grosbeak				S3B	338	2.9 ± 1.0	NS
A	*Alosa pseudoharengus*	Alewife				S3B	33	15.8 ± 0.0	NS
A	*Somateria mollissima*	Common Eider				S3B,S3M,S3N	973	0.2 ± 0.0	NS
A	*Tringa melanoleuca*	Greater Yellowlegs				S3B,S4M	2084	2.9 ± 0.0	NS
A	*Falco sparverius*	American Kestrel				S3B,S4S5M	233	1.9 ± 7.0	NS
A	*Gallinago delicata*	Wilson's Snipe				S3B,S5M	537	1.0 ± 0.0	NS
A	*Setophaga striata*	Blackpoll Warbler				S3B,S5M	130	1.6 ± 0.0	NS
A	*Cardellina pusilla*	Wilson's Warbler				S3B,S5M	75	1.9 ± 7.0	NS
A	*Pinicola enucleator*	Pine Grosbeak				S3B,S5N,S5M	133	2.7 ± 0.0	NS
A	*Setophaga tigrina*	Cape May Warbler				S3B,SUM	143	1.9 ± 7.0	NS
A	*Branta bernicla*	Brant				S3M	3	9.5 ± 0.0	NS
A	*Pluvialis squatarola*	Black-bellied Plover				S3M	2038	6.2 ± 0.0	NS
A	*Arenaria interpres*	Ruddy Turnstone				S3M	795	3.2 ± 0.0	NS
A	*Calidris pusilla*	Semipalmated Sandpiper				S3M	1679	3.1 ± 0.0	NS
A	*Calidris melanotos*	Pectoral Sandpiper				S3M	348	9.5 ± 0.0	NS
A	*Limnodromus griseus*	Short-billed Dowitcher				S3M	1294	8.0 ± 0.0	NS
A	*Chroicocephalus ridibundus*	Black-headed Gull				S3N	30	0.7 ± 0.0	NS
A	*Picoides arcticus*	Black-backed Woodpecker				S3S4	149	1.9 ± 7.0	NS
A	*Loxia curvirostra*	Red Crossbill				S3S4	231	1.9 ± 7.0	NS
A	*Botaurus lentiginosus*	American Bittern				S3S4B,S4S5M	170	1.9 ± 7.0	NS
A	*Setophaga castanea*	Bay-breasted Warbler				S3S4B,S4S5M	355	1.9 ± 7.0	NS
A	*Actitis macularius*	Spotted Sandpiper				S3S4B,S5M	756	1.0 ± 0.0	NS
A	*Leiothlypis peregrina*	Tennessee Warbler				S3S4B,S5M	373	1.0 ± 0.0	NS
A	*Passerella iliaca*	Fox Sparrow				S3S4B,S5M	83	1.6 ± 0.0	NS
A	*Mergus serrator*	Red-breasted Merganser				S3S4B,S5M,S5N	323	0.5 ± 0.0	NS
A	*Calidris maritima*	Purple Sandpiper				S3S4N	202	2.0 ± 0.0	NS
A	*Lanius borealis*	Northern Shrike				S3S4N	2	25.7 ± 0.0	NS
A	*Morus bassanus*	Northern Gannet				SHB	62	1.6 ± 0.0	NS
A	*Aythya americana*	Redhead				SHB	5	2.0 ± 0.0	NS
A	*Leucophaeus atricilla*	Laughing Gull				SHB	13	6.1 ± 0.0	NS
A	*Progne subis*	Purple Martin				SHB	1	13.8 ± 0.0	NS
A	*Eremophila alpestris*	Horned Lark				SHB,S4S5N,S5M	25	13.9 ± 0.0	NS
I	*Bombus bohemicus*	Ashton Cuckoo Bumble Bee	Endangered	Endangered	Endangered	S1	24	2.2 ± 5.0	NS
I	*Danaus plexippus*	Monarch	Endangered	Special Concern	Endangered	S2?B,S3M	949	0.5 ± 0.0	NS
I	*Danaus plexippus plexippus*	Monarch	Endangered	Special Concern		S2?B,S3M	2	51.5 ± 0.0	NS
I	*Barnea truncata*	Atlantic Mud-piddock	Threatened	Threatened		S1	10	76.5 ± 0.0	NS
I	*Bombus suckleyi*	Suckley's Cuckoo Bumble Bee	Threatened			SH	4	50.0 ± 5.0	NS
I	*Alasmidonta varicosa*	Brook Floater	Special Concern	Special Concern	Threatened	S3	5	44.5 ± 0.0	NS
I	*Bombus terricola*	Yellow-banded Bumble Bee	Special Concern	Special Concern	Vulnerable	S3	144	1.9 ± 0.0	NS
I	*Coccinella transversoguttata richardsoni*	Transverse Lady Beetle	Special Concern		Endangered	SH	4	46.1 ± 2.0	NS
I	*Gomphurus ventricosus*	Skillet Clubtail	Special Concern	Endangered		SH	2	31.6 ± 0.0	NS
I	*Cicindela formosa*	Big Sand Tiger Beetle				S1	1	86.8 ± 1.0	NS
I	*Erora laeta*	Early Hairstreak				S1	1	7.3 ± 1.0	NS
I	*Pachydiplax longipennis*	Blue Dasher				S1	28	2.8 ± 0.0	NS
I	*Polygonia comma*	Eastern Comma				S1?	21	2.6 ± 0.0	NS
I	*Polygonia satyrus*	Satyr Comma				S1?	7	6.9 ± 2.0	NS
I	*Somatochlora brevicincta*	Quebec Emerald				S1S2	1	20.5 ± 0.0	NS
I	*Tharsalea dospassosi*	Maritime Copper				S2	3	5.2 ± 5.0	NS
I	*Satyrium acadica*	Acadian Hairstreak				S2	4	87.5 ± 2.0	NS
I	*Coenagrion resolutum*	Taiga Bluet				S2	2	17.7 ± 1.0	NS
I	*Margaritifera margaritifera*	Eastern Pearlshell				S2	65	35.0 ± 0.0	NS
I	*Pantala hymenaea*	Spot-Winged Glider				S2?B	6	4.3 ± 1.0	NS
I	*Nymphalis l-album*	Compton Tortoiseshell				S2S3	19	2.5 ± 5.0	NS
I	*Aglais milberti*	Milbert's Tortoiseshell				S2S3	22	2.5 ± 5.0	NS
I	*Somatochlora kennedyi*	Kennedy's Emerald				S2S3	3	4.3 ± 1.0	NS

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I	*Enallagma geminatum*	Skimming Bluet				S2S3	2	87.7 ± 0.0	NS
I	*Stylurus scudderi*	Zebra Clubtail				S2S3	6	31.6 ± 0.0	NS
I	*Alasmidonta undulata*	Triangle Floater				S2S3	22	3.6 ± 0.0	NS
I	*Strophiona nitens*	Chestnut Bark Long-horned Beetle				S3	2	10.5 ± 0.0	NS
I	*Psephenus herricki*	Herrick's Water Penny Beetle				S3	1	76.9 ± 0.0	NS
I	*Lebia ornata*	Ornate Harp Ground Beetle				S3	1	98.5 ± 0.0	NS
I	*Carabus serratus*	Serrated Ground Beetle				S3	1	85.4 ± 0.0	NS
I	*Hippodamia parenthesis*	Parenthesis Lady Beetle				S3	3	4.5 ± 0.0	NS
I	*Disonycha pensylvanica*	Pennsylvania Flea Beetle				S3	1	86.6 ± 0.0	NS
I	*Chrysochus auratus*	Dogbane Leaf Beetle				S3	1	39.1 ± 0.0	NS
I	*Naemia seriata*	Seaside Lady Beetle				S3	29	8.8 ± 0.0	NS
I	*Elateroides lugubris*	Sapwood Ship-timber Beetle				S3	1	9.0 ± 0.0	NS
I	*Chilocorus stigma*	Twice-stabbed Lady Beetle				S3	10	6.4 ± 0.0	NS
I	*Myzia pullata*	Streaked Lady Beetle				S3	5	3.6 ± 0.0	NS
I	*Monochamus marmorator*	Balsam Fir Sawyer				S3	1	26.5 ± 0.0	NS
I	*Trachysida aspera*	Rough Flower Longhorn Beetle				S3	1	6.7 ± 0.0	NS
I	*Dicerca tuberculata*	Swollen Jewel Beetle				S3	1	21.7 ± 9.0	NS
I	*Astylopsis sexguttata*	Six-speckled Long-horned Beetle				S3	2	18.5 ± 0.0	NS
I	*Satyrium calanus*	Banded Hairstreak				S3	72	2.6 ± 2.0	NS
I	*Callophrys lanoraieensis*	Bog Elfin				S3	23	15.6 ± 2.0	NS
I	*Strymon melinus*	Gray Hairstreak				S3	13	6.9 ± 1.0	NS
I	*Ophiogomphus aspersus*	Brook Snaketail				S3	2	33.2 ± 0.0	NS
I	*Ophiogomphus mainensis*	Maine Snaketail				S3	7	81.9 ± 0.0	NS
I	*Ophiogomphus rupinsulensis*	Rusty Snaketail				S3	21	31.5 ± 0.0	NS
I	*Epitheca princeps*	Prince Baskettail				S3	14	13.3 ± 0.0	NS
I	*Somatochlora forcipata*	Forcipate Emerald				S3	4	4.1 ± 1.0	NS
I	*Enallagma vernale*	Vernal Bluet				S3	5	22.4 ± 1.0	NS
I	*Polygonia interrogationis*	Question Mark				S3B	164	1.9 ± 7.0	NS
I	*Lepturopsis biforis*	Two-spotted Long-horned Beetle				S3S4	1	61.9 ± 0.0	NS
I	*Cecropterus pylades*	Northern Cloudywing				S3S4	5	85.5 ± 2.0	NS
I	*Amblyscirtes hegon*	Pepper and Salt Skipper				S3S4	28	2.6 ± 2.0	NS
I	*Cupido comyntas*	Eastern Tailed Blue				S3S4	28	15.2 ± 0.0	NS
I	*Argynnis aphrodite*	Aphrodite Fritillary				S3S4	33	16.6 ± 0.0	NS
I	*Polygonia faunus*	Green Comma				S3S4	14	3.6 ± 2.0	NS
I	*Oeneis jutta*	Jutta Arctic				S3S4	6	35.5 ± 1.0	NS
I	*Aeshna clepsydra*	Mottled Darner				S3S4	11	12.4 ± 0.0	NS
I	*Aeshna constricta*	Lance-Tipped Darner				S3S4	21	3.4 ± 1.0	NS
I	*Boyeria grafiana*	Ocellated Darner				S3S4	4	51.3 ± 1.0	NS
I	*Gomphaeschna furcillata*	Harlequin Darner				S3S4	14	3.8 ± 0.0	NS
I	*Somatochlora franklini*	Delicate Emerald				S3S4	2	37.7 ± 1.0	NS
I	*Erythrodiplax berenice*	Seaside Dragonlet				S3S4	7	10.0 ± 0.0	NS
I	*Nannothemis bella*	Elfin Skimmer				S3S4	19	11.7 ± 1.0	NS
I	*Enallagma vesperum*	Vesper Bluet				S3S4	4	38.8 ± 0.0	NS
I	*Amphiagrion saucium*	Eastern Red Damsel				S3S4	2	82.6 ± 1.0	NS
I	*Sphaerophoria pyrrhina*	Violaceous Globetail				SH	1	81.1 ± 5.0	NS
I	*Icaricia saepiolus*	Greenish Blue				SH	1	6.7 ± 2.0	NS
I	*Polygonia gracilis*	Hoary Comma				SH	1	82.9 ± 2.0	NS
N	*Erioderma mollissimum*	Graceful Felt Lichen	Endangered	Endangered	Endangered	S1	19	42.2 ± 0.0	NS
N	*Erioderma pedicellatum (Atlantic pop.)*	Boreal Felt Lichen - Atlantic pop.	Endangered	Endangered	Endangered	S1	374	12.4 ± 0.0	NS
N	*Peltigera hydrothyria*	Eastern Waterfan	Threatened	Threatened	Threatened	S1	16	60.3 ± 0.0	NS
N	*Pannaria lurida*	Wrinkled Shingle Lichen	Threatened	Threatened	Threatened	S2S3	157	19.5 ± 1.0	NS
N	*Anzia colpodes*	Black-foam Lichen	Threatened	Threatened	Threatened	S3	43	19.7 ± 0.0	NS

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N	*Fuscopannaria leucosticta*	White-rimmed Shingle Lichen	Threatened			S3	20	13.0 ± 0.0	NS
N	*Heterodermia squamulosa*	Scaly Fringe Lichen	Threatened			S3	17	51.2 ± 0.0	NS
N	*Pectenia plumbea*	Blue Felt Lichen	Special Concern	Special Concern	Vulnerable	S3	249	12.4 ± 0.0	NS
N	*Sclerophora peronella (Atlantic pop.)*	Frosted Glass-whiskers (Atlantic population)	Special Concern	Special Concern		S3S4	29	18.5 ± 0.0	NS
N	*Pseudevernia cladonia*	Ghost Antler Lichen	Not At Risk			S2S3	19	9.2 ± 0.0	NS
N	*Fissidens exilis*	Pygmy Pocket Moss	Not At Risk			S3	15	53.3 ± 0.0	NS
N	*Chaenotheca servitii*	Flexuous Golden Stubble	Data Deficient			S1	1	93.1 ± 1.0	NS
N	*Aloina brevirostris*	Short-Beaked Rigid Screw Moss				S1	2	52.0 ± 2.0	NS
N	*Sematophyllum demissum*	a Moss				S1	2	19.6 ± 2.0	NS
N	*Cyrto-hypnum minutulum*	Tiny Cedar Moss				S1	1	93.2 ± 0.0	NS
N	*Blennothallia crispa*	Crinkled Jelly Lichen				S1	1	73.2 ± 0.0	NS
N	*Umbilicaria vellea*	Grizzled Rocktripe Lichen				S1	1	25.7 ± 5.0	NS
N	*Usnea perplexans*	Powdered Beard Lichen				S1	1	74.7 ± 0.0	NS
N	*Lathagrium cristatum*	Fingered Jelly Lichen				S1	3	59.4 ± 0.0	NS
N	*Fuscopannaria praetermissa*	Moss Shingles Lichen				S1	1	56.9 ± 0.0	NS
N	*Scytinium schraderi*	Wrinkled Jellyskin Lichen				S1	1	66.2 ± 0.0	NS
N	*Lichina confinis*	Marine Seaweed Lichen				S1	4	19.7 ± 0.0	NS
N	*Polychidium muscicola*	Eyed Mossthorns Woollybear Lichen				S1	1	77.0 ± 0.0	NS
N	*Pseudevernia consocians*	Common Antler Lichen				S1	1	77.4 ± 0.0	NS
N	*Sticta limbata*	Powdered Moon Lichen				S1	4	41.6 ± 3.0	NS
N	*Peltigera lepidophora*	Scaly Pelt Lichen				S1	6	55.6 ± 0.0	NS
N	*Bryoria nitidula*	Tundra Horsehair Lichen				S1	2	15.8 ± 0.0	NS
N	*Hypogymnia hultenii*	Powdered Honeycomb Lichen				S1	14	21.2 ± 1.0	NS
N	*Calypogeia neogaea*	Common Pouchwort				S1?	2	71.4 ± 0.0	NS
N	*Jubula pennsylvanica*	a liverwort				S1?	1	45.9 ± 0.0	NS
N	*Aloina rigida*	Aloe-Like Rigid Screw Moss				S1?	3	52.0 ± 2.0	NS
N	*Imbribryum muehlenbeckii*	Muehlenbeck's Bryum Moss				S1?	2	67.4 ± 0.0	NS
N	*Conardia compacta*	Coast Creeping Moss				S1?	1	33.5 ± 2.0	NS
N	*Tortula obtusifolia*	a Moss				S1?	3	72.2 ± 0.0	NS
N	*Didymodon tophaceus*	Olive Beard Moss				S1?	2	72.8 ± 4.0	NS
N	*Homomallium adnatum*	Adnate Hairy-gray Moss				S1?	1	87.6 ± 0.0	NS
N	*Paludella squarrosa*	Tufted Fen Moss				S1?	3	52.4 ± 0.0	NS
N	*Physcomitrium immersum*	a Moss				S1?	2	88.1 ± 0.0	NS
N	*Schistostega pennata*	Luminous Moss				S1?	2	48.6 ± 0.0	NS
N	*Enchylium limosum*	Lime-loving Tarpaper Lichen				S1?	2	72.8 ± 4.0	NS
N	*Scytinium intermedium*	Forty-five Jellyskin Lichen				S1?	1	72.8 ± 4.0	NS
N	*Melanelia culbersonii*	Appalachain Camouflage Lichen				S1?	1	44.5 ± 0.0	NS
N	*Porella pinnata*	Pinnate Scalewort				S1S2	1	97.3 ± 0.0	NS
N	*Arrhenopterum heterostichum*	One-sided Groove Moss				S1S2	3	52.0 ± 2.0	NS
N	*Hypnum pratense*	Meadow Plait Moss				S1S2	1	97.4 ± 3.0	NS
N	*Mnium thomsonii*	Thomson's Leafy Moss				S1S2	1	57.7 ± 2.0	NS
N	*Tortula acaulon*	Cuspidate Earth Moss				S1S2	2	93.5 ± 0.0	NS
N	*Plagiothecium latebricola*	Alder Silk Moss				S1S2	1	54.3 ± 5.0	NS
N	*Platydictya confervoides*	a Moss				S1S2	1	55.7 ± 0.0	NS
N	*Sematophyllum marylandicum*	a Moss				S1S2	2	19.9 ± 3.0	NS
N	*Timmia megapolitana*	Metropolitan Timmia Moss				S1S2	2	90.7 ± 1.0	NS
N	*Tortula mucronifolia*	Mucronate Screw Moss				S1S2	1	93.2 ± 3.0	NS
N	*Pseudotaxiphyllum distichaceum*	a Moss				S1S2	1	60.6 ± 0.0	NS
N	*Haplocladium microphyllum*	Tiny-leaved Haplocladium				S1S2	1	74.6 ± 5.0	NS

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N	*Rhynchostegium serrulatum*	Moss Dark Beaked Moss				S1S2	1	40.1 ± 2.0	NS
N	*Enchylium bachmanianum*	Bachman's Jelly Lichen				S1S2	2	59.6 ± 0.0	NS
N	*Placidium squamulosum*	Limy Soil Stipplescale Lichen				S1S2	1	71.2 ± 6.0	NS
N	*Pilophorus cereolus*	Powdered Matchstick Lichen				S1S2	1	91.3 ± 3.0	NS
N	*Rhizoplaca subdiscrepans*	Scattered Rock-posy Lichen				S1S2	1	45.7 ± 1.0	NS
N	*Parmotrema reticulatum*	Netted Ruffle Lichen				S1S2	1	75.8 ± 0.0	NS
N	*Parmeliella parvula*	Poor-man's Shingles Lichen				S1S2	9	34.2 ± 0.0	NS
N	*Umbilicaria polyrhiza*	Ballpoint Rocktripe Lichen				S1S3	1	84.2 ± 0.0	NS
N	*Lecanora polytropa*	a lichen				S1S3	2	19.6 ± 1.0	NS
N	*Acarospora sinopica*	a cracked lichen				S1S3	2	6.1 ± 0.0	NS
N	*Heterodermia galactophylla*	Branching Fringe Lichen				S1S3	1	45.7 ± 0.0	NS
N	*Xylopsora friesii*	a Lichen				S1S3	2	3.1 ± 0.0	NS
N	*Stereocaulon grande*	Grand Foam Lichen				S1S3	1	96.2 ± 0.0	NS
N	*Stereocaulon intermedium*	Pacific Brain Foam Lichen				S1S3	3	11.2 ± 0.0	NS
N	*Anacamptodon splachnoides*	a Moss				S2	1	4.9 ± 30.0	NS
N	*Sphagnum platyphyllum*	Flat-leaved Peat Moss				S2	2	22.1 ± 3.0	NS
N	*Sphagnum subnitens*	Lustrous Peat Moss				S2	1	52.7 ± 2.0	NS
N	*Usnea flavocardia*	Blood-splattered Beard Lichen				S2	1	18.7 ± 4.0	NS
N	*Cystocoleus ebeneus*	Rockgossamer Lichen				S2	5	13.1 ± 0.0	NS
N	*Hypotrachyna catawbiensis*	Powder-tipped Antler Lichen				S2	3	45.7 ± 0.0	NS
N	*Scytinium imbricatum*	Scaly Jellyskin Lichen				S2	2	68.2 ± 4.0	NS
N	*Nephroma arcticum*	Arctic Kidney Lichen				S2	1	10.8 ± 1.0	NS
N	*Nephroma resupinatum*	a lichen				S2	11	21.0 ± 1.0	NS
N	*Placynthium flabellosum*	Scaly Ink Lichen				S2	1	39.7 ± 17.0	NS
N	*Moerckia flotoviana*	Flotow's Ruffwort				S2?	1	73.5 ± 0.0	NS
N	*Riccardia multifida*	Delicate Germanderwort				S2?	2	46.3 ± 0.0	NS
N	*Anomodon viticulosus*	a Moss				S2?	1	96.0 ± 0.0	NS
N	*Weissia muhlenbergiana*	a Moss				S2?	5	57.7 ± 1.0	NS
N	*Atrichum angustatum*	Lesser Smoothcap Moss				S2?	2	89.5 ± 2.0	NS
N	*Ptychostomum pendulum*	Drooping Bryum				S2?	1	52.0 ± 2.0	NS
N	*Drepanocladus polygamus*	Polygamous Hook Moss				S2?	4	19.6 ± 2.0	NS
N	*Pseudocampylium radicale*	Long-stalked Fine Wet Moss				S2?	1	97.4 ± 3.0	NS
N	*Dicranum condensatum*	Condensed Broom Moss				S2?	3	31.3 ± 0.0	NS
N	*Ditrichum rhynchostegium*	a Moss				S2?	1	12.8 ± 1.0	NS
N	*Grimmia anomala*	Mountain Forest Grimmia				S2?	1	64.6 ± 1.0	NS
N	*Kiaeria starkei*	Starke's Fork Moss				S2?	1	40.5 ± 10.0	NS
N	*Orthotrichum anomalum*	Anomalous Bristle Moss				S2?	1	59.1 ± 2.0	NS
N	*Philonotis marchica*	a Moss				S2?	2	88.7 ± 0.0	NS
N	*Platydictya jungermannioides*	False Willow Moss				S2?	1	46.1 ± 0.0	NS
N	*Cyrtomnium hymenophylloides*	Short-pointed Lantern Moss				S2?	1	3.6 ± 5.0	NS
N	*Platylomella lescurii*	a Moss				S2?	5	42.4 ± 0.0	NS
N	*Phylliscum demangeonii*	Black Rock-wafer Lichen				S2?	5	58.7 ± 0.0	NS
N	*Oxyrrhynchium hians*	Light Beaked Moss				S2S3	4	15.5 ± 5.0	NS
N	*Scorpidium revolvens*	Limprichtia Moss				S2S3	3	33.8 ± 2.0	NS
N	*Moelleropsis nebulosa*	Blue-gray Moss Shingle Lichen				S2S3	55	10.6 ± 0.0	NS
N	*Moelleropsis nebulosa ssp. frullaniae*	Blue-gray Moss Shingle Lichen				S2S3	3	51.5 ± 0.0	NS
N	*Ramalina thrausta*	Angelhair Ramalina Lichen				S2S3	11	12.0 ± 5.0	NS
N	*Collema leptaleum*	Crumpled Bat's Wing Lichen				S2S3	70	16.7 ± 1.0	NS
N	*Usnea ceratina*	Warty Beard Lichen				S2S3	2	77.3 ± 0.0	NS
N	*Usnea rubicunda*	Red Beard Lichen				S2S3	6	53.3 ± 0.0	NS
N	*Ahtiana aurescens*	Eastern Candlewax Lichen				S2S3	20	20.6 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
N	*Usnocetraria oakesiana*	Yellow Band Lichen				S2S3	10	15.1 ± 0.0	NS
N	*Cladonia mateocyatha*	Mixed-up Pixie-cup				S2S3	4	10.9 ± 5.0	NS
N	*Cladonia parasitica*	Fence-rail Lichen				S2S3	3	24.5 ± 0.0	NS
N	*Chaenotheca gracilenta*	a lichen				S2S3	1	2.8 ± 0.0	NS
N	*Scytinium tenuissimum*	Birdnest Jellyskin Lichen				S2S3	7	13.1 ± 0.0	NS
N	*Melanohalea septentrionalis*	Northern Camouflage Lichen				S2S3	1	74.7 ± 0.0	NS
N	*Myelochroa aurulenta*	Powdery Axil-bristle Lichen				S2S3	1	81.1 ± 2.0	NS
N	*Parmelia fertilis*	Fertile Shield Lichen				S2S3	9	66.7 ± 0.0	NS
N	*Hypotrachyna minarum*	Hairless-spined Shield Lichen				S2S3	2	45.2 ± 0.0	NS
N	*Parmeliopsis ambigua*	Green Starburst Lichen				S2S3	2	4.6 ± 0.0	NS
N	*Racodium rupestre*	Rockhair Lichen				S2S3	3	20.0 ± 1.0	NS
N	*Umbilicaria polyphylla*	Petalled Rocktripe Lichen				S2S3	2	22.6 ± 0.0	NS
N	*Usnea cavernosa*	Pitted Beard Lichen				S2S3	4	74.7 ± 0.0	NS
N	*Usnea mutabilis*	Bloody Beard Lichen				S2S3	1	74.7 ± 0.0	NS
N	*Fuscopannaria sorediata*	a Lichen				S2S3	4	20.0 ± 1.0	NS
N	*Physcia subtilis*	Slender Rosette Lichen				S2S3	2	22.4 ± 0.0	NS
N	*Dimelaena oreina*	Golden Moonglow Lichen				S2S3	2	8.0 ± 0.0	NS
N	*Cetraria arenaria*	Sand-loving Icelandmoss Lichen				S2S3	13	62.1 ± 0.0	NS
N	*Cladonia coccifera*	Eastern Boreal Pixie-cup Lichen				S2S3	3	16.2 ± 2.0	NS
N	*Cladonia deformis*	Lesser Sulphur-cup Lichen				S2S3	2	61.0 ± 4.0	NS
N	*Cladonia phyllophora*	Felt Lichen				S2S3	2	93.1 ± 4.0	NS
N	*Usnea flammea*	Coastal Bushy Beard Lichen				S2S3	1	19.6 ± 1.0	NS
N	*Ephemerum serratum*	a Moss				S3	3	59.5 ± 5.0	NS
N	*Fissidens taxifolius*	Yew-leaved Pocket Moss				S3	14	43.8 ± 0.0	NS
N	*Anomodon tristis*	a Moss				S3	3	49.5 ± 15.0	NS
N	*Sphagnum contortum*	Twisted Peat Moss				S3	4	71.2 ± 4.0	NS
N	*Tetraplodon angustatus*	Toothed-leaved Nitrogen Moss				S3	2	52.7 ± 2.0	NS
N	*Collema nigrescens*	Blistered Tarpaper Lichen				S3	36	23.4 ± 0.0	NS
N	*Solorina saccata*	Woodland Owl Lichen				S3	11	45.2 ± 2.0	NS
N	*Fuscopannaria ahlneri*	Corrugated Shingles Lichen				S3	80	15.8 ± 0.0	NS
N	*Scytinium lichenoides*	Tattered Jellyskin Lichen				S3	33	10.6 ± 0.0	NS
N	*Leptogium milligranum*	Stretched Jellyskin Lichen				S3	10	52.2 ± 0.0	NS
N	*Nephroma bellum*	Naked Kidney Lichen				S3	6	18.7 ± 4.0	NS
N	*Placynthium nigrum*	Common Ink Lichen				S3	1	72.2 ± 0.0	NS
N	*Platismatia norvegica*	Oldgrowth Rag Lichen				S3	1	53.7 ± 0.0	NS
N	*Punctelia appalachensis*	Appalachian Speckleback Lichen				S3	16	92.9 ± 0.0	NS
N	*Viridothelium virens*	a lichen				S3	4	25.4 ± 2.0	NS
N	*Ephebe lanata*	Waterside Rockshag Lichen				S3	4	39.7 ± 17.0	NS
N	*Phaeophyscia adiastola*	Powder-tipped Shadow Lichen				S3	1	3.0 ± 0.0	NS
N	*Phaeophyscia pusilloides*	Pompom-tipped Shadow Lichen				S3	9	2.7 ± 0.0	NS
N	*Peltigera collina*	Tree Pelt Lichen				S3	8	13.4 ± 0.0	NS
N	*Barbula convoluta*	Lesser Bird's-claw Beard Moss				S3?	3	9.1 ± 0.0	NS
N	*Calliergon giganteum*	Giant Spear Moss				S3?	2	49.0 ± 3.0	NS
N	*Drummondia prorepens*	a Moss				S3?	1	57.5 ± 5.0	NS
N	*Elodium blandowii*	Blandow's Bog Moss				S3?	5	4.5 ± 7.0	NS
N	*Mnium stellare*	Star Leafy Moss				S3?	3	52.7 ± 0.0	NS
N	*Sphagnum lindbergii*	Lindberg's Peat Moss				S3?	1	66.5 ± 0.0	NS
N	*Sphagnum riparium*	Streamside Peat Moss				S3?	2	42.5 ± 0.0	NS
N	*Cladonia stygia*	Black-footed Reindeer Lichen				S3?	4	34.9 ± 0.0	NS

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N	*Anomodon rugelii*	Rugel's Anomodon Moss				S3S4	1	93.1 ± 0.0	NS
N	*Dichelyma capillaceum*	Hairlike Dichelyma Moss				S3S4	3	17.0 ± 3.0	NS
N	*Dicranum leioneuron*	a Dicranum Moss				S3S4	1	32.2 ± 0.0	NS
N	*Encalypta ciliata*	Fringed Extinguisher Moss				S3S4	1	93.2 ± 3.0	NS
N	*Splachnum ampullaceum*	Cruet Dung Moss				S3S4	2	41.7 ± 0.0	NS
N	*Thamnobryum alleghaniense*	a Moss				S3S4	5	76.7 ± 0.0	NS
N	*Tomentypnum nitens*	Golden Fuzzy Fen Moss				S3S4	4	52.5 ± 0.0	NS
N	*Schistidium agassizii*	Elf Bloom Moss				S3S4	3	52.8 ± 0.0	NS
N	*Hylocomiastrum pyrenaicum*	a Feather Moss				S3S4	1	4.3 ± 0.0	NS
N	*Bryoria pseudofuscescens*	Mountain Horsehair Lichen				S3S4	4	17.3 ± 1.0	NS
N	*Enchylium tenax*	Soil Tarpaper Lichen				S3S4	10	45.0 ± 0.0	NS
N	*Sticta fuliginosa*	Peppered Moon Lichen				S3S4	67	18.3 ± 0.0	NS
N	*Arctoparmelia incurva*	Finger Ring Lichen				S3S4	85	3.8 ± 1.0	NS
N	*Scytinium teretiusculum*	Curly Jellyskin Lichen				S3S4	9	21.9 ± 0.0	NS
N	*Leptogium acadiense*	Acadian Jellyskin Lichen				S3S4	28	4.5 ± 0.0	NS
N	*Scytinium subtile*	Appressed Jellyskin Lichen				S3S4	26	23.0 ± 0.0	NS
N	*Cladonia floerkeana*	Gritty British Soldiers Lichen				S3S4	4	16.2 ± 0.0	NS
N	*Vahliella leucophaea*	Shelter Shingle Lichen				S3S4	1	98.6 ± 0.0	NS
N	*Heterodermia speciosa*	Powdered Fringe Lichen				S3S4	38	49.2 ± 0.0	NS
N	*Leptogium corticola*	Blistered Jellyskin Lichen				S3S4	92	20.5 ± 0.0	NS
N	*Melanohalea olivacea*	Spotted Camouflage Lichen				S3S4	1	74.7 ± 0.0	NS
N	*Parmeliopsis hyperopta*	Gray Starburst Lichen				S3S4	1	96.1 ± 0.0	NS
N	*Parmotrema perlatum*	Powdered Ruffle Lichen				S3S4	25	15.6 ± 0.0	NS
N	*Peltigera hymenina*	Cloudy Pelt Lichen				S3S4	2	16.2 ± 2.0	NS
N	*Sphaerophorus fragilis*	Fragile Coral Lichen				S3S4	11	16.2 ± 2.0	NS
N	*Sclerophora peronella*	Frosted Glass-whiskers Lichen				S3S4	2	87.6 ± 0.0	NS
N	*Coccocarpia palmicola*	Salted Shell Lichen				S3S4	531	9.2 ± 0.0	NS
N	*Physcia caesia*	Blue-gray Rosette Lichen				S3S4	3	19.6 ± 1.0	NS
N	*Physcia tenella*	Fringed Rosette Lichen				S3S4	7	3.2 ± 0.0	NS
N	*Anaptychia palmulata*	Shaggy Fringed Lichen				S3S4	92	15.1 ± 0.0	NS
N	*Evernia prunastri*	Valley Oakmoss Lichen				S3S4	36	50.9 ± 0.0	NS
N	*Heterodermia neglecta*	Fringe Lichen				S3S4	100	10.6 ± 0.0	NS
P	*Clethra alnifolia*	Coast Pepper-Bush	Endangered	Threatened	Vulnerable	S2	3	4.1 ± 0.0	NS
P	*Juglans cinerea*	Butternut	Endangered	Endangered		SNA	30	3.0 ± 0.0	NS
P	*Fraxinus nigra*	Black Ash	Threatened		Threatened	S1S2	782	9.0 ± 0.0	NS
P	*Liatris spicata*	Dense Blazing Star	Threatened	Threatened		SNA	4	2.2 ± 0.0	NS
P	*Lophiola aurea*	Goldencrest	Special Concern	Special Concern	Vulnerable	S2	41	86.5 ± 1.0	NS
P	*Lilaeopsis chinensis*	Eastern Lilaeopsis	Special Concern	Special Concern	Vulnerable	S3	140	77.7 ± 0.0	NS
P	*Scirpus longii*	Long's Bulrush	Special Concern		Vulnerable	S3	3	98.6 ± 0.0	NS
P	*Isoetes prototypus*	Prototype Quillwort	Special Concern	Special Concern	Vulnerable	S3	10	95.2 ± 0.0	NS
P	*Floerkea proserpinacoides*	False Mermaidweed	Not At Risk			S2S3	39	85.9 ± 7.0	NS
P	*Acer saccharinum*	Silver Maple				S1	12	79.2 ± 0.0	NS
P	*Osmorhiza depauperata*	Blunt Sweet Cicely				S1	1	81.1 ± 5.0	NS
P	*Andersonglossum boreale*	Northern Wild Comfrey				S1	5	55.1 ± 1.0	NS
P	*Turritis glabra*	Tower Mustard				S1	1	83.8 ± 0.0	NS
P	*Lobelia spicata*	Pale-Spiked Lobelia				S1	6	81.1 ± 7.0	NS
P	*Ribes americanum*	Wild Black Currant				S1	4	54.1 ± 3.0	NS
P	*Fraxinus pennsylvanica*	Red Ash				S1	11	35.4 ± 5.0	NS
P	*Persicaria careyi*	Carey's Smartweed				S1	1	64.4 ± 3.0	NS
P	*Phytolacca americana*	Common Pokeweed				S1	4	7.6 ± 0.0	NS
P	*Podostemum ceratophyllum*	Horn-leaved Riverweed				S1	4	90.6 ± 0.0	NS
P	*Montia fontana*	Water Blinks				S1	1	4.5 ± 1.0	NS
P	*Lysimachia quadrifolia*	Whorled Yellow Loosestrife				S1	1	29.1 ± 0.0	NS
P	*Salix myrtillifolia*	Blueberry Willow				S1	1	48.9 ± 0.0	NS
P	*Salix serissima*	Autumn Willow				S1	2	48.6 ± 0.0	NS
P	*Carex garberi*	Garber's Sedge				S1	4	89.7 ± 0.0	NS
P	*Carex laxiflora*	Loose-Flowered Sedge				S1	1	92.5 ± 1.0	NS

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P	*Carex ormostachya*	Necklace Spike Sedge				S1	1	99.7 ± 5.0	NS
P	*Carex plantaginea*	Plantain-Leaved Sedge				S1	4	85.8 ± 0.0	NS
P	*Carex prairea*	Prairie Sedge				S1	2	94.7 ± 1.0	NS
P	*Carex viridula var. saxilittoralis*	Greenish Sedge				S1	5	66.5 ± 2.0	NS
P	*Scirpus atrovirens*	Dark-green Bulrush				S1	4	44.5 ± 0.0	NS
P	*Iris prismatica*	Slender Blue Flag				S1	1	91.8 ± 100.0	NS
P	*Sisyrinchium fuscatum*	Coastal Plain Blue-eyed-grass				S1	1	87.9 ± 0.0	NS
P	*Juncus secundus*	Secund Rush				S1	1	96.9 ± 0.0	NS
P	*Juncus vaseyi*	Vasey Rush				S1	1	90.1 ± 0.0	NS
P	*Trillium grandiflorum*	White Trillium				S1	3	94.7 ± 1.0	NS
P	*Malaxis monophyllos var. brachypoda*	North American White Adder's-mouth				S1	4	86.7 ± 10.0	NS
P	*Spiranthes casei var. casei*	Case's Ladies'-Tresses				S1	1	74.4 ± 0.0	NS
P	*Dichanthelium xanthophysum*	Slender Panic Grass				S1	10	83.5 ± 1.0	NS
P	*Elymus hystrix*	Spreading Wild Rye				S1	11	51.8 ± 0.0	NS
P	*Adiantum pedatum*	Northern Maidenhair Fern				S1	26	47.1 ± 1.0	NS
P	*Dryopteris goldieana*	Goldie's Woodfern				S1	1	69.8 ± 1.0	NS
P	*Equisetum palustre*	Marsh Horsetail				S1	1	89.1 ± 5.0	NS
P	*Botrychium lunaria*	Common Moonwort				S1	10	13.8 ± 0.0	NS
P	*Selaginella rupestris*	Rock Spikemoss				S1	1	54.2 ± 0.0	NS
P	*Solidago hispida*	Hairy Goldenrod				S1?	2	1.9 ± 7.0	NS
P	*Suaeda rolandii*	Roland's Sea-Blite				S1?	5	55.4 ± 2.0	NS
P	*Carex pensylvanica*	Pennsylvania Sedge				S1?	3	24.8 ± 0.0	NS
P	*Allium schoenoprasum*	Wild Chives				S1?	1	13.2 ± 0.0	NS
P	*Allium schoenoprasum var. sibiricum*	Wild Chives				S1?	1	83.1 ± 7.0	NS
P	*Crocanthemum canadense*	Long-branched Frostweed			Endangered	S1S2	2	20.7 ± 1.0	NS
P	*Cypripedium arietinum*	Ram's-Head Lady's-Slipper			Endangered	S1S2	308	49.9 ± 0.0	NS
P	*Sanicula odorata*	Clustered Sanicle				S1S2	10	52.0 ± 0.0	NS
P	*Draba glabella*	Rock Whitlow-Grass				S1S2	1	94.0 ± 0.0	NS
P	*Proserpinaca intermedia*	Intermediate Mermaidweed				S1S2	2	43.6 ± 0.0	NS
P	*Anemone virginiana var. alba*	Virginia Anemone				S1S2	5	83.1 ± 7.0	NS
P	*Carex haydenii*	Hayden's Sedge				S1S2	2	83.8 ± 1.0	NS
P	*Platanthera huronensis*	Fragrant Green Orchid				S1S2	1	51.8 ± 10.0	NS
P	*Euphrasia farlowii*	Farlow's Eyebright				S1S3	2	80.9 ± 0.0	NS
P	*Carex vacillans*	Estuarine Sedge				S1S3	1	56.8 ± 0.0	NS
P	*Zizia aurea*	Golden Alexanders				S2	41	72.1 ± 1.0	NS
P	*Antennaria parlinii ssp. fallax*	Parlin's Pussytoes				S2	33	51.9 ± 0.0	NS
P	*Rudbeckia laciniata*	Cut-Leaved Coneflower				S2	26	37.9 ± 7.0	NS
P	*Arabis pycnocarpa*	Cream-flowered Rockcress				S2	1	92.2 ± 0.0	NS
P	*Cardamine maxima*	Large Toothwort				S2	1	81.1 ± 0.0	NS
P	*Hudsonia ericoides*	Pinebarren Golden Heather				S2	179	1.9 ± 7.0	NS
P	*Desmodium canadense*	Canada Tick-trefoil				S2	12	82.1 ± 1.0	NS
P	*Hylodesmum glutinosum*	Large Tick-trefoil				S2	22	54.0 ± 0.0	NS
P	*Conopholis americana*	American Cancer-root				S2	20	81.4 ± 7.0	NS
P	*Anemonastrum canadense*	Canada Anemone				S2	12	3.5 ± 0.0	NS
P	*Hepatica americana*	Round-lobed Hepatica				S2	74	46.0 ± 0.0	NS
P	*Ranunculus sceleratus*	Cursed Buttercup				S2	24	4.7 ± 2.0	NS
P	*Galium boreale*	Northern Bedstraw				S2	5	86.7 ± 7.0	NS
P	*Gratiola neglecta*	Clammy Hedge-Hyssop				S2	6	63.2 ± 0.0	NS
P	*Dirca palustris*	Eastern Leatherwood				S2	75	39.4 ± 1.0	NS
P	*Carex gynocrates*	Northern Bog Sedge				S2	2	48.9 ± 0.0	NS
P	*Carex pellita*	Woolly Sedge				S2	2	70.4 ± 10.0	NS
P	*Carex livida*	Livid Sedge				S2	13	16.4 ± 0.0	NS

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P	*Juncus greenei*	Greene's Rush				S2	5	3.5 ± 10.0	NS
P	*Allium tricoccum*	Wild Leek				S2	63	81.2 ± 0.0	NS
P	*Lilium canadense*	Canada Lily				S2	72	37.5 ± 0.0	NS
P	*Cypripedium parviflorum var. pubescens*	Yellow Lady's-slipper				S2	26	24.0 ± 7.0	NS
P	*Cypripedium parviflorum var. makasin*	Small Yellow Lady's-Slipper				S2	11	52.2 ± 0.0	NS
P	*Cypripedium reginae*	Showy Lady's-Slipper				S2	57	47.3 ± 0.0	NS
P	*Platanthera flava var. flava*	Southern Rein Orchid				S2	3	80.0 ± 7.0	NS
P	*Platanthera flava var. herbiola*	Pale Green Orchid				S2	11	78.9 ± 1.0	NS
P	*Platanthera macrophylla*	Large Round-Leaved Orchid				S2	5	62.0 ± 1.0	NS
P	*Bromus latiglumis*	Broad-Glumed Brome				S2	28	71.9 ± 0.0	NS
P	*Cinna arundinacea*	Sweet Wood Reed Grass				S2	60	72.1 ± 0.0	NS
P	*Elymus wiegandii*	Wiegand's Wild Rye				S2	6	1.9 ± 7.0	NS
P	*Festuca subverticillata*	Nodding Fescue				S2	9	64.2 ± 5.0	NS
P	*Piptatheropsis pungens*	Slender Ricegrass				S2	2	69.9 ± 10.0	NS
P	*Cryptogramma stelleri*	Steller's Rockbrake				S2	3	59.9 ± 0.0	NS
P	*Cuscuta cephalanthi*	Buttonbush Dodder				S2?	1	38.2 ± 0.0	NS
P	*Rumex persicarioides*	Peach-leaved Dock				S2?	1	53.6 ± 0.0	NS
P	*Crataegus submollis*	Quebec Hawthorn				S2?	5	41.1 ± 7.0	NS
P	*Carex peckii*	White-Tinged Sedge				S2?	4	46.0 ± 0.0	NS
P	*Thuja occidentalis*	Eastern White Cedar			Vulnerable	S2S3	14	36.7 ± 0.0	NS
P	*Osmorhiza longistylis*	Smooth Sweet Cicely				S2S3	16	54.9 ± 0.0	NS
P	*Erigeron philadelphicus*	Philadelphia Fleabane				S2S3	2	71.8 ± 1.0	NS
P	*Lactuca hirsuta*	Hairy Lettuce				S2S3	3	21.5 ± 7.0	NS
P	*Impatiens pallida*	Pale Jewelweed				S2S3	3	70.0 ± 0.0	NS
P	*Caulophyllum thalictroides*	Blue Cohosh				S2S3	80	43.9 ± 0.0	NS
P	*Draba arabisans*	Rock Whitlow-Grass				S2S3	10	92.5 ± 1.0	NS
P	*Boechera stricta*	Drummond's Rockcress				S2S3	9	88.3 ± 0.0	NS
P	*Stellaria humifusa*	Saltmarsh Starwort				S2S3	4	55.7 ± 0.0	NS
P	*Oxybasis rubra*	Red Goosefoot				S2S3	2	66.5 ± 2.0	NS
P	*Hypericum majus*	Large St John's-wort				S2S3	4	1.9 ± 7.0	NS
P	*Hypericum x dissimulatum*	Disguised St. John's-wort				S2S3	4	9.6 ± 10.0	NS
P	*Empetrum atropurpureum*	Purple Crowberry				S2S3	5	2.0 ± 7.0	NS
P	*Euphorbia polygonifolia*	Seaside Spurge				S2S3	12	64.3 ± 3.0	NS
P	*Myriophyllum farwellii*	Farwell's Water Milfoil				S2S3	9	36.6 ± 1.0	NS
P	*Hedeoma pulegioides*	American False Pennyroyal				S2S3	13	27.5 ± 5.0	NS
P	*Oenothera fruticosa ssp. tetragona*	Narrow-leaved Evening Primrose				S2S3	8	14.6 ± 7.0	NS
P	*Polygala polygama*	Racemed Milkwort				S2S3	1	3.5 ± 1.0	NS
P	*Polygonum aviculare ssp. buxiforme*	Box Knotweed				S2S3	8	52.3 ± 7.0	NS
P	*Polygonum oxyspermum ssp. raii*	Ray's Knotweed				S2S3	3	49.8 ± 1.0	NS
P	*Polygonum oxyspermum*	Sharp-fruit Knotweed				S2S3	1	18.3 ± 0.0	NS
P	*Rumex triangulivalvis*	Triangular-valve Dock				S2S3	9	30.4 ± 0.0	NS
P	*Primula mistassinica*	Mistassini Primrose				S2S3	17	77.2 ± 1.0	NS
P	*Anemone quinquefolia*	Wood Anemone				S2S3	15	4.3 ± 0.0	NS
P	*Caltha palustris*	Yellow Marsh Marigold				S2S3	26	4.6 ± 0.0	NS
P	*Amelanchier fernaldii*	Fernald's Serviceberry				S2S3	1	83.7 ± 7.0	NS
P	*Potentilla canadensis*	Canada Cinquefoil				S2S3	9	2.4 ± 0.0	NS
P	*Salix pellita*	Satiny Willow				S2S3	3	59.5 ± 2.0	NS
P	*Tiarella cordifolia*	Heart-leaved Foamflower				S2S3	6	44.4 ± 0.0	NS
P	*Agalinis purpurea var. parviflora*	Small-flowered Purple False Foxglove				S2S3	2	98.9 ± 0.0	NS
P	*Boehmeria cylindrica*	Small-spike False-nettle				S2S3	56	38.9 ± 0.0	NS
P	*Carex adusta*	Lesser Brown Sedge				S2S3	8	5.1 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Carex comosa*	Bearded Sedge				S2S3	4	58.4 ± 7.0	NS
P	*Carex houghtoniana*	Houghton's Sedge				S2S3	1	63.3 ± 1.0	NS
P	*Carex hystericina*	Porcupine Sedge				S2S3	7	89.4 ± 0.0	NS
P	*Eleocharis ovata*	Ovate Spikerush				S2S3	4	34.1 ± 0.0	NS
P	*Scirpus pedicellatus*	Stalked Bulrush				S2S3	7	40.3 ± 0.0	NS
P	*Vallisneria americana*	Wild Celery				S2S3	11	33.3 ± 1.0	NS
P	*Najas gracillima*	Thread-Like Naiad				S2S3	2	43.7 ± 0.0	NS
P	*Goodyera pubescens*	Downy Rattlesnake-Plantain				S2S3	17	42.6 ± 1.0	NS
P	*Spiranthes casei var. novaescotiae*	Case's Ladies'-Tresses				S2S3	3	57.9 ± 0.0	NS
P	*Spiranthes lucida*	Shining Ladies'-Tresses				S2S3	13	44.9 ± 1.0	NS
P	*Potamogeton friesii*	Fries' Pondweed				S2S3	10	83.9 ± 5.0	NS
P	*Woodsia glabella*	Smooth Cliff Fern				S2S3	1	94.2 ± 1.0	NS
P	*Botrychium lanceolatum ssp. angustisegmentum*	Narrow Triangle Moonwort				S2S3	4	60.0 ± 5.0	NS
P	*Botrychium simplex*	Least Moonwort				S2S3	4	33.9 ± 0.0	NS
P	*Ophioglossum pusillum*	Northern Adder's-tongue				S2S3	5	6.5 ± 50.0	NS
P	*Potamogeton pulcher*	Spotted Pondweed			Vulnerable	S3	11	70.9 ± 2.0	NS
P	*Angelica atropurpurea*	Purple-stemmed Angelica				S3	1	73.9 ± 0.0	NS
P	*Conioselinum chinense*	Chinese Hemlock-parsley				S3	2	59.3 ± 0.0	NS
P	*Hieracium robinsonii*	Robinson's Hawkweed				S3	2	81.4 ± 1.0	NS
P	*Iva frutescens*	Big-leaved Marsh-elder				S3	59	54.1 ± 0.0	NS
P	*Senecio pseudoarnica*	Seabeach Ragwort				S3	30	9.5 ± 1.0	NS
P	*Symphyotrichum boreale*	Boreal Aster				S3	5	29.4 ± 5.0	NS
P	*Symphyotrichum undulatum*	Wavy-leaved Aster				S3	126	16.0 ± 7.0	NS
P	*Symphyotrichum ciliolatum*	Fringed Blue Aster				S3	18	48.4 ± 0.0	NS
P	*Alnus serrulata*	Smooth Alder				S3	20	85.8 ± 0.0	NS
P	*Betula michauxii*	Michaux's Dwarf Birch				S3	27	21.7 ± 0.0	NS
P	*Betula pumila*	Bog Birch				S3	3	46.2 ± 0.0	NS
P	*Cardamine parviflora*	Small-flowered Bittercress				S3	14	32.5 ± 1.0	NS
P	*Palustricodon aparinoides*	Marsh Bellflower				S3	14	57.3 ± 1.0	NS
P	*Mononeuria groenlandica*	Greenland Stitchwort				S3	169	1.9 ± 7.0	NS
P	*Sagina nodosa*	Knotted Pearlwort				S3	56	10.7 ± 0.0	NS
P	*Sagina nodosa ssp. borealis*	Knotted Pearlwort				S3	10	22.8 ± 0.0	NS
P	*Stellaria longifolia*	Long-leaved Starwort				S3	11	35.2 ± 5.0	NS
P	*Ceratophyllum echinatum*	Prickly Hornwort				S3	6	74.5 ± 0.0	NS
P	*Triosteum aurantiacum*	Orange-fruited Tinker's Weed				S3	47	50.1 ± 0.0	NS
P	*Crassula aquatica*	Water Pygmyweed				S3	1	34.1 ± 0.0	NS
P	*Empetrum eamesii*	Pink Crowberry				S3	94	1.9 ± 7.0	NS
P	*Vaccinium uliginosum*	Alpine Bilberry				S3	4	14.7 ± 1.0	NS
P	*Halenia deflexa*	Spurred Gentian				S3	3	28.0 ± 0.0	NS
P	*Geranium bicknellii*	Bicknell's Crane's-bill				S3	9	55.2 ± 0.0	NS
P	*Myriophyllum verticillatum*	Whorled Water Milfoil				S3	3	55.4 ± 7.0	NS
P	*Utricularia resupinata*	Inverted Bladderwort				S3	1	99.3 ± 0.0	NS
P	*Epilobium strictum*	Downy Willowherb				S3	7	59.5 ± 0.0	NS
P	*Polygala sanguinea*	Blood Milkwort				S3	30	1.9 ± 7.0	NS
P	*Persicaria arifolia*	Halberd-leaved Tearthumb				S3	11	46.1 ± 0.0	NS
P	*Plantago rugelii*	Rugel's Plantain				S3	7	1.9 ± 0.0	NS
P	*Primula laurentiana*	Laurentian Primrose				S3	14	87.9 ± 7.0	NS
P	*Samolus parviflorus*	Seaside Brookweed				S3	43	3.3 ± 5.0	NS
P	*Pyrola minor*	Lesser Pyrola				S3	2	15.1 ± 0.0	NS
P	*Anemone virginiana*	Virginia Anemone				S3	19	51.5 ± 5.0	NS
P	*Cephalanthus occidentalis*	Common Buttonbush				S3	26	2.9 ± 0.0	NS
P	*Galium labradoricum*	Labrador Bedstraw				S3	79	45.9 ± 0.0	NS
P	*Salix pedicellaris*	Bog Willow				S3	58	35.1 ± 0.0	NS
P	*Salix sericea*	Silky Willow				S3	122	31.1 ± 1.0	NS
P	*Saxifraga paniculata ssp.*	Laestadius' Saxifrage				S3	2	86.7 ± 7.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
	laestadii								
P	*Lindernia dubia*	Yellow-seeded False Pimperel				S3	9	53.3 ± 0.0	NS
P	*Laportea canadensis*	Canada Wood Nettle				S3	48	39.2 ± 0.0	NS
P	*Pilea pumila*	Dwarf Clearweed				S3	9	9.2 ± 0.0	NS
P	*Viola nephrophylla*	Northern Bog Violet				S3	7	60.4 ± 1.0	NS
P	*Carex bebbii*	Bebb's Sedge				S3	24	52.2 ± 0.0	NS
P	*Carex castanea*	Chestnut Sedge				S3	39	45.9 ± 0.0	NS
P	*Carex cryptolepis*	Hidden-scaled Sedge				S3	11	30.3 ± 6.0	NS
P	*Carex eburnea*	Bristle-leaved Sedge				S3	11	66.1 ± 1.0	NS
P	*Carex hirtifolia*	Pubescent Sedge				S3	32	49.8 ± 7.0	NS
P	*Carex lupulina*	Hop Sedge				S3	64	18.1 ± 0.0	NS
P	*Carex rosea*	Rosy Sedge				S3	36	51.6 ± 1.0	NS
P	*Carex swanii*	Swan's Sedge				S3	4	4.3 ± 0.0	NS
P	*Carex tenera*	Tender Sedge				S3	4	53.3 ± 0.0	NS
P	*Carex tribuloides*	Blunt Broom Sedge				S3	13	48.7 ± 0.0	NS
P	*Carex tuckermanii*	Tuckerman's Sedge				S3	32	52.2 ± 2.0	NS
P	*Eleocharis nitida*	Quill Spikerush				S3	7	49.6 ± 5.0	NS
P	*Eleocharis flavescens var. olivacea*	Bright-green Spikerush				S3	8	10.5 ± 0.0	NS
P	*Eriophorum gracile*	Slender Cottongrass				S3	6	18.5 ± 7.0	NS
P	*Coeloglossum viride*	Long-bracted Frog Orchid				S3	3	76.0 ± 1.0	NS
P	*Cypripedium parviflorum*	Yellow Lady's-slipper				S3	577	2.0 ± 0.0	NS
P	*Neottia bifolia*	Southern Twayblade				S3	121	1.7 ± 0.0	NS
P	*Platanthera flava*	Southern Rein-Orchid				S3	31	83.3 ± 0.0	NS
P	*Platanthera grandiflora*	Large Purple Fringed Orchid				S3	77	3.3 ± 0.0	NS
P	*Platanthera hookeri*	Hooker's Orchid				S3	17	54.4 ± 1.0	NS
P	*Dichanthelium linearifolium*	Narrow-leaved Panic Grass				S3	8	58.4 ± 7.0	NS
P	*Piptatheropsis canadensis*	Canada Ricegrass				S3	8	21.7 ± 7.0	NS
P	*Poa glauca*	Glaucous Blue Grass				S3	4	54.0 ± 1.0	NS
P	*Potamogeton praelongus*	White-stemmed Pondweed				S3	3	71.7 ± 5.0	NS
P	*Potamogeton richardsonii*	Richardson's Pondweed				S3	7	59.2 ± 0.0	NS
P	*Potamogeton zosteriformis*	Flat-stemmed Pondweed				S3	15	35.4 ± 5.0	NS
P	*Asplenium viride*	Green Spleenwort				S3	9	91.1 ± 7.0	NS
P	*Dryopteris fragrans*	Fragrant Wood Fern				S3	4	94.7 ± 1.0	NS
P	*Sceptridium dissectum*	Dissected Moonwort				S3	2	80.1 ± 0.0	NS
P	*Polypodium appalachianum*	Appalachian Polypody				S3	19	4.7 ± 0.0	NS
P	*Persicaria amphibia var. emersa*	Long-root Smartweed				S3?	19	40.3 ± 0.0	NS
P	*Spiranthes ochroleuca*	Yellow Ladies'-tresses				S3?	26	19.0 ± 0.0	NS
P	*Diphasiastrum x sabinifolium*	Savin-leaved Ground-cedar				S3?	2	83.9 ± 0.0	NS
P	*Bidens vulgata*	Tall Beggarticks				S3S4	6	6.2 ± 0.0	NS
P	*Erigeron hyssopifolius*	Hyssop-leaved Fleabane				S3S4	25	51.9 ± 7.0	NS
P	*Hieracium paniculatum*	Panicled Hawkweed				S3S4	25	49.8 ± 11.0	NS
P	*Bidens beckii*	Water Beggarticks				S3S4	8	34.7 ± 0.0	NS
P	*Packera paupercula*	Balsam Groundsel				S3S4	104	49.9 ± 0.0	NS
P	*Atriplex glabriuscula var. franktonii*	Frankton's Saltbush				S3S4	13	60.8 ± 0.0	NS
P	*Shepherdia canadensis*	Soapberry				S3S4	113	44.3 ± 7.0	NS
P	*Vaccinium boreale*	Northern Blueberry				S3S4	3	46.0 ± 0.0	NS
P	*Vaccinium cespitosum*	Dwarf Bilberry				S3S4	55	19.2 ± 0.0	NS
P	*Vaccinium corymbosum*	Highbush Blueberry				S3S4	13	4.2 ± 3.0	NS
P	*Fagus grandifolia*	American Beech				S3S4	681	1.5 ± 0.0	NS
P	*Bartonia virginica*	Yellow Bartonia				S3S4	29	19.0 ± 7.0	NS
P	*Proserpinaca pectinata*	Comb-leaved Mermaidweed				S3S4	17	12.6 ± 1.0	NS
P	*Decodon verticillatus*	Swamp Loosestrife				S3S4	2	54.9 ± 0.0	NS
P	*Nuphar microphylla*	Small Yellow Pond-lily				S3S4	1	44.8 ± 0.0	NS
P	*Persicaria pensylvanica*	Pennsylvania Smartweed				S3S4	27	41.1 ± 7.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Fallopia scandens*	Climbing False Buckwheat				S3S4	17	5.6 ± 0.0	NS
P	*Rumex pallidus*	Seabeach Dock				S3S4	1	34.7 ± 0.0	NS
P	*Pyrola asarifolia*	Pink Pyrola				S3S4	10	35.9 ± 50.0	NS
P	*Endotropis alnifolia*	alder-leaved buckthorn				S3S4	271	40.6 ± 0.0	NS
P	*Amelanchier spicata*	Running Serviceberry				S3S4	41	19.5 ± 0.0	NS
P	*Crataegus succulenta*	Fleshy Hawthorn				S3S4	1	12.8 ± 0.0	NS
P	*Fragaria vesca ssp. americana*	Woodland Strawberry				S3S4	66	39.6 ± 0.0	NS
P	*Fragaria vesca*	Woodland Strawberry				S3S4	16	3.7 ± 0.0	NS
P	*Galium aparine*	Common Bedstraw				S3S4	46	2.4 ± 0.0	NS
P	*Geocaulon lividum*	Northern Comandra				S3S4	4	62.8 ± 0.0	NS
P	*Limosella australis*	Southern Mudwort				S3S4	8	5.1 ± 3.0	NS
P	*Ulmus americana*	White Elm				S3S4	72	1.9 ± 0.0	NS
P	*Verbena hastata*	Blue Vervain				S3S4	154	3.7 ± 0.0	NS
P	*Viola sagittata var. ovata*	Arrow-Leaved Violet				S3S4	31	3.2 ± 0.0	NS
P	*Viola selkirkii*	Great-Spurred Violet				S3S4	3	48.3 ± 4.0	NS
P	*Symplocarpus foetidus*	Eastern Skunk Cabbage				S3S4	10	4.3 ± 0.0	NS
P	*Carex argyrantha*	Silvery-flowered Sedge				S3S4	9	56.0 ± 1.0	NS
P	*Sisyrinchium atlanticum*	Eastern Blue-Eyed-Grass				S3S4	6	67.8 ± 0.0	NS
P	*Triglochin gaspensis*	Gasp ├ Arrowgrass				S3S4	29	28.0 ± 0.0	NS
P	*Juncus acuminatus*	Sharp-Fruit Rush				S3S4	5	13.0 ± 0.0	NS
P	*Juncus subcaudatus*	Woods-Rush				S3S4	23	20.8 ± 0.0	NS
P	*Luzula parviflora ssp. melanocarpa*	Black-fruited Woodrush				S3S4	2	88.3 ± 0.0	NS
P	*Goodyera repens*	Lesser Rattlesnake-plantain				S3S4	5	64.7 ± 0.0	NS
P	*Liparis loeselii*	Loesel's Twayblade				S3S4	9	13.1 ± 0.0	NS
P	*Platanthera obtusata*	Blunt-leaved Orchid				S3S4	8	1.9 ± 10.0	NS
P	*Platanthera orbiculata*	Small Round-leaved Orchid				S3S4	7	48.3 ± 4.0	NS
P	*Alopecurus aequalis*	Short-awned Foxtail				S3S4	7	43.7 ± 0.0	NS
P	*Dichanthelium clandestinum*	Deer-tongue Panic Grass				S3S4	298	14.1 ± 0.0	NS
P	*Coleataenia longifolia*	Long-leaved Panicgrass				S3S4	37	98.0 ± 0.0	NS
P	*Panicum philadelphicum*	Philadelphia Panicgrass				S3S4	6	53.3 ± 0.0	NS
P	*Koeleria spicata*	Narrow False Oats				S3S4	11	51.8 ± 1.0	NS
P	*Asplenium trichomanes*	Maidenhair Spleenwort				S3S4	14	76.2 ± 0.0	NS
P	*Equisetum pratense*	Meadow Horsetail				S3S4	15	52.0 ± 0.0	NS
P	*Diphasiastrum complanatum*	Northern Ground-cedar				S3S4	12	7.8 ± 1.0	NS
P	*Diphasiastrum sitchense*	Sitka Ground-cedar				S3S4	2	81.1 ± 1.0	NS
P	*Huperzia appressa*	Mountain Firmoss				S3S4	7	71.1 ± 7.0	NS
P	*Sceptridium multifidum*	Leathery Moonwort				S3S4	8	61.7 ± 10.0	NS
P	*Botrychium matricariifolium*	Daisy-leaved Moonwort				S3S4	4	14.0 ± 0.0	NS
P	*Viola canadensis*	Canada Violet				SH	2	58.5 ± 0.0	NS
P	*Greeneochloa coarctata*	Small Reedgrass				SH	1	7.4 ± 6.0	NS

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The recipient of these data shall acknowledge the AC CDC and the data sources listed below in any documents, reports, publications or presentations, in which this dataset makes a significant contribution.

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87	Staicer, C. 2021. Additional compiled Nova Scotia Species at Risk bird records, 2005-2020. Dalhousie University.
85	Richardson, Leif. 2018. Maritimes Bombus records from various sources. Richardson, Leif.
84	Hubley, Nicole. 2022. Monarch (Danaus plexippus) records submitted to MTRI from the 2021 field season. Mersey Tobeatic Research Institute.
76	Birds Canada. 2022. Maritimes Swiftwatch project data for 2022. Pers. comm., 155 records.
73	Bryson, I. 2020. Nova Scotia and Newfoundland rare species observations, 2018-2020. Nova Scotia Environment.
72	Manthorne, A. 2014. MaritimesSwiftwatch Project database 2013-2014. Bird Studies Canada, Sackville NB, 326 recs.
69	Staicer, Cindy. 2022. 2021 Landbird Species at Risk observations. Dalhousie University.
68	Cameron, R.P. 2011. Lichen observations, 2011. Nova Scotia Environment & Labour, 731 recs.

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65	Belliveau, A.G. 2014. Plant Records from Southern and Central Nova Scotia. Atlantic Canada Conservation Data Centre, 919 recs.
65	Staicer, Cindy. 2023. 2022 SAR Bird field occurrences from the Landbirds at Risk Project, NS. Dalhousie University, 446 records.
64	Churchill, J.L. 2022. Atlantic Canada Conservation Data Centre Fieldwork 2022. Atlantic Canada Conservation Data Centre.
64	Roland, A.E. & Smith, E.C. 1969. The Flora of Nova Scotia, 1st Ed. Nova Scotia Museum, Halifax, 743pp.
64	Staicer, Cindy. 2023. 2022 SAR Bird ARU occurrences. Dalhousie University, 379 records.
63	Blaney, C.S.; Mazerolle, D.M. 2008. Fieldwork 2008. Atlantic Canada Conservation Data Centre. Sackville NB, 13343 recs.
62	Nussey, Pat & NCC staff. 2019. AEI tracked species records, 2016-2019. Chapman, C.J. (ed.) Atlantic Canada Conservation Data Centre, 333.
59	Belland, R.J. Maritimes moss records from various herbarium databases. 2014.
59	Blaney, C.S. 2020. Sean Blaney 2020 field data. Atlantic Canada Conservation Data Centre, 4407 records.
58	iNaturalist. 2020. iNaturalist butterfly records selected for the Maritimes Butterfly Atlas. iNaturalist.
58	Zinck, M. & Roland, A.E. 1998. Roland's Flora of Nova Scotia. Nova Scotia Museum, 3rd ed., rev. M. Zinck; 2 Vol., 1297 pp.
55	LaPaix, R.W.; Crowell, M.J.; MacDonald, M.; Neily, T.D.; Quinn, G. 2017. Stantec Nova Scotia rare plant records, 2012-2016. Stantec Consulting.
55	Staicer, C. & Bliss, S.; Achenbach, L. 2017. Occurrences of tracked breeding birds in forested wetlands. , 303 records.
53	Churchill, J.L. 2020. Atlantic Canada Conservation Data Centre Fieldwork 2020. Atlantic Canada Conservation Data Centre, 1083 recs.
49	NatureServe Canada. 2019. iNaturalist Maritimes Butterfly Records. iNaturalist.org and iNaturalist.ca.
46	Cameron, R.P. 2009. Erioderma pedicellatum database, 1979-2008. Dept Environment & Labour, 103 recs.
46	Feltham, Carter. 2022. Monarch (Danaus plexippus) and Milkweed MTRI records from the 2022 Field Season. Mersey Tobeatic Research Institute.
42	Amirault, D.L. & McKnight, J. 2003. Piping Plover Database 1991-2003. Canadian Wildlife Service, Sackville, unpublished data. 7 recs.
42	Belliveau, A.G. 2016. Atlantic Canada Conservation Data Centre Fieldwork 2016. Atlantic Canada Conservation Data Centre, 10695 recs.
40	Cameron, E. 2007. Canadian Gypsum Co. survey 2005-07. Dillon Consulting Ltd, 40 recs.
40	Chapman-Lam, C.J. 2021. Atlantic Canada Conservation Data Centre 2020 botanical fieldwork. Atlantic Canada Conservation Data Centre, 17309 recs.
40	MacDonald, E.C. 2018. Piping Plover nest records from 2010-2017. Canadian Wildlife Service.
39	Mersey Tobetic Research Institute. 2021. 2020 Monarch records from the MTRI monitoring program. Mersey Tobetic Research Institute, 72 records.
39	Neily, T.H. & Pepper, C.; Toms, B. 2020. Nova Scotia lichen database [as of 2020-03-18]. Mersey Tobeatic Research Institute.
38	Benjamin, L.K. (compiler). 2001. Significant Habitat & Species Database. Nova Scotia Dept of Natural Resources, 15 spp, 224 recs.
38	Nova Scotia Nature Trust. 2013. Nova Scotia Nature Trust 2013 Species records. Nova Scotia Nature Trust, 95 recs.
38	Porter, C.J.M. 2014. Field work data 2007-2014. Nova Scotia Nature Trust, 96 recs.
37	Neily, T.H. & Pepper, C.; Toms, B. 2015. Nova Scotia lichen location database [as of 2015-02-15]. Mersey Tobeatic Research Institute, 1691 records.
37	Tsehtik, M.; Leblanc, M.; Creaser, T. 2020. Coastal Action: 2020 Species at Risk Data. Coastal Action, 40 records.
36	Belliveau, A.G. 2018. E.C. Smith Herbarium and Atlantic Canada Conservation Data Centre Fieldwork 2018. E.C. Smith Herbarium, 6226 recs.
36	Churchill, J.L. 2018. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre, 2318 recs.
34	Mazerolle, D.M. 2018. Atlantic Canada Conservation Data Centre botanical fieldwork 2018. Atlantic Canada Conservation Data Centre, 13515 recs.
33	Haughian, Sean. 2021. Update to lichen data from 2017-2021. Nova Scotia Museum.
33	Mazerolle, D.M. 2017. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
32	Atlantic Canada Conservation Data Centre. 2020. Cape LaHave Island observations from August 2020. Atlantic Canada Conservation Data Centre, 605 records.
32	Blaney, C.S.; Spicer, C.D.; Rothfels, C. 2004. Fieldwork 2004. Atlantic Canada Conservation Data Centre. Sackville NB, 1343 recs.
32	Ogden, J. NS DNR Butterfly Collection Dataset. Nova Scotia Department of Natural Resources. 2014.
32	Patrick, A.; Horne, D.; Noseworthy, J. et. al. 2017. Field data for Nova Scotia and New Brunswick, 2015 and 2017. Nature Conservancy of Canada.
31	Hill, N.M. 1994. Status report on the Long's bulrush Scirpus longii in Canada. Committee on the Status of Endangered Wildlife in Canada, 7 recs.
30	Cameron, R.P. 2018. Degelia plumbea records. Nova Scotia Environment.
30	Klymko, J.J.D.; Robinson, S.L. 2012. 2012 field data. Atlantic Canada Conservation Data Centre, 447 recs.
30	Toms, Brad & Pepper, Chris; Neily, Tom. 2022. Nova Scotia lichen database [as of 2022-04]. Mersey Tobeatic Research Institute.
29	Blaney, C.S.; Spicer, C.D.; Popma, T.M.; Hanel, C. 2002. Fieldwork 2002. Atlantic Canada Conservation Data Centre. Sackville NB, 2252 recs.
29	Pepper, C. 2021. Rare bird, plant and mammal observations in Nova Scotia, 2017-2021.
28	Pepper, Chris. 2012. Observations of breeding Canada Warbler's along the Eastern Shore, NS. Pers. comm. to S. Blaney, Jan. 20, 28 recs.
27	Canadian Wildlife Service, Dartmouth. 2010. Piping Plover censuses 2007-09, 304 recs.
26	Ferguson, D.C. 1954. The Lepidoptera of Nova Scotia. Part I, macrolepidoptera. Proceedings of the Nova Scotian Institute of Science, 23(3), 161-375.
26	Neily, T.H. 2019. Tom Neily NS Bryophyte records (2009-2013). T.H. Neily, Atlantic Canada Conservation Data Centre, 1029 specimen records.
26	Westwood, A., Staicer, C. 2016. Nova Scotia landbird Species at Risk observations. Dalhousie University.
25	MacDonald, E.C. 2018. CWS Piping Plover Census, 2010-2017. Canadian Wildlife Service, 672 recs.
24	Belliveau, A.G. 2021. New Black ash site records near Kentville, NS. Acadia University, 47 records.
24	Benjamin, L.K. 2011. NSDNR fieldwork & consultant reports 1997, 2009-10. Nova Scotia Dept Natural Resources, 85 recs.
24	Neily, T.H. 2013. Email communication to Sean Blaney regarding Listera australis observations made from 2007 to 2011 in Nova Scotia. , 50.
22	Belliveau, A. 2013. Rare species records from Nova Scotia. Mersey Tobeatic Research Institute, 296 records. 296 recs.
22	Brazner, John; MacKinnon, Frances. 2020. Relative conservation value of Nova Scotia's forests: forested wetlands as avian biodiversity hotspots. Canadian Journal of Forest Research, 50(12): 1307-1322. dx.doi.org/10.1139/cjfr-2020-0101.
22	Breen, A. 2018. 2018 Atlantic Whitefish observations. Coastal Action.
22	LaPaix, Rich. 2022. Rare species observations, 2018-2022. Nova Scotia Nature Trust.
22	Nelly, T.H. 2006. Cypripedium arietinum in Hants Co. Pers. comm. to C.S. Blaney. 22 recs, 22 recs.

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20	Chapman, C.J. 2019. Atlantic Canada Conservation Data Centre 2019 botanical fieldwork. Atlantic Canada Conservation Data Centre, 11729 recs.
19	Hall, R.A. 2001. S.. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 178 recs.
19	Richardson, D., Anderson, F., Cameron, R, McMullin, T., Clayden, S. 2014. Field Work Report on Black Foam Lichen (Anzia colpodes). COSEWIC.
19	Robinson, S.L. 2014. 2013 Field Data. Atlantic Canada Conservation Data Centre.
18	Ogden, K. Nova Scotia Museum butterfly specimen database. Nova Scotia Museum. 2017.
17	Anderson, Frances; Neily, Tom. 2010. A Reconnaissance Level Survey of Calciphilous Lichens in Selected Karst Topography in Nova Scotia with Notes on Incidental Bryophytes. Mersey Tobeatic Research Institute.
17	Hall, R.A. 2003. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 189 recs.
17	McNeil, Jeffie. 2023. 2022 Turtle Records. Mersey Tobeatic Research Institute.
17	Neily, T.H. 2010. Erioderma Pedicellatum records 2005-09. Mersey Tobiatic Research Institute, 67 recs.
17	NS DNR. 2017. Black Ash records from NS DNR Permanent Sample Plots (PSPs), 1965-2016. NS Dept of Natural Resources.
17	Stewart, J.I. 2010. Peregrine Falcon Surveys in New Brunswick, 2002-09. Canadian Wildlife Service, Sackville, 58 recs.
16	Blaney, C.S.; Mazerolle, D.M.; Oberndorfer, E. 2007. Fieldwork 2007. Atlantic Canada Conservation Data Centre. Sackville NB, 13770 recs.
16	Nature Conservancy of Canada. 2022. NCC Field data for Nova Scotia. Nature Conservancy of Canada.
15	Basquill, S.P. 2011 vascular plant field data. Nova Scotia Department of Natural Resources, 37 recs.
15	McNeil, J.A. 2010. Ribbonsnake (Thamophis sauritus) sightings, 1900-2009. Parks Canada, 2521 recs of 716+ individuals.
15	Neily, T.H. & Pepper, C. 2020. Nova Scotia SMP lichen surveys 2020. Mersey Tobeatic Research Institute.
14	Cameron, R.P. 2014. 2013-14 rare species field data. Nova Scotia Department of Environment, 35 recs.
14	Chapman, C.J. 2018. Atlantic Canada Conservation Data Centre botanical fieldwork 2018. Atlantic Canada Conservation Data Centre, 11171 recs.
14	e-Butterfly. 2018. Selected Maritimes butterfly records from 2016 and 2017. Maxim Larrivee, Sambo Zhang (ed.) e-butterfly.org.
14	Manthorne, A. 2019. Incidental aerial insectivore observations. Birds Canada.
14	Munro, Marian K. Nova Scotia Provincial Museum of Natural History Herbarium Database. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia. 2014.
13	Bryson, I. 2013. Nova Scotia rare plant records. CBCL Ltd., 180 records.
13	Holder, M. 2003. Assessment and update status report on the Eastern Lilaeopsis (Lilaeopsis chinensis) in Canada. Committee on the Status of Endangered Wildlife in Canada, 16 recs.
13	Neily, T.H. 2012. 2012 Erioderma pedicellatum records in Nova Scotia.
13	Nova Scotia Nature Trust. 2014. Ladyslipper records from Saint Croix Nova Scotia, JLC Ed. Nova Scotia Nature Trust.
13	Powell, B.C. 1967. Female sexual cycles of Chrysemy spicta & Clemmys insculpta in Nova Scotia. Can. Field-Nat., 81:134-139. 26 recs.
13	Richardson, D., Anderson, F., Cameron, R, Pepper, C., Clayden, S. 2015. Field Work Report on the Wrinkled Shingle lichen (Pannaria lurida). COSEWIC.
13	Robinson, S.L. 2015. 2014 field data.
13	Wilhelm, S.I. et al. 2019. Colonial Waterbird Database. Canadian Wildlife Service.
12	Basquill, S.P. 2012. 2012 rare vascular plant field data. Nova Scotia Department of Natural Resources, 37 recs.
12	Blaney, C.S. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre. Sackville NB, 1042 recs.
12	Cameron, R.P. 2017. 2017 rare species field data. Nova Scotia Environment, 64 recs.
11	Archibald, D.R. 2003. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 213 recs.
10	Bredin, K.A. 2002. NS Freshwater Mussel Fieldwork. Atlantic Canada Conservation Data Centere, 30 recs.
10	Neily, T. H. 2018. Lichen and Bryophyte records, AEI 2017-2018. Tom Neily; Atlantic Canada Conservation Data Centre.
10	Patrick, Allison. 2021. Animal and plant records from NCC properties from 2019 and 2020. Nature Conservancy Canada.
9	Cameron, R.P. 2006. Erioderma pedicellatum 2006 field data. NS Dept of Environment, 9 recs.
9	Edsall, J. 2007. Personal Butterfly Collection: specimens collected in the Canadian Maritimes, 1961-2007. J. Edsall, unpubl. report, 137 recs.
9	Gilhen, J. 1984. Amphibians & Reptiles of Nova Scotia, 1st Ed. Nova Scotia Museum, 164pp.
9	Klymko, J.J.D. 2018. 2017 field data. Atlantic Canada Conservation Data Centre.
8	Blaney, C.S.; Spicer, C.D. 2001. Fieldwork 2001. Atlantic Canada Conservation Data Centre. Sackville NB, 981 recs.
8	Cameron, R.P. 2005. Erioderma pedicellatum unpublished data. NS Dept of Environment, 9 recs.
8	Cameron, R.P. 2013. 2013 rare species field data. Nova Scotia Department of Environment, 71 recs.
8	Chapman, C.N. (Cody). 2020. Nova Scotia Black Ash (Fraxinus nigra) field observations by Confederacy of Mainland Mi'kmaq. Forestry Program, Confederacy of Mainland Mi'kmaq.
8	King, Katie; Jean, Samuel. 2021. Black ash observations near Booklyn, NS. E.C. Smith Herbarium.
8	Klymko, J. Butterfly records at the Nova Scotia Museum not yet accessioned by the museum. Atlantic Canada Conservation Data Centre. 2017.
8	McNeil, J.A. 2014. Blandings Turtle (Emydoidea blandingii) and Snapping Turtle (Chelydra serpentina) sightings, 2014. Mersey Tobeatic Research Institute.
8	McNeil, J.A. 2016. Blandings Turtle (Emydoidea blandingii), Eastern Ribbonsnake (Thamnophis sauritus), Wood Turtle (Glyptemys insculpta), and Snapping Turtle (Chelydra serpentina) sightings, 2016. Mersey Tobeatic Research Institute, 774 records.
8	McNeil, Jeffie. 2023. Ribbonsnake records from 2022. Mersey Tobeatic Research Institute.
8	Neily, T.H. & Anderson, F. 2011. Lichen observations from NRC site at Sandy Cove. , 97.
8	Phinney, Lori; Toms, Brad; et. al. 2016. Bank Swallows (Riparia riparia) in Nova Scotia: inventory and assessment of colonies. Merset Tobeiatc Research Institute, 25 recs.
8	Sollows, M.C,. 2008. NBM Science Collections databases: mammals. New Brunswick Museum, Saint John NB, download Jan. 2008, 4983 recs.
8	Webster, R.P. Atlantic Forestry Centre Insect Collection, Maritimes butterfly records. Natural Resources Canada. 2014.
7	Blaney, C.S.; Mazerolle, D.M. 2009. Fieldwork 2009. Atlantic Canada Conservation Data Centre. Sackville NB, 13395 recs.
7	Boyne, A.W. & Grecian, V.D. 1999. Tern Surveys. Canadian Wildlife Service, Sackville, unpublished data. 23 recs.
7	Cameron, B. 2006. Hepatica americana Survey at Scotia Mine Site in Gays River, and Discovery of Three Yellow-listed Species. Conestoga-Rovers and Associates, (a consulting firm), october 25. 7 recs.
7	Downes, C. 1998-2000. Breeding Bird Survey Data. Canadian Wildlife Service, Ottawa, 111 recs.
7	Goltz, J.P. & Bishop, G. 2005. Confidential supplement to Status Report on Prototype Quillwort (Isoetes prototypus). Committee on the Status of Endangered Wildlife in Canada, 111 recs.

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7	Klymko, J.J.D.; Robinson, S.L. 2014. 2013 field data. Atlantic Canada Conservation Data Centre.
6	Adams, J. & Herman, T.B. 1998. Thesis, Unpublished map of C. insculpta sightings. Acadia University, Wolfville NS, 88 recs.
6	Basquill, S.P., Porter, C. 2019. Bryophyte and lichen specimens submitted to the E.C. Smith Herbarium. NS Department of Lands and Forestry.
6	Benjamin, L.K. 2006. Cypripedium arietinum. Pers. comm. to D. Mazerolle. 9 recs, 9 recs.
6	Benjamin, L.K. 2012. NSDNR fieldwork & consultant reports 2008-2012. Nova Scotia Dept Natural Resources, 196 recs.
6	Blaney, C.S; Korol, J.B.; Crowell, I. 2023. 2022 AC CDC Botany program field data. Atlantic Canada Conservation Data Centre, 5293 records.
6	Clayden, S.R. 2005. Confidential supplement to Status Report on Ghost Antler Lichen (Pseudevernia cladonia). Committee on the Status of Endangered Wildlife in Canada, 27 recs.
6	Gallop, John. 2021. Sheet Harbour rare lichen observations. McCallum Environmental.
6	Hall, R. 2008. Rare plant records in old fieldbook notes from Truro area. Pers. comm. to C.S. Blaney. 6 recs, 6 recs.
6	Haughian, S.R. 2018. Description of Fuscopannaria leucosticta field work in 2017. New Brunswick Museum, 314 recs.
6	Klymko, J.J.D. 2012. Odonata specimens & observations, 2010. Atlantic Canada Conservation Data Centre, 425 recs.
6	Matthew Smith. 2010. Field trip report from Avon Caving Club outlining the discovery of Cyrpipedium arietinum and Hepatica nobilis populations. Public Works and Government Services Canada.
6	McNeil, J.A. 2010. Blandings Turtle (Emydoidea blandingii) sightings, 1946-2009. Parks Canada, 12,871 recs of 597+ individuals.
6	McNeil, J.A. 2020. Snapping Turtle and Eastern Painted Turtle records, 2020. Mersey Tobeatic Research Institute.
6	Neily, T.H. Tom Neily NS Sphagnum records (2009-2014). T.H. Neily, Atlantic Canada Conservation Data Centre. 2019.
6	Nova Scotia Nature Trust. 2022. Ram's Head Lady Slipper observations from 2015 and 2019. , 6 records.
6	Whittam, R.M. 1999. Status Report on the Roseate Tern (update) in Canada. Committee on the Status of Endangered Wildlife in Canada, 36 recs.
5	Carter, Jeff; Churchill, J.; Churchill, I.; Churchill, L. 2020. Bank Swallow colony Scots Bay, NS. Atlantic Canada Conservation Data Centre.
5	Chaput, G. 2002. Atlantic Salmon: Maritime Provinces Overview for 2001. Dept of Fisheries & Oceans, Atlantic Region, Science Stock Status Report D3-14. 39 recs.
5	Holder, M.L.; Kingsley, A.L. 2000. Kinglsey and Holder observations from 2000 field work.
5	McNeil, J.A. 2019. Snapping Turtle records, 2019. Mersey Tobeatic Research Institute.
5	Olsen, R. Herbarium Specimens. Nova Scotia Agricultural College, Truro. 2003.
5	Pohl, G.P. Specimen data from Northern Forest Research Centre. Northern Forest Research Centre. 2022.
5	Porter, K. 2013. 2013 rare and non-rare vascular plant field data. St. Mary's University, 57 recs.
5	Rock, J. 2020. Atlantic Canada Piping Plover field surveys: Nesting pairs by beach, 2018-2020. Environment and Climate Change Canada - Canadian Wildlife Service, 216 records.
5	Towell, C. 2014. 2014 Northern Goshawk and Common Nighthawk email reports, NS. NS Department of Natural Resources.
5	White, S. 2019. Notable species sightings, 2018. East Coast Aquatics.
4	Bateman, M.C. 2001. Coastal Waterfowl Surveys Database, 1965-2001. Canadian Wildlife Service, Sackville, 667 recs.
4	Cameron, R.P. 2009. Nova Scotia nonvascular plant observations, 1995-2007. Nova Scotia Dept Natural Resources, 27 recs.
4	Cameron, R.P. 2012. Additional rare plant records, 2009. , 7 recs.
4	Christie, D.S. 2000. Christmas Bird Count Data, 1997-2000. Nature NB, 54 recs.
4	Cody, W.J. 2003. Nova Scotia specimens of Equisetum pratense at the DAO herbarium in Ottawa. , Pers. comm. to C.S. Blaney. 4 recs.
4	Forsythe, B. 2006. Cypripedium arietinum at Meadow Pond, Hants Co. Pers. comm. to C.S. Blaney. 4 recs, 4 recs.
4	Hughes, Cory. 2020. Atlantic Forestry Centre Coccinella transversoguttata collections. Canadian Forest Service, Atlantic Forestry Centre.
4	Klymko, J. Dataset of butterfly records at the New Brunswick Museum not yet accessioned by the museum. Atlantic Canada Conservation Data Centre. 2016.
4	McMullin, R.T. 2022. Maritimes lichen records. Canadian Museum of Nature.
4	McNeil, Jeffie. 2022. Ribbonsnake records, 2021. Mersey Tobeatic Research Institute.
4	Mills, Pamela. 2007. Iva frutescens records. Nova Scotia Dept of Natural Resources, Wildlife Div. Pers. comm. to S. Basquil, 4 recs.
4	Neily, T.H. & Pepper, C.; Toms, B. 2020. Nova Scotia lichen database [as of 2020-05-25]. Mersey Tobeatic Research Institute, 668 recs.
4	Newell, R. & Neily, T.; Toms, B.; Proulx, G. et al. 2011. NCC Properties Fieldwork in NS: August-September 2010. Nature Conservancy Canada, 106 recs.
4	Sabine, D.L. Bombus terricola specimens in Dwayne Sabine's personal collection. pers. comm. 2022.
3	Basquill, S.P. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre, Sackville NB, 69 recs.
3	Basquill, S.P. 2009. 2009 field observations. Nova Scotia Dept of Natural Resources.
3	Belliveau, A.G. & Vail, Cole; King, Katie. 2020. New Allium tricoccum locations, Cornwallis River. Chapman, C.J. (ed.) Acadia University.
3	Benjamin, L.K. 2009. Boreal Felt Lichen, Mountain Avens, Orchid and other recent records. Nova Scotia Dept Natural Resources, 105 recs.
3	Benjamin, L.K. 2009. NSDNR Fieldwork & Consultants Reports. Nova Scotia Dept Natural Resources, 143 recs.
3	Bradford, R. 2004. Coregonus huntsmani locations. Dept of Fisheries & Oceans, Atlantic Region, Pers. comm. to K. Bredin. 4 recs.
3	Brunelle, P.-M. (compiler). 2010. ADIP/MDDS Odonata Database: NB, NS Update 1900-09. Atlantic Dragonfly Inventory Program (ADIP), 935 recs.
3	Chapman, Cody. Unreported Species at Risk Records across Nova Scotia. Chapman, Cody, 5 records.
3	Clayden, S.R. 1998. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, 19759 recs.
3	Doubt, J. 2013. Email to Sean Blaney with Nova Scotia records of Fissidens exilis at Canadian Museum of Nature. pers. comm., 3 records.
3	Hill, N. and D. Patriquin. 2013. 2013 rare plant observations in Williams Lake Backlands area. Fern Hill Institute of Plant Conservation, Berwick, Nova Scotia, 3 records.
3	Oldham, M.J. 2000. Oldham database records from Maritime provinces. Oldham, M.J; ONHIC, 487 recs.
3	Plissner, J.H. & Haig, S.M. 1997. 1996 International piping plover census. US Geological Survey, Corvallis OR, 231 pp.
3	Sabine, M. 2016. NB DNR staff incidental Black Ash observations. New Brunswick Department of Natural Resources.
2	Amiro, Peter G. 1998. Atlantic Salmon: Inner Bay of Fundy SFA 22 & part of SFA 23. Dept of Fisheries & Oceans, Atlantic Region, Science Stock Status Report D3-12. 4 recs.
2	Bagnell, B.A. 2001. New Brunswick Bryophyte Occurrences. B&B Botanical, Sussex, 478 recs.
2	Basquill, S.P. 2011. Field observations & specimen collections, 2010. Nova Scotia Department of Natural Resources, Pers. comm. , 8 Recs.
2	Brazner, J.; Hill, N. 2018. Plant observations along the Cornwallis River, Nova Scotia. Nova Scotia Department of Lands and Forestry.

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2	Cameron, B. 2005. C. palmicola, E. pedicellatum records from Sixth Lake. Pers. comm. to C.S. Blaney. 3 recs, 3 recs.
2	Cameron, R.P. 2012. Rob Cameron 2012 vascular plant data. NS Department of Environment, 30 recs.
2	Canadian National Collection of Insects Arachnids, and Nematodes Bombus specimen database export. Government of Canada. 2022.
2	Frittaion, C. 2012. NSNT 2012 Field Observations. Nova Scotia Nature Trust, Pers comm. to S. Blaney Feb. 7, 34 recs.
2	Gilhen, J., Jones, A., McNeil, J., Tanner, A.W. 2012. A Significant Range Extension for the Eastern Ribbonsnake, Thamnophis sauritus, in Nova Scotia, Canada. The Canadian Field-Naturalist, 126(3): 231-233.
2	Heron, J. 2022. Bombus records communicated to J. Klymko over email in autumn 2022. Pers. comm.
2	Hill, N.M. 2013. email communications to Sean Blaney and David Mazerolle regarding the discovery of Listera australis populations at Black River Lake and Middlewood. , 2.
2	iNaturalist.ca. 2022. iNaturalist records 2022. iNaturalist.ca (ed.) iNaturalist.org; iNaturalist.ca, Web site: 3 recs.
2	Klymko, J. 2019. Atlantic Canada Conservation Data Centre zoological fieldwork 2018. Atlantic Canada Conservation Data Centre.
2	Klymko, J.J.D. 2011. Insect fieldwork & submissions, 2010. Atlantic Canada Conservation Data Centre. Sackville NB, 742 recs.
2	LaPaix, R.; Parker, M. 2013. email to Sean Blaney regarding Listera australis observations near Kearney Lake. East Coast Aquatics, 2.
2	Lock, A.R., Brown, R.G.B. & Gerriets, S.H. 1994. Gazetteer of Marine Birds in Atlantic Canada. Canadian Wildlife Service, Atlantic Region, 137 pp.
2	Mazerolle, David. 2021. Botanical fieldwork 2019-20200. Parks Canada.
2	McAlpine, D.F. 1998. NBM Science Collections databases to 1998. New Brunswick Museum, Saint John NB, 241 recs.
2	McLean, K. 2020. Species occurrence records from Clean Annapolis River Project fieldwork in 2020. Clean Annapolis River Project, 206 records.
2	Munro, M. 2003. Caulophyllum thalictroides & Carex hirtifolia at Herbert River, Brooklyn, NS. , Pers. comm. to C.S. Blaney. 2 recs.
2	Munro, M. 2003. Dirca palustris & Hepatica nobilis var. obtusa at Cogmagun River, NS. , Pers. comm. to C.S. Blaney . 2 recs.
2	Neily, T.H.; Smith, C.; Whitman, E. 2011. NCC Logging Lake (Halifax Co. NS) properties baseline survey data. Nature Conservancy of Canada, 2 recs.
2	Newell, R. E., MacKinnon, C. M. & Kennedy, A. C. 2006. Botanical Survey of Boot Island National Wildlife Area, Nova Scotia, 2004. Canadian Wildlife Service, Atlantic Region, Technical Report Series Number 450. 3 recs.
2	Newell, R.E. 2006. Rare plant observations in Digby Neck. Pers. comm. to S. Blaney, 6 recs.
2	O'Neil, S. 1998. Atlantic Salmon: Eastern Shore Nova Scotia SFA 20. Dept of Fisheries & Oceans, Atlantic Region, Science. Stock Status Report D3-10. 4 recs.
2	Porter, Caitlin. 2021. Field data for 2020 in various locations across the Maritimes. Atlantic Canada Conservation Data Centre, 3977 records.
2	Shafer, A.B.A., D.T. Stewart. 2006. A Disjunct Population of Sorex dispar (Long-Tailed Shrew) in Nova Scotia. Northeastern Naturalist, 13(4): 603-608.
2	Standley, L.A. 2002. Carex haydenii in Nova Scotia. , Pers. comm. to C.S. Blaney. 4 recs.
2	Toms, Brad. 2022. Non-Lichen Observations from Lichen SMP and NCC Property Searches. Mersey Tobeatic Research Institute.
2	White, S. 2018. Notable species sightings, 2016-2017. East Coast Aquatics.
1	Amirault, D.L. 2003. 2003 Peregrine Falcon Survey. Canadian Wildlife Service, Sackville, unpublished data. 7 recs.
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Appendix F

Indigenous Engagement Letters

3099 Barrington Street
Halifax, NS B3K 5M7

September 5th, 2023

Twila Gaudet
Director of Consultation
Kwilmu'kw Maw-Klusuaqn (Mi'kmaq Rights Initiative)
75 Treaty Trail
Millbrook, NS
B6L 1W3

Via email to: tgaudet@mikmaqrights.com

Gwe' Twila,

I am writing to you today on behalf of Irving Shipbuilding Inc., (ISI) regarding an update to the Land Level Expansion Project (Project) at the Halifax Shipyard.

After receiving a determination that the Project was unlikely to cause significant adverse environmental effects, the appropriate authorizations and approvals for the Project were received on June 28th, 2023. The Project is proceeding on schedule with the dredging and construction phase beginning later this fall. As part of the Project dredging phase, dredged materials will need to be temporarily stored and de-watered prior to transporting them to the appropriate landfill site. This aspect of the Project was considered in the assessment, therefore no significant changes to the Project are required. However, we are writing to inform you that this de-watering phase *may* require an additional regulatory approval from the Province of Nova Scotia.

If you would like additional information on the Project's temporary storage and de-watering activities, please contact myself or James Ragan at your earliest convenience. We would be pleased to provide an overview of the de-watering stage activities and answer any questions that your community might have.

Wela'lin

IRVING SHIPBUILDING INC.

Andrew Willett
Director, Indigenous Relations

Phone: (506) 654-7758
Email: Willett.Andrew@jdirving.com

3099 Barrington Street
Halifax, NS B3K 5M7

Cc: James Ragan, Irving Shipbuilding Inc.

Charles Clow, Irving Shipbuilding Inc.

Geoff Allaby, Dillon Consulting Ltd.

Mise'l Abraham, Kwilmu'kw Maw-Klusuaqn

Tracy Menge, Kwilmu'kw Maw-Klusuaqn

Patrick Butler, Kwilmu'kw Maw-Klusuaqn

3099 Barrington Street
Halifax, NS B3K 5M7

September 5th, 2023

Vanessa Mitchell
Maritime Aboriginal Peoples Council
80 Walker St., Suite 3
Truro, NS
B2N 4A7

Via email to: vmitchell@mapcorg.ca

Gwe' Vanessa,

I am writing to you today on behalf of Irving Shipbuilding Inc., (ISI) regarding an update to the Land Level Expansion Project (Project) at the Halifax Shipyard.

After receiving a determination that the Project was unlikely to cause significant adverse environmental effects, the appropriate authorizations and approvals for the Project were received on June 28th, 2023. The Project is proceeding on schedule with the dredging and construction phase beginning later this fall. As part of the Project dredging phase, dredged materials will need to be temporarily stored and de-watered prior to transporting them to the appropriate landfill site. This aspect of the Project was considered in the assessment, therefore no significant changes to the Project are required. However, we are writing to inform you that this de-watering phase *may* require an additional regulatory approval from the Province of Nova Scotia.

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Wela'lin

IRVING SHIPBUILDING INC.

Andrew Willett
Director, Indigenous Relations

Phone: (506) 654-7758
Email: Willett.Andrew@jdirving.com

3099 Barrington Street
Halifax, NS B3K 5M7

Cc: James Ragan, Irving Shipbuilding Inc.

Charles Clow, Irving Shipbuilding Inc.

Geoff Allaby, Dillon Consulting Ltd.

3099 Barrington Street
Halifax, NS B3K 5M7

September 5th, 2023

Trevor Bernard
Membertou First Nation
47 Maillard St.
Membertou, NS B1S 2P5

Via email to: trevorbernard@membertou.ca

Gwe' Trevor,

I am writing to you today on behalf of Irving Shipbuilding Inc., (ISI) regarding an update to the Land Level Expansion Project (Project) at the Halifax Shipyard.

After receiving a determination that the Project was unlikely to cause significant adverse environmental effects, the appropriate authorizations and approvals for the Project were received on June 28th, 2023. The Project is proceeding on schedule with the dredging and construction phase beginning later this fall. As part of the Project dredging phase, dredged materials will need to be temporarily stored and de-watered prior to transporting them to the appropriate landfill site. This aspect of the Project was considered in the assessment, therefore no significant changes to the Project are required. However, we are writing to inform you that this de-watering phase *may* require an additional regulatory approval from the Province of Nova Scotia.

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Wela'lin

IRVING SHIPBUILDING INC.

Andrew Willett
Director, Indigenous Relations

Phone: (506) 654-7758
Email: Willett.Andrew@jdirving.com

3099 Barrington Street
Halifax, NS B3K 5M7

Cc: James Ragan, Irving Shipbuilding Inc.

Charles Clow, Irving Shipbuilding Inc.

Geoff Allaby, Dillon Consulting Ltd.

3099 Barrington Street
Halifax, NS B3K 5M7

September 5th, 2023

Gerald Gloade
Consultation Manager
Millbrook First Nation
P.O. Box 634
Truro, NS
B2N 5E5

Via email to: ggloade@millbrookfn.ca

Gwe' Gerald,

I am writing to you today on behalf of Irving Shipbuilding Inc., (ISI) regarding an update to the Land Level Expansion Project (Project) at the Halifax Shipyard.

After receiving a determination that the Project was unlikely to cause significant adverse environmental effects, the appropriate authorizations and approvals for the Project were received on June 28th, 2023. The Project is proceeding on schedule with the dredging and construction phase beginning later this fall. As part of the Project dredging phase, dredged materials will need to be temporarily stored and de-watered prior to transporting them to the appropriate landfill site. This aspect of the Project was considered in the assessment, therefore no significant changes to the Project are required. However, we are writing to inform you that this de-watering phase *may* require an additional regulatory approval from the Province of Nova Scotia.

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IRVING SHIPBUILDING INC.

Andrew Willett
Director, Indigenous Relations

Phone: (506) 654-7758
Email: Willett.Andrew@jdirving.com

3099 Barrington Street
Halifax, NS B3K 5M7

Cc: James Ragan, Irving Shipbuilding Inc.

Charles Clow, Irving Shipbuilding Inc.

Geoff Allaby, Dillon Consulting Ltd.

3099 Barrington Street
Halifax, NS B3K 5M7

September 5th, 2023

Vera Marr
Consultation Clerk
Sipekne'katik First Nation
522 Church St
Indian Brook, NS
B0H 2H0

Via email to: consultation@sipeknekatik.ca

Gwe' Vera,

I am writing to you today on behalf of Irving Shipbuilding Inc., (ISI) regarding an update to the Land Level Expansion Project (Project) at the Halifax Shipyard.

After receiving a determination that the Project was unlikely to cause significant adverse environmental effects, the appropriate authorizations and approvals for the Project were received on June 28th, 2023. The Project is proceeding on schedule with the dredging and construction phase beginning later this fall. As part of the Project dredging phase, dredged materials will need to be temporarily stored and de-watered prior to transporting them to the appropriate landfill site. This aspect of the Project was considered in the assessment, therefore no significant changes to the Project are required. However, we are writing to inform you that this de-watering phase *may* require an additional regulatory approval from the Province of Nova Scotia.

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IRVING SHIPBUILDING INC.

Andrew Willett
Director, Indigenous Relations

Phone: (506) 654-7758
Email: Willett.Andrew@jdirving.com

3099 Barrington Street
Halifax, NS B3K 5M7

Cc: James Ragan, Irving Shipbuilding Inc.

Charles Clow, Irving Shipbuilding Inc.

Geoff Allaby, Dillon Consulting Ltd.

Samantha Watts, Sipekne'katik First Nation

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