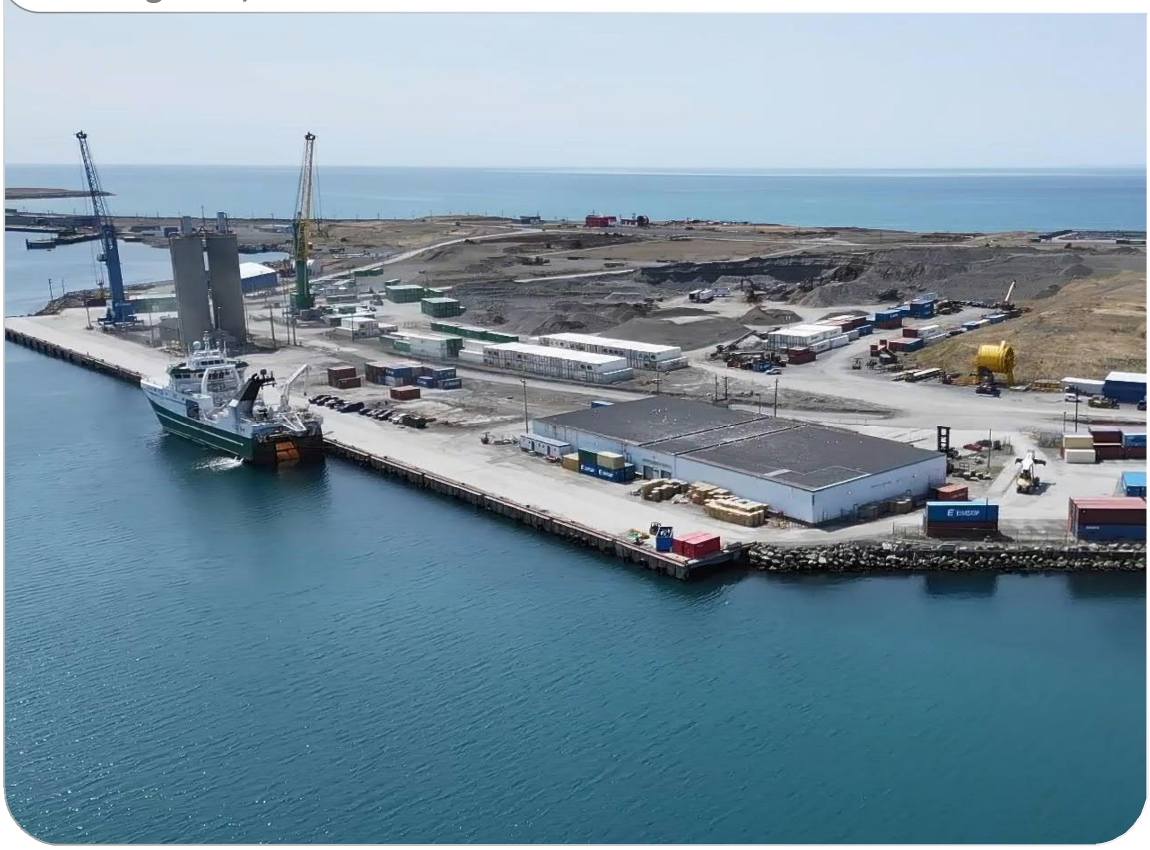
PORT OF ARGENTIA

Initial Project Description and Environmental Assessment Registration Document: Cooper Cove Marine Terminal Expansion Project

Argentia, Newfoundland and Labrador



November 2023 - 21-3088

This document was developed prior to the release of the Government of Canada's "Statement on the Interim Administration of the Impact Assessment Act Pending Legislative Amendments" on October 26, 2023

DILLON CONSULTING

November 29, 2023

Newfoundland and Labrador Satellite Office
Impact Assessment Agency of Canada / Government of Canada
301-10 Barters Hill
St. John's, NL
A1C 6M1

Attention: Leslie Kieley, Project Manager, Impact Assessment Agency of Canada
Vickie Ficzere, Manager of Environmental Assessment, Newfoundland and Labrador Department of Environment and Climate Change

Cooper Cove Marine Terminal Expansion Project Initial Project Description and Environmental Assessment Registration Document.

On behalf of the Port of Argentia, Dillon Consulting Limited (Dillon) is pleased to submit this Initial Project Description (IPD) and Environmental Assessment Registration Document (EARD) for the Cooper Cove Marine Terminal Expansion in Argentia, Newfoundland and Labrador, for review and comment.

Please contact the undersigned at 709.764.6863 or mroche@dillon.ca if you have any questions or concerns.

Sincerely,

DILLON CONSULTING LIMITED

Michelle Roche, EP, RPF
Associate, Environmental Specialist

MLR:jb
Enclosure

Our file: 21-3088

45 Hebron Way
Suite 202
St. John's
Newfoundland and Labrador
Canada
A1A 0P9
Telephone
709.754.2374
Fax
709.754.2380

Dillon Consulting Limited

Table of Contents

Abbreviations

1.0 **Introduction** 1

1.1 Project Overview 1
1.2 Project Context 5
1.3 Regulatory Context 5
1.4 Purpose and Organization of this Document 6

2.0 **Part A: General Information** 6

2.1 (1) Project Name, Sector, and Location 7
2.2 (2) Proponent Contact Information 7
2.2.1 Description of the Existing Port of Argentia 8
2.3 (3) Summary of Engagement 10
2.3.1 Organizations Identified for Engagement to Date 11
2.3.2 Engagement with Business and Industry Organizations 13
2.3.3 Engagement with Municipalities and Committees 13
2.3.4 Engagement with Newsgroups, Magazines, Universities, and Associations 13
2.3.5 Engagement with Government 13
2.4 (4) Indigenous Engagement 14
2.5 Regional and Strategic Assessments 16
2.5.1 (5) Regional Assessments 16
2.5.2 (6) Strategic Assessments 16

3.0 **Part B: Project Information** 17

3.1 (7) Purpose and Need for the Project 17
3.1.1 Strategic Location Advantages 20
3.2 (8) Provisions in the Physical Activities Regulations 23
3.3 (9) Description of Project Components and Activities 24
3.3.1 Project Components 26

DILLON CONSULTING

3.4 (10) Project Production Capacity and Processes 34
3.5 (11) Project Schedule 35
3.6 (12) Project Alternatives 35
3.6.1 Alternative Means of Carrying Out the Project 35
3.6.2 Alternatives to the Project 37

4.0 **Part C: Location Information and Context** 38

4.1 (13a) Proposed Geographic Coordinates 38
4.2 (13b) Project Area 39
4.3 (13c) Legal Description of Project Area 40
4.4 (13d) Projects Proximity to Residence and Nearby Communities - Community Profile 41
4.5 (13e) Projects Proximity to Lands of Significant for Indigenous Peoples 45
4.6 (13f) Projects Proximity to Federal Lands 45
4.7 (14) Overview of the Existing Natural Environment 45
4.7.1 Weather 45
4.7.2 Atmospheric Environment 46
4.7.3 Geology and Hydrology 46
4.7.4 Migratory Birds 47
4.7.5 Terrestrial Habitat 48
4.7.6 Marine Environment 48
4.7.7 Species at Risk 49

5.0 Part D: Federal, Provincial, Territorial, Indigenous and Municipal Involvement and Effects 57

5.1 (16) Federal Financial Support 57
5.2 (17) Federal Lands 58
5.3 (18) Powers, Duties, or Functions of Federal Authorities and Provincial Authorities in Respect of the Project 58
5.3.1 Federal 58
5.3.2 Provincial 59
5.3.3 Municipal 60
5.4 Federal Interests 60

5.4.1 Fisheries Act ... 60
5.4.2 Species at Risk ... 61
5.4.3 Migratory Birds ... 62
5.4.4 Canadian Navigable Waters Act ... 62
5.5 Planned Environmental Studies and Permitting ... 63

6.0 Part E: Potential Effects of the Project 64

6.1 (19) Changes to Components of the Environment within Federal Jurisdiction ... 65
6.2 (20) Changes to the Environment on Federal and Transboundary Lands ... 65
6.3 (21) Changes to the Environment on Indigenous Peoples ... 66
6.3.1 Impact on Physical and Cultural Heritage and Traditional Land Use ... 66
6.4 (22) Health, Social, or Economic Conditions ... 66
6.5 Preliminary Impact Assessment/Environmental Effects Assessment ... 66
6.5.1 Selection of Valued Components ... 67
6.5.2 Scope of Assessment ... 67
6.6 Project-Valued Component Interactions ... 72
6.6.1 Atmospheric Environment ... 73
6.6.2 Acoustic Environment ... 73
6.6.3 Marine Environment ... 74
6.6.4 Terrestrial Wildlife and Wildlife Habitat ... 75
6.6.5 Indigenous Rights ... 76
6.6.6 (22) Socioeconomic Environment Impacts ... 79
6.6.7 (21) Human Health Impacts ... 92
6.6.8 Navigation Impacts ... 92
6.6.9 Heritage Resources ... 94
6.7 (23) Greenhouse Gas Emissions Associated with the Project ... 94
6.7.1 Greenhouse Gas Emission Calculations ... 95
6.7.2 Identification of Greenhouse Gas Mitigation Opportunities ... 97
6.8 (24) Project-Related Emissions and Wastes ... 97
6.8.1 Contaminants of Potential Concern ... 98

6.8.2 Potential Environmental Impacts, Accidents and Malfunctions during Construction 99

6.8.3 Potential Environmental Impacts, Accidents and Malfunctions during Operation.......... 107

6.9 Summary of Residual Impacts/Environmental Effects and Significance Determination.. 110

7.0 (25) Part F: Summary 110

8.0 Closing 118

9.0 References 119

Figures

Figure 1: Project Location.. 2
Figure 2: Existing Site Layout and Proposed Project Development Area Layout................................ 3
Figure 3: Proposed New Site Plan 4
Figure 4: Land Parcels.. 9
Figure 5: Aboriginal and Treaty Rights Information System (ATRIS) Representation of Potentially Impacted Indigenous Communities, 150 km Buffer from PDA....................................... 15
Figure 6: Project Schedule 25
Figure 7: Dreading Sections 30
Figure 8: Infill Area.. 32
Figure 9: Project Location and Surrounding Communities... 42
Figure 10: Habitats and Protected Areas... 50
Figure 11: Project Development Area and Local Area Assessment 68

Tables

Table 1: Proponent Contact Information 7
Table 2: Land and Water Lot Parcels within the Footprint of the Project.. 8
Table 3: Current and Anticipated Increased Marine Vessel Capacity and Cargo Forecast (5-year intervals) 21
Table 4: Proposed Schedule and Milestones.. 35
Table 5: Proposed Geographic Coordinates 39
Table 6: Community Demographics... 43
Table 7: Labour and Employment.. 44
Table 8: Summary of Fauna and Flora SAR/SoCC with the Potential to use the PDA......................... 54
Table 9: Projects of a Similar Nature in Proximity to Project Area 56
Table 10: Cost Summary... 58
Table 11: Federal Powers, Duties, or Functions of Federal Authorities in Respect of the Project...... 59
Table 12: Provincial Approvals, Permits, and Registrations Required for the Project 59

Table 13: Local Assessment Areas (LAA) for Valued Components....................69
Table 14: Effects Significance Evaluation....................70
Table 15: Project Interactions with Value Components (VC) of the Environment....................72
Table 16: High-Level Economic Impacts, Marine Terminal Expansion – (FTEs)....................82
Table 17: High-Level Economic Impacts, Marine Terminal Expansion and Investments in Renewable Energy, Spool Base and Monopile Marshalling Yard – (FTEs)....................83
Table 18: National Occupational Classification....................84
Table 19: Labour Force Occupation....................86
Table 20: Emission Factors for Construction Equipment....................96
Table 21: Global Warming Potentials....................96
Table 22: Anticipated Emissions and Wastes during Construction and Operation....................97
Table 23: Contaminants of Potential Concern....................99
Table 24: Summary of Potential Residual Effects during Construction and Operation, and Significance Determination....................111

Appendices

A Agreement to Transfer

B Port of Argentia Record of Engagement

C Letters of Support

D Sediment Memo

E Species at Risk Review

F Cooper Cove Infill Feasibility Study (2019)

G Geotechnical Investigation Report Stantec, 2023

H GHG Estimates for Construction

Abbreviations

AC CDC	Atlantic Canada Conservation Data Centre
BMP	Best Management Practices
DFO	Fisheries and Oceans Canada
DWT	Deadweight tonnage
EA	Environmental Assessment
EAD	Environmental Assessment Division
EARD	Environmental Assessment Registration Document
EAR	Environmental Assessment Regulation
EH&SP	Environmental Health and Safety Contingency Plans
EMP	Environmental Management Plan
EPA	Environmental Protection Act
EPP	Environmental Protection Plan
EERP	Environmental Emergency Response Plan
EQS	Environmental Quality Standard
FSC	Food, Social and Ceremonial Fisheries
FTE	full time equivalent
FNI	Federation of Newfoundland Indians
GHG	Greenhouse Gas
GOC	Government of Canada
ha	hectare
HADD	Harmful alteration, disruption or destruction
IA	Impact Assessment
IAA	Impact Assessment Act
IAAC	Impact Assessment Agency of Canada
IPD	Initial Project Description
ISPS	International Ship and Port Facility Security
km	kilometre
km^2	square kilometre
kPa	Kilopascal
LAA	Local assessment area
m	metre
m^2	square metre
m^3	cubic metre
MTSR	Marine Transportation Security Regulations
NAFO	Northwest Atlantic Fisheries Organization
NL	Newfoundland and Labrador

NLDECC	Newfoundland and Labrador Department of Environment and Climate Change
NL ESA	Newfoundland and Labrador Endangered Species Act
NOC	National Occupational Classification
NTCF	National Trade Corridor Fund PDAProject development area
POA	Port of Argentia
PWGSC	Public Works and Government Services
RA	Regional Assessment
SA	Strategic Assessment
SACC	Strategic Assessment of Climate Change
SAR	Species at Risk
SARA	*Species at Risk Act*
t/m^2	ton per square metre
TBD	To be determined
TC	Transport Canada
WRMD	Water Resources Management Division

1.0 Introduction

This document is an Initial Project Description (IPD) and Environmental Assessment Registration Document (EARD) for the proposed Cooper Cove Marine Terminal Expansion Project (hereinafter referred to as "the Project") at the port of Argentia, Newfoundland and Labrador ("the port or the port of Argentia"). The Project is proposed by the Port of Argentia (hereinafter referred to as "the POA or the Port"), aims to established a harmonized approach to the Projects environmental determination and review process, this document has been prepared in accordance with the federal *Impact Assessment Act* (IAA), Schedule I of the *Information and Management of Time Limits Regulations* and has incorporated requirements of the provincial *Environmental Protection Act* (EPA) and the *Environmental Assessment Regulations* (EAR) (hereinafter referred to as the "Initial Project Description or IPD"). The purpose of this IPD is to provide an overview of the preliminary planning for the Project to determine if the Project is a "designated project" under the IAA (thereby requiring an Impact Assessment [IA]) and a "registerable undertaking" under the *Environmental Protection Act*. In addition, this document outline the potential environmental, social, and economic impacts, as well as the proposed mitigation measures, to ensure that the Project can be carried out in an environmentally acceptable and sustainable manner. This document serves as a basis for further assessments, Indigenous and stakeholder consultations, and regulatory reviews, enabling a determination on the advancement of the Project in accordance with the applicable legislation and guidelines.

1.1 Project Overview

The Cooper Cove Marine Terminal Expansion Project at the port of Argentia (Figure 1) is designed to address the current lack of wharf space and quayside infrastructure, enhancing berthage and cargo flow in Newfoundland and Labrador (NL). The expansion includes a roll-on-roll-off (Ro-Ro) ramp to streamline vessel loading and an area behind the wharf for increased storage to support cargo activities (Figure 2). The main focus of this Project is as part of the broader strategy to diversify and strengthen POA services. This initiative aligns with Transport Canada's National Trade Corridor Fund (NTCF) objectives and stands to amplify Canada's transportation efficiency, stimulate economic growth in the Placentia region, and support Newfoundland's green energy initiatives and shift from fossil fuels.

The Project has proposed a construction duration of 29 months, beginning in August 2025 and consists of several stages of development in the Project development area (PDA) as outlined in Figure 3. Key activities include creating and setting up concrete caissons for expanding the fleet dock and developing a new wharf face. Essential groundwork, such as seabed dredging, prepares for these key installations. A significant addition in this project will be a Ro-Ro ramp, designed for effective management of modules and heavy equipment. Additionally, the plan involves adding fill behind the expanded fleet dock, establishing armour stone protection along the shoreline, and extending the shoreline near the Ro-Ro ramp to meet storage needs. The project will conclude with thorough site leveling and refining processes to ensure harmony between the new structures and the pre-existing port facilities.

FILENAME: G:\CAD\DANIELLE BOWERING\213088-1401-COOPER COVE\CAD FILES FOR IPD\C2 - EXISTING SITE LAYOUT AND PROPOSED DEVELOPMENT AREA LAYOUT.DWG PLOTTED BY: BOWERING, DANIELLE
PLOT DATE: 2023-11-02 @ 5:36:13 PM PLOT SCALE: 1:25.4 PLOT STYLE: DILLON-STANDARD.CTB

Conditions of Use

Verify elevations and/or dimensions on drawing prior to use. Report any discrepancies to Dillon Consulting Limited.

Do not scale dimensions from drawing.

Do not modify drawing, re-use it, or use it for purposes other than those intended at the time of its preparation without prior written permission from Dillon Consulting Limited.

DILLON CONSULTING

No.	ISSUED FOR	DATE	BY
0	ISSUED FOR REPORT	3-NOV-2023	DSB

DESIGN: S. PEARCE
REVIEWED BY: S. PEARCE
DRAWN: D. BOWERING
CHECKED BY: D. BOWERING
DATE: MAY 2023
SCALE: AS SHOWN

COOPER COVE
MARINE TERMINAL EXPANSION

PROJECT LAYOUT

PROJECT NO. 21-3088-1401

SHEET NO. C2

FILENAME: G:\CAD\DANIELLE BOWERING\213088-1401-COOPER COVE\CAD FILES FOR IPD\C3- PROPOSED NEW SITE PLAN.DWG PLOTTED BY: BOWERING, DANIELLE
PLOT DATE: 2023-11-02 @ 5:40:36 PM PLOT SCALE: 1:25.4 PLOT STYLE: DILLON-STANDARD.CTB

Conditions of Use

Verify elevations and/or dimensions on drawing prior to use. Report any discrepancies to Dillon Consulting Limited.

Do not scale dimensions from drawing.

Do not modify drawing, re-use it, or use it for purposes other than those intended at the time of its preparation without prior written permission from Dillon Consulting Limited.

DILLON CONSULTING

No.	ISSUED FOR	DATE	BY
0	ISSUED FOR REPORT	3-NOV-2023	DSB

DESIGN: S. PEARCE	REVIEWED BY: S. PEARCE
DRAWN: D. BOWERING	CHECKED BY: D. BOWERING
DATE: MAY 2023	
SCALE: AS SHOWN	

COOPER COVE
MARINE TERMINAL EXPANSION

PROJECT NO. 21-3088-1401

PROPOSED NEW SITE PLAN

SHEET NO. C3

ST. JOHN'S

FILENAME: G:\CAD\DANIELLE BOWERING\213088-1401-COOPER COVE\CAD FILES FOR IPD\C1 - PROJECT LOCATION.DWG PLOTTED BY: BOWERING, DANIELLE
PLOT DATE: 2023-11-02 @ 5:36:49 PM PLOT SCALE: 1:25.4 PLOT STYLE: DILLON-STANDARD.CTB

Conditions of Use

Verify elevations and/or dimensions on drawing prior to use. Report any discrepancies to Dillon Consulting Limited.

Do not scale dimensions from drawing.

Do not modify drawing, re-use it, or use it for purposes other than those intended at the time of its preparation without prior written permission from Dillon Consulting Limited.

DILLON CONSULTING

No.	ISSUED FOR	DATE	BY
0	ISSUED FOR REPORT	03-NOV-2023	DSB

DESIGN: S. PEARCE	REVIEWED BY: S. PEARCE
DRAWN: D. BOWERING	CHECKED BY: D. BOWERING
DATE: MAY 2023	
SCALE: AS SHOWN	

COOPER COVE
MARINE TERMINAL EXPANSION

PROJECT LOCATION

PROJECT NO. 21-3088-1401

SHEET NO. C1

1.2 Project Context

As part of the preliminary planning for the Project, the POA has engaged Dillon Consulting Limited ("Dillon") in the development of this IPD, along with the federal and provincial governments, stakeholders, and Indigenous groups, to ensure a collaborative approach for effective stewardship of the seaport and industrial property assets for the long-term benefits of the communities and the people of the Placentia region in NL. Initial studies and assessments include an environmental screening detailing considerations for terrestrial habitat features, the marine environment, species at risk, and an assessment potential environmental impacts and effects during Project construction and operation phases. A marine-focused geotechnical study, baseline marine sediment characterization analysis, and an infill feasibility study have also been carried out for the pre-planning phase of the Project.

Over the next five years, the Port of Argentia is poised to attract billions of dollars in new investment from renewable energy companies seeking to establish wind energy, hydrogen, and ammonia production facilities, among others. Multi-national firms have already begun utilizing the port for staging ongoing and planned offshore wind farm construction projects throughout North America. Additionally, new investments are expected in subsea pipe fabrication ("Spool Base"), container service expansion, aquaculture support services, and facilities for critical mineral processing.

1.3 Regulatory Context

The Project is divided into two primary stages. The first stage is the initial "design-build activities" which entails the front-end engineering designs for the potential construction activities, all of which will progress concurrently with the marine terminal expansion. The design-build phase procurement process is anticipated to being in September 2024. The design-build activities are not expected to fall under the *Physical Activities Regulations*. The subsequent stage is centred on marine terminal expansion into Cooper Cove, which requires primarily the fabrication of new concrete caissons for dock augmentation and the developing of a new wharf face designed for ships that exceed a 25,000 dead weight tonnage (DWT) capacity.

The IAA suggests that due to the marine terminal expansion, particularly the addition of a new berth for larger vessels, an Impact Assessment (IA) may be required under Section 53 of the *Physical Activities Regulations.* Essential operations for this Project, such as dredging and infilling, play a crucial role in the extension of the dock and the formulation of the new wharf face. Though a majority of the Project's components are not encompassed under Part III of the NL Environmental Assessment Regulations, the NL Department of Environment and Climate Change (NLDECC) has highlighted that an Environmental Assessment (EA) could be required given the planned infill over an area larger than 5 hectares.

Upon finalizing the IA/EA evaluations, various permits, approvals, licenses, or other official permissions might be sought per provincial and federal laws. The POA recommends a joint impact assessment and environmental assessment strategy for an efficient and coordinated review and sanctioning process. The Project regulatory framework is further outlined in Section 3.2.

1.4 Purpose and Organization of this Document

This IPD outlines the potential environmental impacts and opportunities arising from the port's expansion and diversification in support of sustainable development framework that align with economic growth and environmental stewardship. It has been developed to meet the requirements of Schedule I of the *Information and Management of Time Limits Regulations* under the IAA, and is organized as follows:

- **Section 1** (current section) provides a general introduction to the IPD including a brief Project overview, Project context, and the purpose of this IPD;
- **Section 2** provides general information about the Project including Proponent contact information, a summary of engagement conducted or planned, and information related to regional and strategic assessments that might inform this IPD;
- **Section 3** provides Project information including the purpose and need for the Project, a Project description including the Project components, phases, and activities; the Project schedule, and alternatives to and alternative means for the Project;
- **Section 4** provides location information and context for the Project;
- **Section 5** provides the information for Federal, Provincial, Territorial, Indigenous and Municipal Involvement and Effects;
- **Section 6** covers Potential effects of the Project; and
- **Section 7** provides a plain language summary in both English and French.

Additional supporting information is provided in the appendices to this IPD.

For ease in readability and in determining its completeness, the IPD follows the outline and headings identified in Schedule I of the *Information and Management of Time Limits Regulations* under the IAA.

2.0 Part A: General Information

As outlined in Schedule I of the *Information and Management of Time Limits Regulations* under the IAA, general information about the Project is provided in this section, including:

- The Project name, and identification of the Proponent including contact information;
- A discussion of the land tenure of the Project, including property ownership and local setting;
- A summary of engagement undertaken or planned in respect of the Project, including public, stakeholder, regulatory, and Indigenous engagement; and
- Information related to regional and strategic assessments that might inform this IPD.

2.1 (1) Project Name, Sector, and Location

Project Name: Cooper Cover Marine Terminal Expansion Project
Sector: Industrial Service
Location: The Project development area (PDA) is located within the inner section of Argentia Harbour at Cooper Cove in Placentia Bay, Newfoundland and Labrador, approximately 130 km southwest of St. John's as shown on Figure 1.

2.2 (2) Proponent Contact Information

The Project may be referred to as the "Cooper Cove Marine Terminal Expansion Project" proposed by the Port of Argentia (POA) in Argentia, Newfoundland and Labrador. The Proponent wishes to expand the Port of Argentia existing wharf facilities to support the industrial service sector. The Project being proposed by the Proponent aims to increase docking space by extending the existing fleet dock, creating a new wharf face, increase quayside infrastructure and installing a roll-on-roll-off (Ro-Ro) ramp and is further outlined in Part B. The Proponent's contact information is provided below in Table 1.

Table 1: Proponent Contact Information

Proponent Name	Name: Port of Argentia Address: P.O. Box 95 1 Augusta Avenue Argentia, NL A0B 1W0 Email: contactus@portofargentia.ca
Chief Executive Officer (Project Manager) and Principal Contact Person for the Purpose of the Impact Assessment	Name: Scott Penney Address: P.O Box 95 1 Augusta Avenue Argentia, NL A0B 1W0 Email: s.penney@portofargentia.ca
Vice President – Operations (Strategy & Growth)	Name: Chris Newhook Address: P.O Box 95 1 Augusta Avenue Argentia, NL A0B 1W0 Email: c.newhook@portoargentia.ca
Indigenous Relations Socio-Cultural Planner	Name: Alana Vigna Official Title: Indigenous Relations Socio-Cultural Planner Address: Dillon Consulting Limited 274 Sydney Street, Suite 100 Saint John, New Brunswick E2L 0A8 Email: avigna@dillon.ca

Environmental Specialist	Name: Michelle Roche Official Title: Environmental Specialist Address: Dillon Consulting Limited 45 Hebron Way, Suite 202 St. John's, NL A1A 0P9 Email: mroche@dillon.ca

2.2.1 Description of the Existing Port of Argentia

The Port of Argentia, originally established as a US Naval Base during World War II in 1941 under the 99-year Lend-Lease agreement between Great Britain and the United States, saw its closure initiated in 1974 and completed in 1994. Following its closure, the Government of Canada (GOC), specifically Public Works and Government Services (PWGSC), assumed property control. In 2001, the property and the "Port" were transferred from the Government of Canada to the Argentia Management Authority (AMA). Then, in 2022, ownership of the property underwent a formal transfer to the POA.

The POA currently exercises full care, custody, and control over a diverse range of assets and facilities at the port of Argentia. This includes exclusive access to 70 hectares (ha) of paved runways dedicated to monopile marshalling port activities, a secure marine terminal spanning 40 ha, and a quayside storage yard which fall within the 372 ha and 319 ha parcel of harbour lands as defined under the 2001 and 2022 "Agreement to Transfer" Parcel P-01-02 and Parcel 2021-02 from the Government of Canada to the Port of Argentia (Appendix A, Figure 4, Table 2). Argentia Freezers and Integrated Logistics utilize the POA for specializes in material-handling services for marine transportation. Both companies act as independent stevedores for their clients and facilitate using the POA facilities to load and unload various types of cargoes, including bulk, break bulk, containerized, and special cargoes, whether for large-scale capital projects or smaller operations, all within the port's infrastructure.

Table 2: Land and Water Lot Parcels within the Footprint of the Project

Parcel No.	Plan ID	Size (ha)	Description
P-01-01	S-4224-3A	32.04	Existing Wharf
P-01-02	S-4224-4	372.5	North side Peninsula
P-21-2	S-6675-W	319	Marine Water lot

The POA operates as a critical facilitator within the marine shipping industry, functioning primarily as a hub for efficiently loading and unloading marine vessels. It's essential to clarify that the POA does not exercise direct control or influence over the maritime shipping industry in Placentia Bay. Instead, its primary role revolves around providing essential docking facilities and associated infrastructure to support the seamless flow of goods and cargo in and out of the port.

ST. JOHN'S

FILENAME: G:\CAD\DANIELLE BOWERING\213088-1401-COOPER COVE\CAD FILES FOR IPD\C4 - LAND PARCELS.DWG PLOTTED BY: BOWERING, DANIELLE
PLOT DATE: 2023-11-02 @ 5:39:33 PM PLOT SCALE: 1:25.4 PLOT STYLE: DILLON-STANDARD.CTB

Conditions of Use

Verify elevations and/or dimensions on drawing prior to use. Report any discrepancies to Dillon Consulting Limited.

Do not scale dimensions from drawing.

Do not modify drawing, re-use it, or use it for purposes other than those intended at the time of its preparation without prior written permission from Dillon Consulting Limited.

DILLON CONSULTING

No.	ISSUED FOR	DATE	BY
0	ISSUED FOR REPORT	3-NOV-2023	DSB

DESIGN: D. BOWERING	REVIEWED BY: D. BOWERING
DRAWN: D. BOWERING	CHECKED BY: M.ROCHE
DATE: SEPTEMBER 2023	
SCALE: AS SHOWN	

COOPER COVE
MARINE TERMINAL EXPANSION

LAND PARCELS

PROJECT NO. 21-3088-1401

SHEET NO. C4

The existing dock (P-01-01) features include three berths. Berths 1 and 2 are roughly 150 metres (m) long and have a depth of 11 m. Berth 3 is 130 m long with an 8.5 m depth. At the port's southern end, there is a 13 m long apron. The current cargo intake capacity is 45 m in width by 137 m in length (Port of Argentia, 2022).

The POA places a strong emphasis on security and compliance, holding the certification of being International Ship and Port Facility Security (ISPS) compliant, recognized by Transport Canada (TC). This certification ensures that the port adheres to the stringent security measures outlined by the ISPS Code. Stevedore crews which service the port are well-trained in handling various types of cargo, including hazardous materials, ensuring a continued focus on safety.

Additionally, the Port of Argentia maintains berthage and wharfage fees that are structured to be competitive, potentially catering to the needs of businesses and vessels in search of budget-conscious choices. For vessels requiring navigation assistance, the port extends pilotage services, emphasizing both efficiency and safety for all marine activities within and near its domain. This approach reflects the port's commitment to fostering a balanced and accommodating environment for maritime operations.

2.3 (3) Summary of Engagement

The POA is committed to advancing the Project with a focus on a sustainable development framework which aims to reduce harm to the environment, benefit the local community, respect people's rights, and adhere to openness and transparency in operations. One of the key principles of sustainable development is meaningful engagement with the individuals, communities, groups and organizations interested in, or potentially affected by the Project in order to build and maintain positive, long term, and mutually beneficial relationships. To achieve meaningful public participation the POA has developed a process for future engagement activities in line with the "Public Participation for Impact Assessment under the *Impact Assessment Act*" guidance document and the "Public Participation" framework (GOC 2021a), which is further discussed in Section 6.6.5.

In keeping with the POA's values (i.e., Accountability, Transparency, Inclusion, and Prosperity), the Port has engaged with various stakeholders in the preliminary planning of the Project, including:

- Government departments and agencies (federal and provincial);
- Local municipalities;
- Business and industry organizations;
- Individuals who may be affected by the Project; and
- Indigenous communities.

Engagement activities with these stakeholders and rights holders have included the ongoing provision of Project-related information including letters, presentations, virtual meetings, and email exchanges. In summary, the POA has received overwhelming support for the Project through correspondence from stakeholders who have responded to engagement efforts. Engagement activities undertaken to date have not resulted in any instances of objection, raised any concerns, or generated requests for additional information or calls for mitigation. Engagement activities undertaken by the Port are summarized in the Record of Engagement, Appendix B.

2.3.1 Organizations Identified for Engagement to Date

This section identifies jurisdictions or other interested parties engaged during the development of the Project, as of October 2023. The following organizations have been notified of the Project, and can be categorized as (in alphabetical order):

- Indigenous Communities
  - Miawpukek First Nation
  - Qalipu First Nation
- Business and Industry Organizations:
  - Argentia Freezers and Terminals
  - Avalon West CBDC
  - Boskalis
  - CRH Cement
  - Econext
  - Energy NL
  - Equinor/BP
  - Integrated Logistics
  - Mammoet
  - Newco Metals
  - Pattern Energy
  - Placentia Bay Traffic Committee
  - POA Board of Directors
  - Search Minerals
  - Subsea 7
  - TechnipFMC
  - TMSI Containers
  - Marine Atlantic
- Federal Authorities:
  - Environment and Climate Change Canada
  - Impact Assessment Agency
  - Fisheries and Oceans Canada
  - Transport Canada
  - Transport Canada, National Trade Corridors Fund Team

- Speaking Engagements and Public Events:
  - Placentia Bay Industries Showcase (Star of the Sea Hall)
  - Memorial University
  - Marine Renewables Canada Conference (2022)
- Municipalities:
  - Town of Long Harbour-Mount Arlington Heights
  - Town of Fox Harbour
  - Town of Placentia
  - Town of Saint Brides
- Provincial Authorities:
  - Department of Environment and Climate Change
  - Immigration, Population Growth and Skills
  - Municipal and Provincial Affairs
  - Pollution Prevention Division
  - Water Resources Management Division

The Impact Assessment Agency of Canada (IAAC) conducted an initial review of an early draft of this Initial Project Description in July 2023. Their comments noted that they would be engaging with the following organizations during the public comment period.

- ACAP Humber Arm
- Balaena Institute for Cetacean Conservation Studies
- Bay St. George Climate Action Network
- Canadian Parks and Wilderness Society
- Council of Canadians
- Ecology Action Centre
- Environmental Resources Management Association
- Fish, Food and Allied Workers Union
- Island Rooms
- Montevecchi Lab
- Salmonid Association of Eastern Newfoundland
- Sierra Club Canada Foundation
- Whales Release and Stranding's NL
- World Wildlife Fund

To remain consistent with the process and encourage transparency, the Port of Argentia issued Project notification letters to the above organizations on August 22, 2023, and provided contact information in the event that there may be questions or concerns related to the Project.

2.3.2 Engagement with Business and Industry Organizations

In March 2022, the POA reached out to local businesses and one municipality via email requesting support for the Project. This is summarized in the Record of Engagement, Appendix B. After the initial outreach, the POA received letters of support from the following businesses (listed in order of support received):

- March 30, 2022: Town of Placentia; CRH Cement; Subsea 7; and TMSI Containers;
- March 31, 2022: Argentia Freezers and Terminals; Newco Metals' Pattern Energy; and TechnipFMC;
- April 1, 2022: Econnext; Integrated Logistics; and Energy NL;
- April 11, 2022: Mammoet;
- April 14, 2022: Search Minerals; and
- May 24, 2022: Boskalis.

No additional questions, concerns, or issues were provided by these organizations.

2.3.3 Engagement with Municipalities and Committees

On March 27, 2023, the POA distributed a notice to nearby municipalities, as well as the Placentia Bay Traffic Committee, providing these groups an overview of the Project, a conceptual graphic illustration of the anticipated completed Project, and an opportunity to learn more about the Project. No additional questions, concerns or issues were provided by these groups. All summarized information can be found in the Record of Engagement, Appendix B.

2.3.4 Engagement with Newsgroups, Magazines, Universities, and Associations

The POA also engaged with several newsgroups, magazines, universities, and associations to describe the works and activities associated with the Project and the potential opportunities for the Port's future growth in new economic sectors. They include:

- allNewfoundlandLabrador;
- Globe and Mail;
- Maclean's Magazine;
- Memorial University; and
- Newfoundland and Labrador Construction Association.

No additional questions, concerns, or issues were provided by these organizations.

2.3.5 Engagement with Government

The POA also held meetings with federal and provincial leaders to discuss the Project and future plans. No additional questions, concerns, or issues were provided by these organizations.

- September 16, 2022: The Honourable Seamus O'Regan, Canadian Minister of Labour and senior staff.

- January 11, 2023: The Honourable Andrew Parsons, Newfoundland and Labrador Minister of Industry, Energy, and Technology and senior staff.

The POA is committed to working with any organizations that have requests for meetings, additional information, or concerns/issues related to the Project.

2.4 (4) Indigenous Engagement

The Impact Assessment Agency of Canada has designed guidelines on how it will involve Indigenous communities throughout the impact assessment process for designated projects. This encompasses a range of engagement levels, which ensures that assessments are conducted to respect Indigenous rights, integrate Indigenous knowledge into decision-making, and foster inter-jurisdictional cooperation when applicable. Under the Act, it's imperative to consult with Indigenous groups affected by a project, addressing impacts on these communities, their rights, and their traditional use of lands and resources (GOC 2021). The POA is committed to this process through direct engagement efforts to promote early collaboration and the identification of potential impacts as outlined in the following guidance documents:

- Indigenous Participation in Impact Assessment (GOC 2021b); and
- Collaboration with Indigenous Peoples in Impact Assessments (GOC 2022a).

This section identifies Indigenous communities that may be affected by the Project and summarizes engagement work undertaken by the POA to date, as of September 2023 (Figure 5). In the surrounding area of the Project location, only two Indigenous communities can be found (listed in alphabetical order):

- Miawpukek First Nation; and
- Qalipu First Nation.

Miawpukek First Nation is located at the mouth of the Conne River (MFN 2023), on the south coast of Newfoundland and is approximately 224 km from the nearest service centre, Gander, Newfoundland (MFNGov 2023). The community is accessible by land, air, and water. Since Miawpukek's establishment as a reserve in 1987, it has become a thriving, fast-growing community, and has become a role model for other First Nations communities (MFN 2023). As of April 2023, the total population of the Miawpukek band is 3,100, including 835 members living on-reserve at Conne River and an additional 2,263 living off-reserve (GOC 2023a).

The Qalipu First Nation is a Mi'kmaq First Nation established in 2011 as an Indigenous Band under the *Indian Act.* Though the Qalipu do not have any reserve land, its membership of 67 Newfoundland Mi'kmaq communities makes it one of the largest First Nations groups in Canada (Qalipu 2016). Qalipu is broken up into nine electoral wards, which are located either on the west or northern coasts of the island (QFN 2011). Qalipu Mi'kmaq Band members, a "landless band" formed under the *Indian Act*, *1985* now live in a variety of communities across the province, with traditional communities extending from western to central Newfoundland. The Qalipu First Nation currently has just over 25,000 members (GOC 2023b) as of April, 2023 and includes the nine Mi'kmaq bands formerly represented by the Federation of Newfoundland Indians (FNI).

Neither First Nation has asserted land claims or has historically used lands near Placentia. Statistical data from the 2021 census indicates that Placentia and its surrounding area have a small population identifying as Indigenous, with 25 residents identifying as Indigenous, including 10 as First Nation (North American Indian), and 10 residents identified themselves as having registered or Treaty status (Statistics Canada 2021).

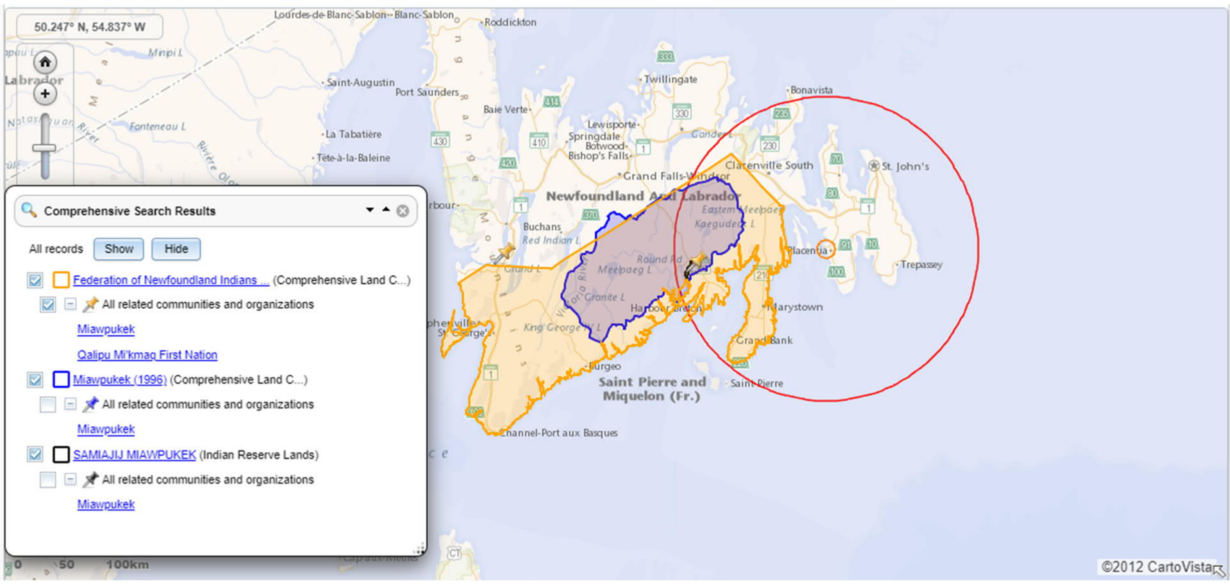


Figure 5: Aboriginal and Treaty Rights Information System (ATRIS) Representation of Potentially Impacted Indigenous Communities, 150 km Buffer from PDA

On February 1, 2023, the POA sent a notice to both the Miawpukek and Qalipu Mi'kmaq First Nations advising them of the Project, providing an overview, conceptual graphic illustration of the anticipated completed works, as well as an opportunity to discuss the Project further.

A second notification letter was sent from the POA to both Miawpukek and Qalipu Mi'kmaq First Nations on August 18, 2023. The letter provided information on the Project, an update on the status funding from the NTCF and offers to discuss and meet on issues of concern.

Dillon staff, on behalf of the POA, followed up with both organizations via phone call/email on August 28, 2023 to confirm whether the second notification letter was received and if there was any interest in meeting to discuss potential concerns. After receiving a list of contacts that the IAAC had been in touch with, Dillon staff sent an additional email to Miawpukek and Qalipu Mi'kmaq First Nations on September 5, 2023 to establish a connection and provide Project information.

The IAAC has committed to providing funding for participation efforts to both Miawpukek First Nation and the Qalipu Mi'kmaq First Nation through the Government of Canada Participant Funding Program for Impact Assessment. Though neither the Miawpukek First Nation nor the Qalipu Mi'kmaq First Nation have provided any feedback regarding the Project to the Proponent at this time, the POA is committed to working with the First Nations in the event that concerns or issues arise regarding the Project. The POA also commits to observing and/or participating in any engagement activities facilitated by IAAC. This section will be updated as information becomes available.

2.5 Regional and Strategic Assessments

Regional assessments and strategic assessments near the Project area that might inform this IPD are identified in this section.

2.5.1 (**5**) Regional Assessments

Regional assessment, as defined, refers to any study or plan pertaining to the Project that has been conducted or is currently being conducted within the region where the Project is proposed. This includes regional assessments carried out under Section 92 or 93 of the *Impact Assessment Act*, as well as studies or plans undertaken by any jurisdiction or on behalf of an Indigenous governing body. The following list outlines the regional assessments that are publicly available:

- Regional Assessment (RA) of Offshore Wind Development in Newfoundland and Labrador, Impact Assessment Agency: This RA may inform the Port of Argentia of Indigenous and non-indigenous values within the Project footprint and greater Placenta Bay area (GOC 2019a).
- Regional Assessment of Offshore Oil and Gas Exploratory Drilling East of Newfoundland and Labrador, Impact Assessment Agency: This RA may inform the Port of Argentia regards issues raised by both Indigenous and non-indigenous groups thought the assessment process for commercial fisheries, marine birds, cumulative effects, oil spills, marine fish and fish habitat and climate change (GOC 2019b).
- Transport Canada assessing the cumulative effects of marine shipping, Pilot area: Placentia Bay, Transport Canada: This RA may inform the Port of Argentia of potential effects of how marine shipping impacts the environment and coastal communities within the Placentia Bay area (GOC 2019c).

2.5.2 (**6**) Strategic Assessments

Under the *Impact Assessment Act*, strategic assessments (SA) are critical evaluations designed to address overarching issues like climate change. The Strategic Assessment of Climate Change (SACC) provides a comprehensive perspective on Canada's approach to environmental challenges. This is further complemented by two technical guides. The first guide delves deep into the specifics of calculating net greenhouse gas (GHG) emissions, studying impacts on carbon sinks, devising mitigation strategies, formulating a net-zero plan, and scrutinizing upstream GHG emissions. Meanwhile, the second guide emphasizes understanding the resilience of projects and systems in the face of potential climate change impacts.

A specific GHG assessment is pending since the Project is still in the design phase. The POA has committed to a third-party specialist to conduct an atmospheric assessment to quantify potential reductions. The POA has also taken the next steps in understanding emissions reduction with a request for proposal (RFP) being released on August 4, 2023 to complete an electrification study at the port. The POA has also committed to enabling renewable energy companies in Argentia to work towards global GHG mitigation. These measures will contribute to the Government of Canada's ability to meet its commitments in respect to climate change such as the Paris Agreement, Canada's 2030 target and the goal of Canada achieving net-zero emissions by 2050. To achieve this the POA is committed to applying a consistent approach to addressing GHG emissions through the following:

- Strategic Assessment of Climate Change (GOC 2022c);
- Draft Technical Guide Related to the Strategic Assessment of Climate Change: Guidance on quantification of net GHG emissions, impact on carbon sinks, mitigation measures, net-zero plan and upstream GHG assessment (GOC 2021c); and
- Draft Technical Guide related to the Strategic Assessment of Climate Change: Assessing Climate Change Resilience (GOC 2022d).

3.0 Part B: Project Information

As outlined in Schedule I of the *Information and Management of Time Limits Regulations* under the IAA, Project-related information is provided in this section, including:

- The purpose and need for the Project;
- The impact assessment/environmental assessment regulatory framework likely applicable to the Project;
- A description of Project components (including where available the sizes, capacities, and footprints of Project elements), and a description of Project phases and activities required to construct, operate, and ultimately decommission the Project at the end of its useful life;
- The Project schedule;
- Alternative means of carrying out the Projects that are technically and economically feasible; and
- Alternatives to the Project that are technically and economically feasible.

3.1 (7) Purpose and Need for the Project

The Port of Argentia is an industrial seaport on the east side of Placentia Bay in the Province of Newfoundland and Labrador. Argentia offers ice free, year round access, a wide turning basin, over 600 metres of commercial dock facilities and abundant uplands available to support dockside activities. The POA Marine Terminal offers stevedoring, transportation, crane and other services with dock facilities within a 40-hectare secure fenced compound. Port of Argentia is certified by Transport Canada as compliant under the Marine Transportation Security Regulations (MTSR). The POA property includes 1,200 hectares of developed industrial land, and 46,000 square metres of commercial building space. Led by a volunteer Board of Directors and professional Management Team, the port is a non-share capital corporation mandated by the Province to provide effective stewardship of the seaport and industrial property at Argentia to enhance the region's economic vitality and quality of life. The Port is carrying out this mandate by attracting interest from diverse sectors including renewable energy, aquaculture, marine transportation, offshore energy, and critical minerals.

The primary purpose of the proposed Cooper Cove Marine Terminal Expansion Project aims to address the existing shortage of wharf space and quayside infrastructure at the Port of Argentia. This Project is pivotal for improving berthage capabilities and optimizing cargo flow in and out of Newfoundland and Labrador. The scope of this Project also includes the installation of a roll-on-roll-off (Ro-Ro) ramp to improve loading and unloading vessel capabilities and the infilling the area behind the wharf expansion to create further storage and laydown areas to support cargo shipping activities. While the expansion will enhance POA's ability to support an increase of vessel traffic, particularly from sectors like the emerging green hydrogen hub that may be developed by other parties as a separate project, it is important to note that the Projects core purpose is not solely tied to any specific industry or project. Instead, this expansion Project underpins the POA's overarching strategy to diversify and amplify the services at the port of Argentia.

The Project offers a myriad of benefits, from improving the efficiency of Canada's transportation corridors to stimulating significant direct economic growth in the Placentia region of NL and the broader Canadian economy. This Project also aligns with NTCF objectives, which seek to support Canada's connection to international markets, driven by the private sector's growing demand, and aims to improve transportation priorities, specifically creating a safe, secure, green, innovative, and integrated transportation system that supports employment, trade, and economic growth within in the region.

In addition, to catalyzing private sector investment in important and longstanding NL industries, such as offshore oil and gas development and onshore mining projects, the Project is particularly important to the green energy sector. While this expansion project will facilitate the POAs ability to support the green energy revolution through the ability to accommodate increased vessel traffic needed for renewable energy projects such as the recently announced green hydrogen hub, it is not reliant on this industry; the wharf expansion is part of the long-term vision for the POA services. This hub will leverage eastern Newfoundland's exceptional wind resources to produce green hydrogen, contributing to the global transition toward sustainable energy sources. The Port's participation in the green economy will have wide-ranging effects on the NL economy as the Province seeks to transition to a post-hydrocarbon world. With expected billions of dollars in capital investment, the Project will significantly impact employment, earned incomes, and taxation. This investment will help secure the province's economic future as it gradually reduces its reliance on fossil fuels.

Over the next five years, the POA aims be the host port to billions in new investment from renewable energy companies seeking to establish wind energy, hydrogen, and ammonia production facilities and it is anticipated to double vessel traffic and cargo volume over a 30-year planning horizon. Multi-national firms have already begun utilizing the port for staging ongoing and planned offshore wind farm construction projects throughout North America. Letters of support have also been provided by prospective tenants, existing clients/tenants and the Government of Newfoundland and Labrador (Appendix C). New investments are expected in subsea pipe fabrication (Spool Base), container service expansion, aquaculture support services, and facilities for critical mineral processing. This includes the potential for supporting numerous projects such as these few examples:

- Cenovus' decision to reactivate the West White Rose Expansion and wellhead platform at the POA;
- Pattern Energy's option to lease land for the development of a major export-oriented Wind, Hydrogen and Ammonia Energy Hub at the POA (detailed below);
- Boskalis' agreement to establish a feeder port at the POA to support renewable projects in the United States;
- Teslas has proposed plans to obtain nickel from Vale's adjacent nickel, copper, and cobalt refinery at Long Harbour, with inputs used in production moved through Argentia;
- Equinor's had planned development of the Bay du Nord offshore project (currently paused), with its substantial subsea piping requirements that can be supported by the POA ; and
- Eimskip and TMSI's proposal to increase vessel size and call frequency for their container shipping expansion plans.

Pattern Energy is currently undertaking early-stage feasibility work for a renewable energy-to-green fuels project at the Port. The proposed 400 metric ton per day (MTPD) green ammonia project, coupled with a hydrogen electrolysis facility and on-site 300 megawatt wind project, demonstrates a commitment to sustainable energy solutions. This project will increase vessel traffic by approximately one handy sized vessels that range in length from 130 m to 150 m with a 10 m drought visiting the port to pick up ammonia per month.

Since June 2022, Pattern Energy has had a Ground Lease Option Agreement with the POA. In May of 2023, that option agreement was amended to include commercial terms that would be included in definitive agreements if Pattern Energy were to exercise its option to lease property and move ahead with the renewable project. In the amended option to lease agreement, Pattern Energy specifically states that capital expenditures will be required to improve dock and related infrastructure at the port to accommodate the operations of an ammonia storage and export terminal. The capital expenditures are currently estimated to be in the range of between CAD$20 million and CAD$30 million. Pattern Energy states that the capital expenditures may be most efficiently made in coordination with capital expenditures being made by the POA and other third parties related to the Port's planned marine terminal expansion project. In the event Pattern exercises the Option to Lease and proceeds with the construction of a wind farm and green hydrogen / ammonia terminal as contemplated, Pattern Energy has agreed to make a financial contribution which will be used for the Cooper Cove Project. The amount of the contribution will be reduced in the event additional third party contributors participate in the Cooper Cove Project.

The POA is the landlord but may have further involvement through its partnership in Argentia Capital Inc. (ACI). ACI has the right to acquire a limited partner equity interest in Pattern's renewable project. However, as a Limited Partner, ACI has no voting rights or decision-making authority with respect to the planning, development, construction, management, operation or maintenance of Pattern Energy's proposed renewable energy project. ACI has agreed that Pattern Energy will have sole authority to make decisions in its sole and absolute discretion regarding the Project.

It is important to emphasize that while this Project's enhanced infrastructure may benefit various sectors, including those projects listed above, its design and purpose are not exclusively tailored for any specific industry or project. Instead, this expansion serves as an upgrade to the existing infrastructure, positioning the port to accommodate the diverse needs of current and future tenants and companies across various sectors. The POA does not have care, custody or control over the marine shipping within Placentia Bay – rather the Port's primary role encompasses providing essential docking facilities and associated infrastructure to support the seamless flow of goods and cargo in and out of the port.

3.1.1 Strategic Location Advantages

Originally constructed as a Military Base for the United States Navy during World War II, today the port supports traditional marine supply chain traffic in the transportation, container shipping, renewable energy, offshore energy, seafood, critical metal smelting (e.g., nickel, copper, cobalt), and metal recycling industries. The Argentia Naval Base closed in 1994. Since that time there has been little to no investment in new marine infrastructure. With the existing 430 m marginal wharf being fully utilized, future growth is constrained by an acute shortage of available wharf space and quayside infrastructure. Underlying business opportunities that are driving the Port of Argentia's expansion are all export-oriented and driven by value-added production. The current traffic volume of vessels using the Port is between 180 to 200 vessels per year, with future growth expected to double over the 30-year planning horizon (POA 2022).

As an integral part of the POA, Cooper Cove is characterized by its unique seabed, featuring relatively shallow waters near the shore that rapidly transition to deeper waters and a human-made shoreline. This location advantageously supports the development of port facilities and heavy marine operations. This site offers several strategic locational advantages, making it well-suited for attracting business opportunities. With an approach channel that provides 14 to 50 m of depth, the berth and channel can accommodate various types of vessels up to approximately 35,000 deadweight tonnes (DWT). These include access to ice-free tidewater, which is crucial for large industrial projects. The port can be accessed year-round, facilitating continuous inbound and outbound shipments. Argentia Harbour and Placentia Bay feature deep water dockside areas, enabling the port to accommodate large vessels and heavy-lift cargo from a range of existing industries including the Marystown Shipyard, Cow Head

Fabrication Facility, Argentia Ferry Terminal, North Atlantic Refining Limited, Vale Inco, and Newfoundland Transhipment Ltd. It is understood that the primary function of the proposed infill area and the wharf is to support heavy marine operations associated with offshore and green energy industries.

Currently, navigation within the POA and Placentia Bay is pivotal in maritime trade and regional development. The POA stands as a significant maritime hub, historically serving military and commercial purposes, while Placentia Bay's deep waters support various maritime operations such as shipping, fishing, and oil-related ventures. Both locales have traditionally been key gateways for Newfoundland, aiding in local and international trade.

The port hosts a diverse array of vessels, including support vessels, fishing vessels, passenger ships, container carriers, ro-ro ships, and dry breakbulk vessels. Prioritizing security, the port is certified by Transport Canada under the *Marine Transportation Security Regulations* (MTSR), and a 40-hectare secure fenced compound protects its dock facilities.

The existing port infrastructure features three major berths: Berth 1 is 150 m long, Berth 2 mirrors its dimensions, and Berth 3 is 130 m with varying widths and draughts. Their strategic placement within the Atlantic regional traffic service zones underscores their importance in regional maritime operations.

The proposed Project location within the POA is strategically located at the pre-existing industrial area which is appropriately zoned as “Industrial” by the Town of Placentia and is connected to a well-developed road transportation network. It is conveniently situated within a reasonable distance from the urbanized industrial zones of the northeastern Avalon Peninsula, making it a significant hub for moving cargo daily and provides access for the 40 tenants of the site to services such as repairs, supplies, housing and other services. From January 2023 – November 2023 the port has had a 142 vessels dock averaging approximately 13 vessels per month. The Port is projected to manage approximately 540,000 tonnes of cargo over an average of 245 vessels in the next five years, increasing to an estimated 371 vessels moving approximately 907,405 tonnes of cargo throughout the Eastern Seaboard, northern locations, and trans-Atlantic by 2052 (Table 3), further adding to its appeal and building upon the historical use of the site.

Table 3: Current and Anticipated Increased Marine Vessel Capacity and Cargo Forecast (5-year intervals)

Metric	Average 2019-2021	2023-2027	2028-2032	2033-2037	2038-2042	2043-2047	2048-2052
Vessels (#)	*198*	245	302	327	344	357	371
Total Cargo (tonnes)	*179,383*	540,268	668,464	873,077	882,676	849,733	907.405
Exports (tonnes)	*24,675*	194,210	323,847	554,926	569,432	571,090	572,833

Metric	Average 2019-2021	2023-2027	2028-2032	2033-2037	2038-2042	2043-2047	2048-2052
Export (Million Dollars CAD)	*49*	170	373	618	646	649	653

The Port of Argentia exercises care and control over marine shipping activities within its property boundaries though oversight of the port's daily operations, including managing vessel arrivals, cargo handling, and berth allocation. Ensuring the safety of these operations is a paramount concern, and the port authority diligently enforces safety protocols, conducts regular inspections, and collaborates with relevant authorities to prevent accidents, environmental spills, and other potential hazards.

The nature of the existing marine shipping activities at the POA is a multifaceted operation that aims to meet the needs and benefit users of the port facility through the coordination of third-party marine shipping services. The POA role in marine shipping is as follows;

1. Nature of Marine Shipping: Marine shipping at the POA plays a pivotal role in facilitating the transportation of goods and cargo. It serves as a vital link in the supply chain, providing a facility for loading and unloading various commodities.
2. Subordinate or Complementary to Cooper Cove Expansion: Marine shipping activities at the POA can complement the Cooper Cove Marine Terminal Expansion Project. While the expansion project primarily focuses on enhancing port infrastructure to diversify services and capacity, marine shipping activities would be tied directly to the various industries and trade activities the port serves.
3. Care and Control of the POA: The extent of care and control the POA exercises over marine shipping activities are initiated once vessels are docked. The POA does not have influence or control over industry drivers or trade activities that may require increased marine shipping needs. Navigation into the POA facility may be completed by the Atlantic Pilotage Authority (APA), which can be coordinated through stevedores' services. The APA provides safe marine pilotage services in Placentia Bay's compulsory pilotage area (Zone B, Argentia).
4. Relationship with Third Parties: The POA accepts vessels arranged through third-party stevedore services, which are required to follow an adequate marine logistic plan. Collaboration, coordination, and adherence to safety and regulatory standards are essential to such relationships.
5. Benefit to Other Proponents: The Project does not exclusively benefit any one tenant, project or businesses in the region. The POA is committed to promoting shared access to a range of tenants and industries to enhance the port's role as a regional trade hub.
6. Regulatory Requirements of the POA: The POA is certified by Transport Canada as an ISPS compliant port and adheres to Marine Transportation Security Regulations.

3.1.1.1 Existing Infrastructure

Currently, the roads serving the POA encompass a diverse mix of traffic types, including industrial vehicles linked to port operations, the transportation of goods, service and maintenance vehicles for port facilities, and general commuter traffic serving the local area. The frequency of traffic on these roads varies throughout the day and week, correlating with vessel schedules, cargo handling activities, and operational shifts at the port. On the other hand, commuter traffic adheres to consistent patterns in alignment with the work schedules of the local population.

In 2023, a significant transformation occurred along Waterfront Drive within the POA. This transformative project entailed substantial infrastructure upgrades, including the widening of the road, as well as the strategic relocation or burial of power utility lines. The existing road was excavated and rebuilt using rockfill, class B and Class A materials. The upgraded road can now accommodate loads of up to 8.8t/m2 which greatly exceeds the typical day-to-day vehicle and trucks loads use for general operations at the port. The primary objective of these enhancements was to facilitate the efficient and safe transportation of monopiles from the marine terminal to the runway area. These improvements represents a proactive effort to optimize the port's logistics and infrastructure, ultimately contributing to the smooth flow of goods and materials supporting a variety of industries.

3.2 (8) Provisions in the Physical Activities Regulations

The Project entails two sets of activities or stages of development for the Project. First, is the design-build, which includes the potential for the design and construction of land-based facilities such as a warehouse building, fabrication halls, and related infrastructure (e.g., water, sewer, and utilities), it is expected to run concurrently with the marine terminal expansion tasks. At this time it has not been determined if additional building or structures will be part of the land-based design. However, it is important to note that the construction, operation, or decommissioning activities associated with the design-build are not anticipated to fall under the *Impact Assessment Act, Physical Activities Regulations*, or the "Project List," as designated projects for this Act.

The second set of activities includes fabricating and constructing new concrete caissons for the fleet dock expansion, a new wharf face, and a roll-on-roll-off (Ro-Ro) ramp. Dredging and seabed preparation will be carried out to facilitate the installation of these caissons. Expanding the existing fleet dock will involve constructing and installing concrete caissons approximately 248 m (+/-) in length. Additionally, 200 m (+/-) of new wharf face will be built, connecting to the fleet dock expansion and extending northwards, culminating in a Ro-Ro ramp for easy loading and unloading of heavy modules. The subsequent phases include infilling behind the expanded dock and new wharf face, placement of armour stone for shoreline protection, further infilling adjacent to the Ro-Ro ramp for storage purposes, and site grading and finishing work.

Federally, the *Impact Assessment Act* (IAA) determined that the Project may be considered a designated physical activity under item 53 of the *Physical Activities Regulations* which states:

> *"The expansion of an existing marine terminal, if the expansion requires the construction of a new berth designed to handle ships larger than 25 000 DWT and, if the berth is not a permanent structure in the water, the construction of a new permanent structure in the water."*

This designation pertains to the expansion of an existing marine terminal. This expansion requires constructing a new berth for ships larger than 25,000 deadweight tonnage (DWT) which include the expansion of the existing wharf at the Port of Argentia and construction of a new wharf face into Cooper Cove. Therefore, at the conclusion of the planning phase applicable to this IDP under the IAA, the IAAC will make a determination under Section 16(1) of the IAA as to whether or not an IA is required for this designated project.

In addition, this document has been prepared in coordination and consultation with the Newfoundland and Labrador Department of Environment and Climate Change (NLDECC) – Environmental Assessment Division. In accordance with Section 26 of the NL *Environmental Assessment Regulations,* while the project components are not captured under Part III of the regulations, NLDECC has indicated that due to the proposal infill of an area greater than 5 ha the Project necessitates the submission of an Environmental Assessment Registration Document (EARD) to the NLDECC – Environmental Assessment Division. For clarity, a cooperative impact assessment has been requested to ensure a harmonized approach, reduce duplication, and increase efficiencies in the review and Project approval process.

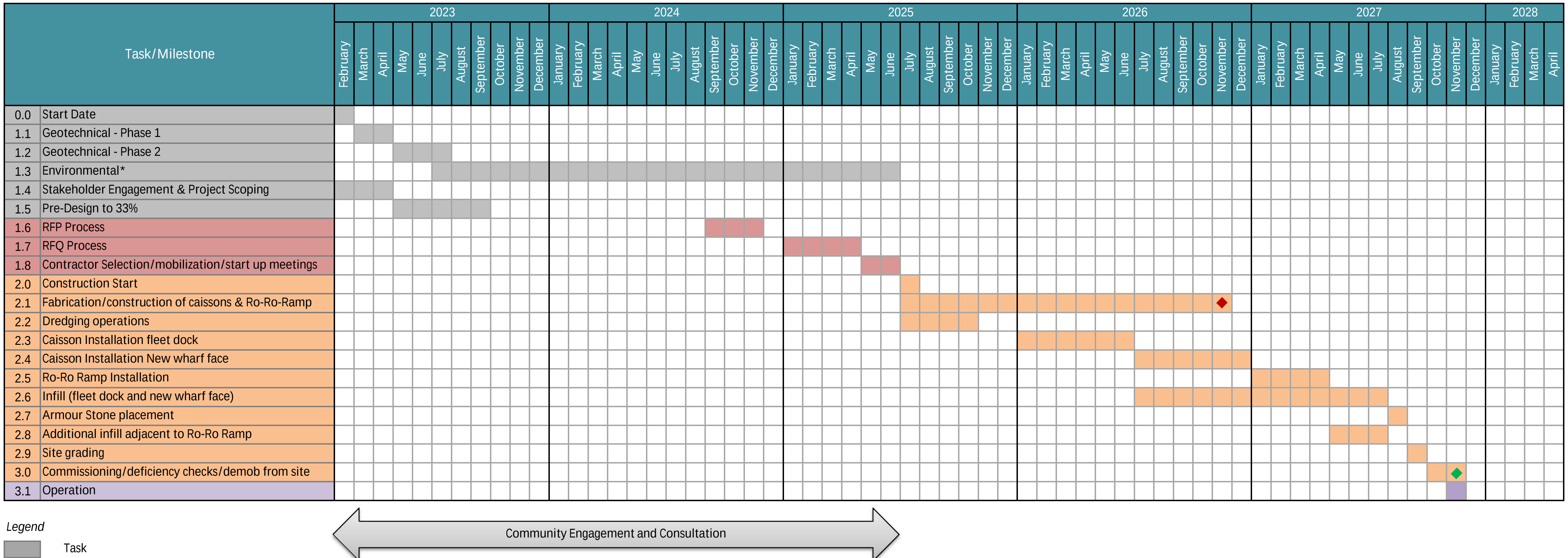
3.3 (9) Description of Project Components and Activities

The Project's anticipated construction schedule includes two significant milestones for completion. The initial milestone involves the construction of the Ro-Ro ramp and caissons, with an estimated completion date set for October 2026. Subsequently, the fleet dock expansion and infill milestone of the Project is scheduled to conclude by November 2027. An additional schedule has been provided (Figure 6) which includes anticipated time required to conduct the impact assessment, should one be required.

The design-build construction activities encompass a broad range of potential activities. Within this scope is the prospect of designing and constructing infrastructure such as warehouse buildings and fabrication halls. Additional facilities will be tied into existing utilities and services such as water, sewer, and other utilities. These activities are projected to run parallel with the marine terminal expansion endeavours, streamlining the Project timeline and ensuring simultaneous progress on multiple fronts.

Cooper Cove Wharf Extension Project

Proposed Project Schedule



Legend

Task

Milestone 1: Ro-Ro ramp and caissons

Milestone 2: Fleet dock extension and infill

* Provincial Environmental Assessment Process (Project-specific timelines may be applicable)

The proposed 29-month construction schedule for the Project outlines one of many possible construction sequences that could actually occur through the Project. However, the general sequence will follow construction of caissons and Ro-Ro Ramp, seabed preparation, installation of caissons and Ro-Ro Ramp, infilling and site grading. It is possible that while one portion of the caissons have been installed (e.g., fleet dock portion), infilling behind this location can occur while installation of the new wharf face caissons are ongoing, and vice-versa. The 29-month schedule outlines the ideal Project schedule with a proposed completion date of November 2027 aligning with the NTCF timeline assumes that a federal impact assessment will not be required; however, if an impact assessment is required, it is anticipated that the Project will be completed in April 2028, which could pose risks to NTCF.

3.3.1 Project Components

The proposed project is divided into seven main phases which include:

- Preliminary investigations including Geotechnical and benthic surveys, and permitting for environmental works;
- Procurement and Design Build;
- The construction phase of the project;
- Pilotage;
- Commissioning;
- The operation and maintenance phase; and
- Decommissioning and abandonment phase of the project.

3.3.1.1 Preliminary Investigations and Permitting

The preliminary investigation and permitting components include:

- Completion of a comprehensive geotechnical study and sediment characteristic program;
- Completion of a Benthic Survey; and
- Completion of Environmental/Impact Assessment and Approvals/Permits/Authorizations, as required.

Further details of the preliminary works are described in the sections below.

Geotechnical Survey and Characterization of Sediment Quality

The Cooper Cove Marine Terminal Expansion Project necessitates a comprehensive geotechnical study and sediment characteristic program to ensure the foundation's integrity and long-term sustainability of the wharf extension. A geotechnical study is required to understand the underlying soil and rock conditions, assess the bearing capacity, and identify potential challenges related to soil mechanics, which are crucial for the safe and effective design and construction of the wharf. Concurrently, the sediment characterization program will be undertaken to evaluate the properties and composition of marine sediments in the vicinity. This assessment is essential not only for construction considerations but also to ensure that dredging or disturbance does not inadvertently release harmful contaminants into the water and to identify dredge spoil disposal options, thus safeguarding both the marine environment and the Project's sustainability.

Benthic Survey

A comprehensive benthic habitat survey will be conducted to provide a detailed characterization of the underwater environment within the Project's domain, specifically focusing on Cooper Cove's marine water lot. This survey is being coordinated in collaboration with Fisheries and Oceans Canada, and the findings will be integrated into the Project's provincial environmental/impact assessment. A Project-specific Request for Review application to Fisheries and Oceans Canada will be submitted to determine if the Project requires an authorization under Section 35(2) of the *Fisheries Act* for harmful alteration, disruption, or destruction (HADD) of fish habitat due to dredging and marine construction. Additionally, an application for a *Canadian Navigable Waters Act* (CNWA) authorization is also planned to be submitted to Transport Canada, Navigation Protection Program (NPP) for planned impediments to navigation in navigable waters that may result from the wharf expansion.

Environmental/Impact Assessment and Approvals/Permits/Authorizations

As outlined in Section 3.2, the Cooper Cove Marine Terminal Expansion Project is being evaluated for both an impact assessment (IA) and an environmental assessment (EA) in accordance with federal and provincial legislation. Under the federal *Impact Assessment Act*, the Project may fall under section 53 of the *Physical Activities Regulations*, which pertains to marine terminal expansions that involve constructing new berths for ships over 25,000 DWT. This is particularly relevant considering the Project's intention to expand the existing wharf at the Port of Argentia into Cooper Cove. Moreover, as per the NL *Environmental Assessment Regulations*, there is a requirement to present an EARD to the NLDECC-EAD. To optimize these requirements, a collaborative impact assessment is being sought to ensure a unified, efficient, and non-redundant approach to the review and approval stages.

The Port of Argentia, spearheading the expansion project, has outlined a 25-month environmental approval process to match the construction timeline. This is crucial in adhering to the requirements of Transport Canada's NTCF, which stipulates the Project's completion by November 2027. Should it be determined that an Impact Assessment is mandatory, the Port of Argentia is prepared to modify the existing schedule. This amendment aims to comprehensively cover all five phases of the IA.

3.3.1.2 Procurement and Design-Build

The Project is currently at a preliminary Level D design stage, last updated in 2021 by Jewer Bailey Engineering in collaboration with the Port of Argentia, building upon earlier plans by Dillon. Before tendering and phased construction can begin, a detailed design must be finalized. The design-build phase is an integrated project delivery approach where a single entity or team is responsible for the design and construction processes. It offers numerous benefits, including faster project delivery through overlapping design and construction phases, cost savings through collaborative value engineering, improved quality control, enhanced flexibility and innovation, and streamlined team communication.

The POA will oversee the Project's management over three years, working alongside project partners. The Project will undergo a systematic public tendering process to ensure timely approvals, abiding by the POA's purchasing guidelines. These guidelines prioritize hiring qualified contractors while maximizing value and minimizing costs.

The POA has an established history in managing infrastructure projects and will lead the overall project management with support from Dillon. The procurement process entails selecting reputable contractors through the Request for Proposal (RFP) and Request for Quote (RFQ) processes, with tenant consultations incorporated to identify any specific needs. All port enhancements will be professionally designed, tendered, supervised, and executed in phases to limit disruptions to current harbour and port operations.

During the project's design-build phase, all new infrastructure and activities planned to take place on port-owned land will be identified. It's important to note that plans for new land-based infrastructure and activities will not be known until the completion of this phase. The design-build phase will serve as the crucial stage for clarifying, refining and integrating these plans into the overall land-based project scope. The design plans for new land-based infrastructure and activities will be completed in parallel with the marine terminal expansion, ensuring that both aspects of the project are developed cohesively to meet the project's objectives efficiently and effectively. This synchronized approach allows adjustments and adaptations to align the land-based infrastructure with the broader expansion project's goals and requirements.

The RFP for the design-build phase, which may encompass additional components necessary for the facilities' operations will be issued in September 2024. The design build will cover all aspects of the Project's delivery, including essential elements for its successful operation. Once complete, these plans will be reviewed with the appropriate regulatory agencies.

3.3.1.3 Construction

The construction portion of the project can be broken down into various components as listed below (Figure 3):

- Fabrication and construction of new concrete caissons for the fleet dock expansion, new wharf face and Ro-Ro Ramp.
- Dredging and seabed preparation for installation of caissons.
- Installation of concrete caissons for the expansion of the existing fleet dock measuring approximately 248 m long (+/-).
- Installation of concrete caissons for approximately 200 m (+/-) of new wharf face connecting to the fleet dock expansion and extending to the North and transitioning into a Ro-Ro ramp at the end.
- Construction and installation of Ro-Ro ramp to allow for loading and unloading of modules and other heavy loads.
- Infill of the area behind the fleet dock expansion and new wharf face.

- Placement of armour stone shoreline protection on exposed infill area slopes.
- Additional infilling of the shoreline adjacent to the Ro-Ro ramp to allow for pipe storage or other general storage requirements.
- Site grading and finishing work to the fleet dock expansion and new wharf face.

Further details on the activities to be carries out during the construction of the project are provided in the following sections.

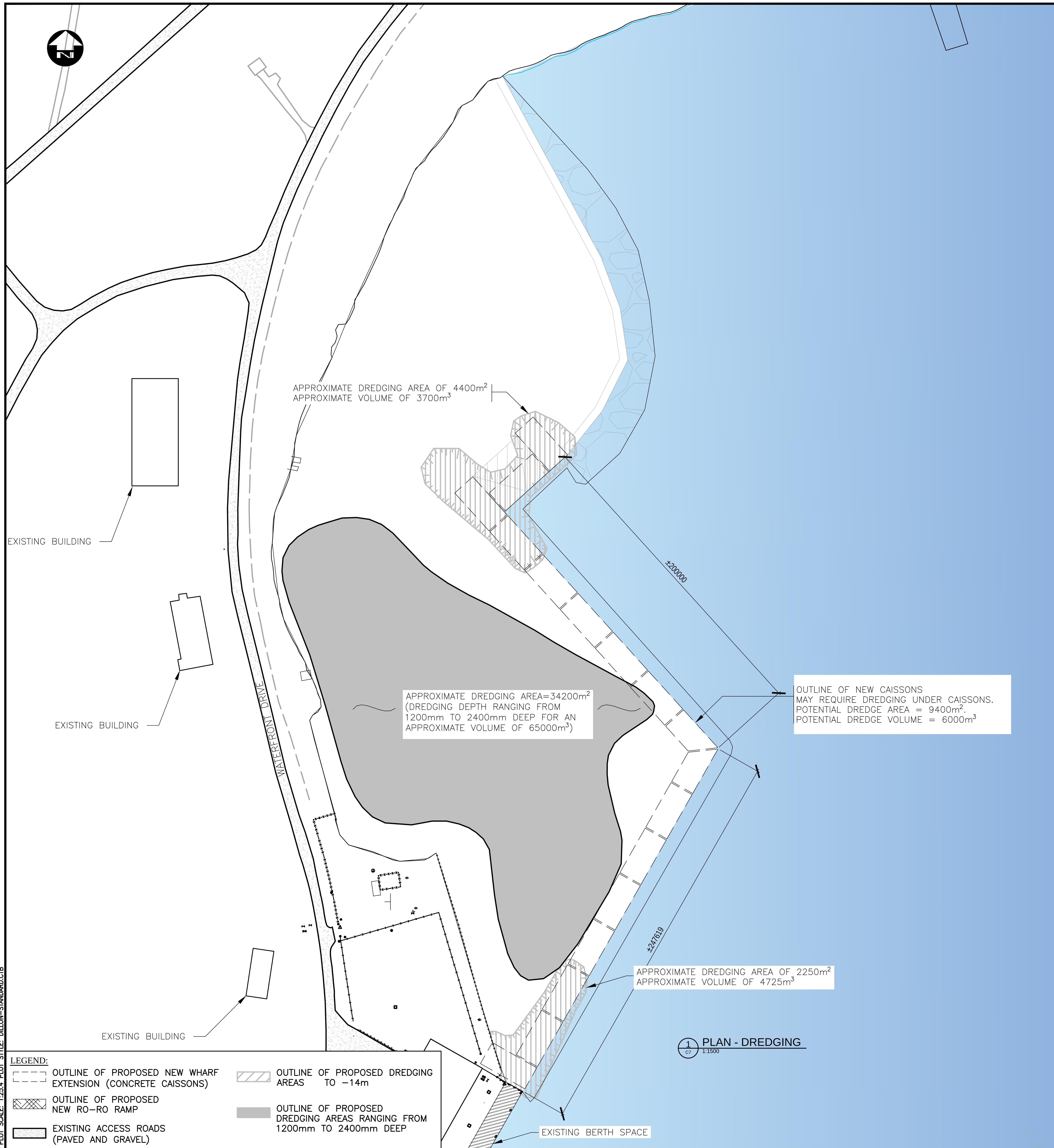
Concrete Caissons and Ro-Ro Ramp Fabrication

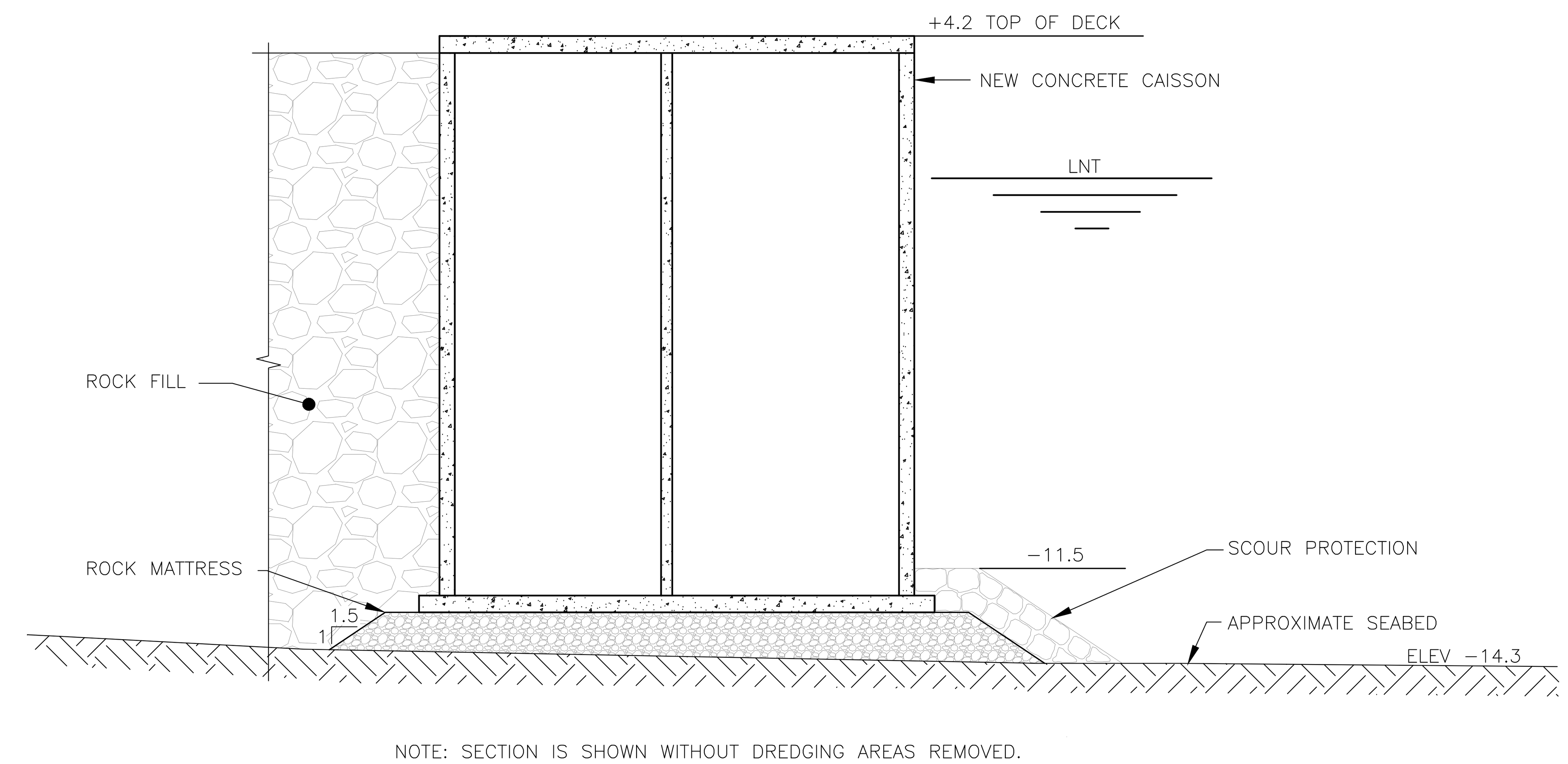
The Ro-Ro ramp and concrete caissons are one of the main components to the proposed wharf expansion, they are what form the outline/shape of the new wharf. The caissons are anticipated to be a concrete structure measuring approximately 17 m high with interior wall thickness in the range of 400-500 millimetre (mm) thick. The caissons will contain hollow sections called cells which will be infilled once the caissons are placed in the required location for the wharf. The anticipated design for the concrete caissons will allow for the structure to be partially submerged once constructed and floated into place. The Ro-Ro ramp along the wharf will also be constructed via concrete caisson but will be of a lower height. The top surface of the ramp will be a sloped concrete surface to allow for roll on, roll off operations for berthed vessels.

Dredging Operations

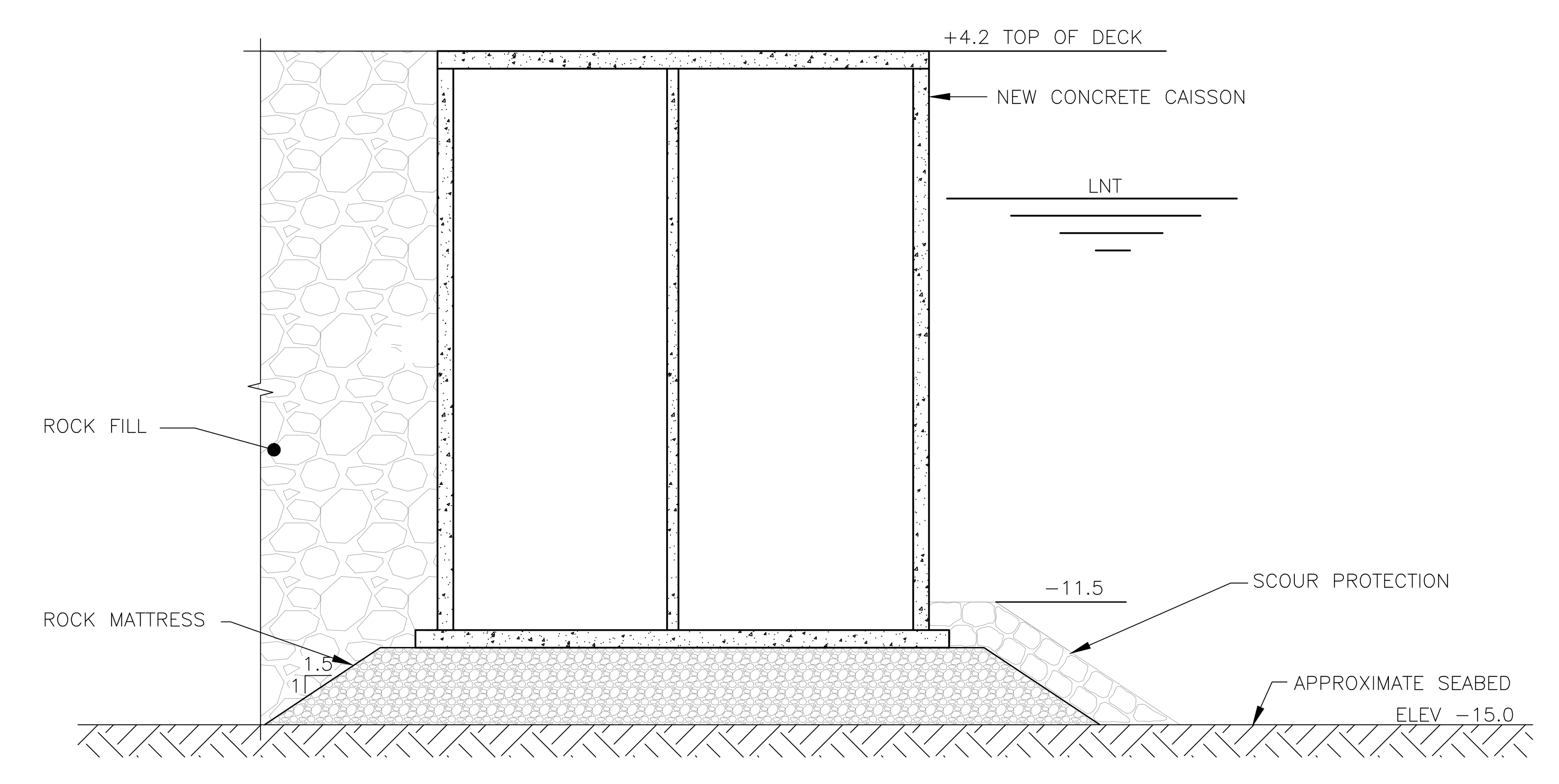
Dredging operations and infilling of the fleet dock are another main component of the project. Dredging operations are required to remove layers of soft marine sediment that are in the footprint of the new wharf and required infill areas. Proposed dreading area outlined in Figure 7 estimates three areas covering approximately 5 ha total within the project development area (PDA). Typical dredging procedures include removal of fill materials by use of mechanical equipment, such as an excavator grab bucket, or hydraulic dredging, which includes the use of a cutter head and suction pipe. Large dredging operations are generally completed using equipment called dredges that are supported on barges. Once the required materials have been dredged from the ocean floor, they will be disposed of at an approved location. Dredge depths are then rechecked to confirm the desired depths have been achieved.

Based on geotechnical investigations completed thus far, a marine sediment layer measuring approximately 600mm thick will need to be dredged across the entire footprint of the wharf and infill area. Dredging this area will ensure that appropriate bearing capacities can be achieved as required from final design requirements. Dredging operations are anticipated to take place over 5 weeks but can extend if needed. If needed dredging operations can take place parallel to installation of the concrete caissons. For example, if all dredging operations have been completed along the fleet dock expansion side, then installation of the concrete caissons can take place here and dredging activities can proceed along the new wharf face side and vice versa.





2 C7 SECTION - NEW CAISSON 1:150



3 C7 SECTION - NEW CAISSON 1:150

ST. JOHN'S

FILENAME: G:\CAD\DANIELLE BOWERING\213088-1401-COOPER COVE\CAD FILES FOR IPD\C7 - DREDGING AND SECTIONS.DWG PLOTTED BY: BOWERING, DANIELLE
PLOT DATE: 2023-11-02 @ 3:42:20 PM PLOT SCALE: 1:25.4 PLOT STYLE: DILLON-STANDARD.CTB

Conditions of Use

Verify elevations and/or dimensions on drawing prior to use. Report any discrepancies to Dillon Consulting Limited.

Do not scale dimensions from drawing.

Do not modify drawing, re-use it, or use it for purposes other than those intended at the time of its preparation without prior written permission from Dillon Consulting Limited.

DILLON CONSULTING

No.	ISSUED FOR	DATE	BY
0	ISSUED FOR REPORT	3-NOV-2023	DSB

DESIGN: S. PEARCE	REVIEWED BY: S. PEARCE
DRAWN: D. BOWERING	CHECKED BY: D. BOWERING
DATE: MAY 2023	
SCALE: AS SHOWN	

COOPER COVE
MARINE TERMINAL EXPANSION

DREDGING AND SECTIONS

PROJECT NO. 21-3088-1401

SHEET NO. C7

Overall infill and dredging activities planning will be carried out in collaboration with various stakeholders, including both the Environmental Assessment Division and Water Resources Divisions of the NLDECC, IAAC, TC, and Fisheries and Oceans Canada (DFO).

Installation of Concrete Caissons

Once dredging operations are completed the rock mattress for the concrete caissons can be installed. The final outline and materials for the rock mattress will be determine at the final design stage. Once the rock mattress has been installed, the concrete caissons can be floated into place. The cells of the caissons will be filled with approved fill materials, and this will help to anchor the caissons to their final position. The installation of the caissons may take place while dredging operations are ongoing in different areas in the footprint of the project as both activities can occur at the same time. But this will be determined by the contractor for the project at the design-build phase.

Construction and Installation of Ro-Ro Ramp

Construction and installation of the Ro-Ro ramp is outlined to take place after the installation of the concrete caissons, but this may change depending on the construction approach decided by the selected contractor for the project. The general construction of the Ro-Ro ramp also includes seabed preparation through completion of dredging activities and placement of rock mattress. A smaller concrete caisson will be floated into place and then the top slope surface of the ramp will be constructed. The ramp will tie into the concrete caissons at the west side and will be encompassed by armour stone along the east side which will contain the infill material at this side of the wharf expansion.

Infilling Operations

Infilling operations for the project are expected to take place once dredging operations are completed and caissons have been installed. As depicted in Figure 8, the infill area is estimated to be 10.3 ha. It is anticipated that not all caissons will need to be installed for infilling operations to take place. The caissons will need to be installed completely along the fleet dock expansion side or the new wharf face side of the project so that the fill can remain in place once infilling operations have started. If infilling starts before all caissons for the entire project are installed, caution will have to be taken to ensure that the fill materials are protected from being washed away by the open water areas and imposed wave action. The infill for the project will be placed in lifts behind the newly installed concrete caissons and compacted to the required percentage as determined from the final design requirements. The areas behind the new caissons will be infilled until the design grade is achieved. Once completed, final site grading and finishing will take place in accordance with the requirements of the final design.

Placement of Armour Stone along Wharf Face

Armour stone material will be placed along the front of the caissons and will sit on top of a portion of the rock mattress (Figure 8). The armour stone will act to protect the rock mattress from being washed away by currents and any wave action in the area.

DILLON CONSULTING

ST. JOHN'S

FILENAME: G:\CAD\DANIELLE BOWERING\213088-1401-COOPER COVE\CAD FILES FOR IPD\C8- INFILL AREAS.DWG PLOTTED BY: BOWERING, DANIELLE
PLOT DATE: 2023-11-02 @ 3:43:34 PM PLOT SCALE: 1:25.4 PLOT STYLE: DILLON-STANDARD.CTB

Conditions of Use

Verify elevations and/or dimensions on drawing prior to use. Report any discrepancies to Dillon Consulting Limited.

Do not scale dimensions from drawing.

Do not modify drawing, re-use it, or use it for purposes other than those intended at the time of its preparation without prior written permission from Dillon Consulting Limited.

DILLON CONSULTING

No.	ISSUED FOR	DATE	BY
0	ISSUED FOR REPORT	3-NOV-2023	DSB

DESIGN	REVIEWED BY
S. PEARCE	S. PEARCE
DRAWN	CHECKED BY
D. BOWERING	D. BOWERING

DATE: MAY 2023

SCALE: AS SHOWN

COOPER COVE
MARINE TERMINAL EXPANSION

INFILL AREAS

PROJECT NO. 21-3088-1401

SHEET NO. C8

Access and Utility Corridors and Final Infilling

Facilities, access and utilities will be included in the scope of the design-build execution plan scheduled for the award at a later date. Buildings and associated infrastructure will tie into existing access roads, such as Waterfront Drive, which are capable of accommodating heavy equipment and vehicles. Identification of existing underground infrastructure and utility access will be assessed at the design-build stage of the Project. If it is required for the new work to connect into any existing underground infrastructure, it is anticipated that this will take place prior to final infilling for the project. Existing underground infrastructure would have to be exposed to make any new connections as required.

Site Grading and Finishing Work

Site grading and finishing work will take place once all infilling and underground connections have been made. Final site grading and surface finishing will be determined at a later date and as part of the design build process. Options for final finishing include gravel access road surface or asphalt surface.

3.3.1.4 Pilotage

In order to address navigation and pilotage requirements, a detailed survey of Argentia Harbour in the vicinity of Cooper Cove will be carried out. This survey will provide essential information for the placement of navigation markers, buoys, and beacons to ensure compliance with the Canadian Aids to Navigation System which the Canadian Coast Guard is responsible for placing and anchoring markers and buoys. Shipping navigation within Placentia Bay, Argentia Harbour, and its approaches will continue to necessitate the expertise of a qualified harbor pilot and in accordance with the *Pilotage Act* (R.S.C.,1985, c. P-14).

3.3.1.5 Commissioning

Upon completion of the major construction works, there will be a task for commissioning, deficiency checks and demobilization from site. Once any and all deficiency items are addressed, the Project can go to operation stage where the area will be opened to allow for berthing of vessels and offloading of materials and equipment.

3.3.1.6 Operation and Maintenance

The Port of Argentia (POA) is gearing up for a considerable expansion in response to the predicted surge in vessel and cargo traffic over the forthcoming three decades. Presently accommodating 180-200 vessels annually, this figure is expected to double, with cargo volumes foreseen to multiply more than four times in the set planning horizon. Alongside this growth, POA's operational focus will transition from predominantly catering to heavy industrial tenants to emphasizing sustainable port operations.

With the wharf expansion's implementation and the new wharf face, vessels will frequently dock at the POA. Operational procedures at the port will echo current practices. Containers are to be loaded or offloaded from vessels utilizing a crane, subsequently being moved to interim storage zones and marshalling yards.

Maintenance undertakings at the new terminal will mirror conventional port maintenance requirements. Winter months will necessitate snow clearance, and preventative maintenance activities for facility equipment will be ongoing as part of a regular maintenance plan, ensuring sustained operations. Operational and maintenance activities at the POA are projected to resemble those currently observed. This continuity ensures that while infrastructure and capacity may evolve, the essence of operations at the POA remains consistent and familiar.

3.3.1.7 Decommissioning and Abandonment

There are no immediate intentions to decommission or abandon the Project. However, like all infrastructure developments, this Project will eventually need to be decommissioned at the end of its operational life. The potential environmental effects and the regulatory landscape at the time of decommissioning remain uncertain, making it challenging to forecast the exact implications of future actions.

The anticipated service life of this wharf extension is between 65 to 70 years, a standard duration for such infrastructure. Typically, inspections would commence around the 45 to 50-year timeframe to ensure the structure's integrity. Based on these assessments, a maintenance schedule might be established. As the structure nears its end-of-life, further inspections and necessary repairs will be undertaken. When the wharf structure and/or associated infrastructure as part of the scope of this Project no longer meets its intended purpose, decisions on its replacement or removal would be determined by the landowner's preferences.

Once the plans for decommissioning and abandonment have been identified at the end of the Project's useful life, the decommissioning activities will be assessed in accordance with the regulatory requirements in place at that time.

3.4 (10) Project Production Capacity and Processes

The proposed terminal expansion significantly enhances the existing infrastructure, targeting an increase in both berth capacity and functional space. With an addition of 460 m of berthing space, three new berths, and innovative roll-on roll-off features, the facility aims to handle a broad spectrum of cargo, ranging from regular containers to specialized shipments. The overarching goal is not just to expand the physical space but to streamline cargo handling processes. This objective is evident in integrating the roll-on roll-off ramp, specifically designed to expedite the loading and unloading processes of containers and heavy axle loads, further emphasizing the terminal's intent to enhance efficiency and productivity.

While traditional measures like production capacity might not provide a comprehensive picture of the expansion's magnitude, examining the Project's physical scale offers some insights. The Project intends to infill Cooper Cove, adding 5.7 ha of operational space. Moreover, the area around the roll-on roll-off ramp will also be infilled, leading to an extra 3.2 ha and an increment of 140 meters in wharf length. This expansion would increase the dockside space by approximately 8.9 ha.

Beyond the infrastructural advancements, the Project also brings forth substantial economic implications. The terminal expansion is not just about accommodating more cargo or vessels; it is about stimulating the local economy. The Project is estimated to generate 315 person-years of direct employment and create up to 800 job opportunities in the region.

3.5 (11) Project Schedule

The POA has estimated that the Project's construction phase will be completed within 29 months after receiving final approval. The Proposed schedule is subject to the timely completion of key milestones and activities outlined in the table below (Table 4). The table provides a comprehensive overview of the various stages of the Project, along with their expected start and completion dates.

Table 4: Proposed Schedule and Milestones

Project Activity/Milestone	Start Date	Completion Date
Pre-Project Design and Surveying	2022 July	Ongoing/TBD
Impact Assessment/Environmental Assessment and Component Studies	2023 May	TBD
Engagement and Consultation	2023 May	Upon Project Completion
Construction Permitting	2024 May	TBD
Tender Call (Design-Build)	2024 September	2025 April
Start/End of Construction	2025 July	2027 November

3.6 (12) Project Alternatives

3.6.1 Alternative Means of Carrying Out the Project

As part of the feasibility phase of this Project, alternative designs were evaluated for two wharf face layouts:

1. Option A, a straight extension of the Fleet Dock; and
2. Option B, which features a bend needing less infill.

The infill costs were estimated at $5.2 million for Option A and $2.4 million for Option B (Dillon 2019). Alternate locations were not considered, as the Project is a natural extension of the existing wharf structure. To maintain a seamless operation, the new work area must be contiguous with the current port. Option B was selected as the most technically and economically feasible design alternative for the Project, as described herein.

In addition, the following short-term cost-effective alternatives means were considered:

- Floating Barges and Jetties: Considered as nimble, provisional platforms for spooling equipment to ensure operational flexibility; and
- Mooring Dolphins: Evaluated as potential anchoring points for ships during construction, offering an innovative solution that could defer the need for a major terminal extension in the interim.

Floating barges are proposed as a short-term measure during construction activities, and they can be used to safely and efficiently operate and store equipment. The barges will allow for the quick movement of product and equipment as an alternative which will free congestion in the port and reduce air and noise pollution as a result in increased activity, but they are not considered a technically feasible long-term alternative. A jetty is a more disruptive short-term alternative means which would protect the shoreline of the port, along with allowing the docking of ships and cargo to continue, without intrusion of construction activities. The installation of mooring dolphins would provide a temporary structure of boats to secure themselves to during construction activities. Strategic placement of the mooring dolphins and jetties would need to be assessed in order to not interfere with future developments on the pier, while the floating barge could be transported to different areas where deemed necessary. The preferred short-term measure during construction activities of the port is the introduction of floating barges which can be used to spool equipment bases, load and unload vessels and cargo, and act as anchor points during construction.

During the planning phase of the Project, the POA will evaluate alternatives to determine the most feasible and cost-effective design that would meet the Project's requirements while carefully considering environmental aspects to ensure that the expansion aligns with responsible and sustainable development framework. These alternatives encompass a wide range of aspects, including;

- Site Access and Road Placement: Exploring the most efficient layouts to ensure seamless movement while minimizing environmental impact.
- Underground Infrastructure: Designing systems that ensure sustainability, safety, and longevity.
- Aggregate Supply Sources and Storage: Identifying reliable and sustainable sources for aggregates and designing effective storage solutions.
- Dredging Methods: Adopting techniques that are both efficient and environmentally conscious.
- Waste Management Practices: This involves not just disposal, but also a strong emphasis on material recycling, ensuring a circular economy approach.
- Aquatic Offsetting and Compensation Strategies: Ensuring any aquatic impact is balanced with strategies that restore and enhance aquatic ecosystems.

- Effluent Discharge Procedures: Establishing systems that prioritize the purity of discharges, safeguarding water bodies.
- Resource Utilization: Implementing measures to ensure the most efficient use of resources, minimizing wastage and optimizing outputs.

3.6.2 Alternatives to the Project

When considering the expansion of the existing wharf facilities at the port, it is imperative to explore various alternatives to ensure the optimal path forward is chosen that aligns with environmental, economic, and technical viability. Following the section explores potential alternatives to the project, keeping the overarching goal and purpose of the project in mind.

- 'Do Nothing' Approach:
  - **Description**: This approach would involve retaining the current infrastructure without any enhancements or expansions.
  - **Evaluation**: Although this would have the least immediate environmental and financial implications, it would not meet the project's purpose of enhancing berthage capabilities and accommodating the forecasted increase in cargo and vessel traffic. Economically, in the long run, this could result in lost opportunities for growth and might not support the evolving needs of the region.
- **Utilization of Alternative Ports**:
  - **Description**: Another approach could be diverting some of the cargo and vessel traffic to other ports within the region.
  - **Evaluation**: While this might alleviate some of the immediate pressures on the Port of Argentia, it wouldn't foster focused economic growth for the POA. Additionally, relying on external ports might not be economically viable in the long run due to transportation costs, potential delays, and logistical challenges. It also aligns differently with the project's purpose of strengthening the Port of Argentia's capabilities.
- Modular Expansion Over Time:
  - **Description**: The port could consider phased or modular growth instead of a comprehensive expansion. This would involve expanding the port in smaller increments over a longer period.
  - **Evaluation**: This approach might be more economically palatable in the short term and might reduce immediate environmental impacts. However, it may not efficiently cater to the anticipated rapid increase in vessel and cargo traffic. Incremental developments might also result in intermittent disruptions to port activities.
- Technological Enhancements without Physical Expansion:
  - **Description**: Leveraging advanced technologies to optimize the current operations of the port without expanding its physical infrastructure.
  - **Evaluation**: While technology can enhance operations to a degree, the physical constraints of berth space and quayside infrastructure still pose limitations. The project's primary objective of addressing these physical constraints might not be fully realized with this alternative.

- **Collaborative Operations with Nearby Ports**:
  - **Description**: Form strategic partnerships with nearby ports to handle cargo and vessel traffic collaboratively.
  - **Evaluation**: While this might help in distributing the traffic and economic benefits, there are other solutions to the specific needs of the POA. Furthermore, the complexity of multi-port coordination might introduce new challenges.

In summary, while several alternatives can be considered, it is paramount to weigh them against the specific needs and objectives of the Project. The primary focus remains on revitalising the POA capabilities and ensuring its readiness to meet the evolving demands of the region.

4.0 Part C: Location Information and Context

As outlined in Schedule I of the *Information and Management of Time Limits Regulations* under the IAA, information about the location of the Project and its context/setting is provided in this section, including:

- The geographic coordinates of the Project, including site maps and other location information;
- A general description of the area of the Project and its surroundings, including land ownership;
- Information about the Project's proximity to land used by Indigenous peoples, First Nations reserves, and federal lands;
- An overview of the physical and biological environment of the Project's location, based on publicly available information; and
- An overview of the health, social, and economic context of the region, based on publicly available information.

4.1 (13a) Proposed Geographic Coordinates

The expansion of the existing fleet dock is proposed to commence at Universal Transverse Mercator (UTM) coordinates N5243008.89 and E274755.81 (NAD83), marking the Project's starting point. The expansion will proceed until it reaches its end point at N5242739.41 and E274633.14, where the new wharf face begins (Table 5). This new wharf face will then extend towards the state-of-the-art roll-on-roll-off ramp, located at N5242609.3 and E274727.78. The expansion will include infilling of the land area directly behind the new expansion. This new area will allow for laydown areas long the dock which could be directly accessed by the existing access road, Waterfront Drive. The layout of this entire expansion, including the beginning and end points of the fleet dock expansion and the new wharf face and Ro-Ro ramp, can be viewed in Figure 3 of the Project documentation.

Table 5: Proposed Geographic Coordinates

Location	Longitude	Latitude	Easting (m) NAD83	Northing (m) NAD83
Fleet Dock Expansion Start	*-53.979667902358855*	*47.301796614893*	E274755.81	N5243008.89
Fleet Dock Expansion Stop/New Wharf Face Begins	*-53.981152150804235*	*47.299332861310354*	E274633.14	N5242739.41
New Wharf Face Ends	*-53.97983624381367*	*47.298196220654035*	E274727.78	N5242609.3

4.2 (13b) Project Area

The Argentia Peninsula is a triangular landmass which surrounds the Argentia Harbour and covers a significant amount of land, including 372.5 ha on the north side of the peninsula (Argentia), 795 ha on the south side, 2,387 ha of back lands which acts as a natural buffer between nearby communities, and 319 ha of harbour lands. Northeast Placentia Bay, stretching from Argentia Harbour to North Harbour, features a coastline with numerous shoals, headlands, and small islands. This unique landscape protects the biota along these shores from the surf and ice erosion, as it is influenced by the same north-flowing currents as the Cape Shore. Pack ice, typically carried northwards into the outer part of Placentia Bay, rarely survives transport beyond Argentia (Catto et al. 1997).

The Project focuses on enhancing the Port's capacity and functionality through several key physical features. The conceptual design includes a 248 m (+/-) expansion to the fleet dock, adding berthing space in the area as well as 200 m (+/-) of new wharf face to the North and Ro-Ro ramp (Figure 3). This will facilitate container and specialized cargo movement via Ro-Ro ramp capabilities while increasing dockside space by 32,000 m^2. Additionally, the design will have the capability to support live loads of up to 120 kilopascals (kPa) and outrigger loads from a 150-tonne crane. With the upgrading of the port's capacity, future cargo use potential including rare earth minerals, offshore subsea piping, and entry/exist points of contact for companies will be available. The port can be expected to see increased traffic as the new extension will allow for vessels to berth along the new extension as well as the existing fleet dock. Frequency of current traffic along access road Waterfront Drive could not be quantified at this time, but it is anticipated that there will be an increase in vehicle traffic as well due to the wharf expansion.

Land use planning for the infilled area of Cooper Cove includes the creation of 57,000 m^2 of usable space for laydown areas, warehousing and fabrication halls, while a Ro-Ro ramp integrated into the design will streamline loading and unloading operations, including spool base tasks. Infilling around the ramp adds another 32,000 m^2 of space, and with the addition of armoured stone area of 5,000 m^2 and the area of infill for cribbing of 9,000 m^{2}, requiring infilling a total estimated area 103,000 m^2 of the marine lot. Water depths at the wharf expansion and new dock will range from a minimum of 12 m at the dock face to a maximum of 16 m within the berthing area, accommodating various vessel sizes.

The Project encompasses two proposed dredging and seabed preparation locations (Figure 7) for the installation of caissons. The dredging process will involve the careful extraction of a marine sediment layer measuring approximately 600 mm thick extending across the entire footprint of the new wharf and infill areas equating to an approximate area of 50,250 m^2 (Figure 8). In addition to dredging across the entire project footprint, one additional area measuring approximately 3.4 ha will require dredging in depths ranging from 1.2 m to 2.4 m deep and removing approximately 65,000 m^3 of marine sediment (Stantec 2023). Dredging these areas will create a solid and even foundation for the caissons and ensure that infill materials do not settle excessively. Simultaneously, advanced techniques will be employed to prepare the seabed with utmost consideration for the surrounding marine ecosystem. A preliminary sediment chemistry analysis (Appendix D) has been conducted; samples taken from the proposed dredge area for the Project revealed that only one sample (BH-23 CC-1A) exceeded the acceptable threshold for benzo(a)pyrene, as defined by the Atlantic PIRI Ecological Tier I Environmental Quality Standards (EQS) for sediment (Atlantic RBCA 2022). The concentrations of the other parameters analyzed in the sediment samples were either below the applicable Atlantic PIRI Eco Tier I EQS or below the laboratory reporting detection limits, which were also lower than the Atlantic PIRI Eco Tier I EQS. Overall, apart from the elevated level of benzo(a)pyrene and silver, the majority of the analyzed sediment samples met the required standards and guidelines (Dillon 2023). This information, along with the remaining sample results, will be used to determine the most effective management options for handling excess marine sediment dredged from the Project area.

The detailed characterization of the underwater habitat within the Project area is set to be undertaken as part of an extensive benthic habitat survey, scheduled for 2024. Currently, the existing available information regarding the underwater habitat includes small zones where divers collected sediment samples during the Baseline Marine Sediment Sampling Program and Multibeam Survey conducted by Englobe in 2021 for Public Services and Procurement Canada (PSPC). Field observations revealed a lack of diversity and abundance of macroflora or macrofauna at the site, yet there was no apparent evidence of ecological impairment within the waterlot (Englobe 2021). As the Project progresses, further assessments will be completed before infilling or non-routine dredging activities in consultation with the relevant Regulatory Agencies.

4.3 (13c) Legal Description of Project Area

The proposed PDA is situated within the port of Argentia, located in the inner portion of Argentia Harbour that previously served as a United States Naval base. This area has shallow water near the shore, which quickly transitions to deep water, providing natural seabed characteristics that support the Project. The area has a natural barrier of rolling hills 10 km from the nearest community, Placentia, NL. The PDA, depicted in Figure 3, will consist of the expansion of existing wharf infrastructure northwest, along the southwest portion of Cooper Cove on Argentia Peninsula which is located on the northeastern side of Placentia Bay roughly 130 km (or 80 miles) southwest of the provincial capital, St. John's. This position allows the Project to benefit from the surrounding communities like Fox Harbour, Saint Brides, and Dunville, all of which offer a range of services, amenities, and residential accommodations (Figure 9).

Notably, the proposed wharf expansion resides within a 319 ha parcel of harbour lands as defined under parcel ID3 P-21-2 in the “Agreement to Transfer” from the Government of Canada to the POA (Appendix A). The ownership and operation of the lands adjacent to the Project area fall under the ownership of the POA (Figure 4, Table 2). The parcel's location does not encompass any federal lands; however, it does fall within the Placentia Municipal Planning Area, further solidifying its connection with the local community. According to the Town of Placentia's Development Regulations, the harbour lands are zoned as 'Industrial.' This zoning classification, in conjunction with the Project's location within the marine water lot classified for 'Transportation' use, establishes its compatibility with existing land-use guidelines set forth by the NL Department of Municipal and Provincial Affairs. Therefore, the Project is not only suitably located but also aligns with the established zoning requirements and regulations, underscoring its appropriateness for development in this specific area.

4.4 (13d) Projects Proximity to Residence and Nearby Communities - Community Profile

The Project is located in Argentia, a seaport located within the town of Placentia, which consists of the port of Argentia (Argentina Industrial Park), Townside Placentia, Freshwater, Gallardin Point, Dunville, Southeast Placentia, Point Verde, and Jerseyside. Other nearby municipalities include the towns of Fox Harbour, Saint Brides, and Long Harbour-Mount Arlington Heights (see Figure 9).

Based on the 2021 and 2016 Census, the current demographics of these municipalities is as follows in Table 6.

The total population between these four municipalities is 2,067, down 3% from 2016. Communities tend to be generally balanced between genders, however there are more males than females. The majority of the population is within working age (16-64 years old), with those 65+ making up most of the remainder. Of the 2,067 people residing in these municipalities, 2021 Census data indicate 15 are Indigenous (Statistics Canada 2023).

Median household income levels were not available for Fox Harbour or Long Harbour-Mount Arlington Heights. Based on the median household income levels for Placentia and Saint Brides, it is assumed that median household income levels in this area are around $54,000. Additionally, the majority of the population of these municipalities have a high school degree (or equivalent) or higher.

Based on the 2021 Census, the current labour and employment of these municipalities is as follows in Table 7.

3 0 3
SCALE 1:150,000 KILOMETRES

Conditions of Use

Verify elevations and/or dimensions on drawing prior to use. Report any discrepancies to Dillon Consulting Limited.

Do not scale dimensions from drawing.

Do not modify drawing, re-use it, or use it for purposes other than those intended at the time of its preparation without prior written permission from Dillon Consulting Limited.

DILLON CONSULTING

No.	ISSUED FOR	DATE	BY
0	ISSUED FOR REPORT	3-NOV-2023	DSB

DESIGN	REVIEWED BY
S. PEARCE	S. PEARCE
DRAWN	CHECKED BY
D. BOWERING	D. BOWERING
DATE	
SEPTEMBER 2023	
SCALE	
AS SHOWN	

COOPER COVE
MARINE TERMINAL EXPANSION

PROJECT LOCATION AND
SURROUNDING COMMUNITIES

PROJECT NO. 21-3088-1401

SHEET NO. C9

FILENAME: G:\CAD\DANIELLE BOWERING\213088-1401-COOPER COVE\CAD FILES FOR IPD\C9 - PROJECT LOCATION AND SURROUNDING COMMUNITIES.DWG PLOTTED BY: BOWERING, DANIELLE ST. JOHN'S
PLOT DATE: 2023-11-02 @ 5:44:39 PM PLOT SCALE: 1:25.4 PLOT STYLE: DILLON-STANDARD.CTB

Table 6: Community Demographics

Municipality	Population (2021[1])	Population (2016)	% Change, 2016 to 2021	Age	Gender
Placentia	1,338	1374	-2.6%	125: 0-14 yrs[2] *680: 16-64 yrs* 525: 65+ yrs 60: 85+ yrs	670 M 665 F
Fox Harbour	226	252	-10.3%	15: 0-14 yrs *140: 16-64 yrs* 65: 65+ yrs 30: 85+ yrs	125 M 100 F
Saint Brides	318	252	+26.2%	15: 0-14 yrs *180: 16-64 yrs* 120: 65+ yrs 10: 85+ yrs	175 M 140 F
Long Harbour-Mount Arlington Heights	185	250	-26%	10: 0-14 yrs *95: 16-64 yrs* 80: 65+ yrs 5: 85+ yrs	100 M 90 F
Total	2067	2,128	-3%	N/A	

[1] Source for 2021 and 2016: https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/details/page.cfm?LANG=E&GENDERlist=1,2,3&STATISTIClist=1&DGUIDlist=2021S05101575,2021A00051001254,2021A00051001228,2021A00051001263&HEADERlist=37,36,,21,19,,42,44,40,43,41&SearchText=long%20harbour
[2] Yrs = Years; N/A = Not Applicable

Table 7: Labour and Employment

Municipality	Median Household Income (2020[3])	Unemployment Rate	Education	Total Population with a High School Degree (or higher)
Placentia	$53,600	19%	260: High School Diploma (or equivalent) 555: Post-Secondary certificate, diploma, or degree 100: Bachelor's Degree or higher	915 (of 1338)
Fox Harbour	N/A	31%	75: High School Diploma (or equivalent) 85: Post-Secondary certificate, diploma, or degree 0: Bachelor's Degree or higher	160 (of 226)
Saint Brides	$54,400	39%	145: High School Diploma (or equivalent) 90: Post-Secondary certificate, diploma, or degree 15: Bachelor's Degree or higher	250 (of 318)
Long Harbour-Mount Arlington Heights	N/A	31.8%	45: High School Diploma (or equivalent) 130: Post-Secondary certificate, diploma, or degree 15: Bachelor's Degree or higher	190 (of 185)*

*population data from 2021 Census may not be accurate.

[3] Source: https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/details/page.cfm?LANG=E&GENDERlist=1,2,3&STATISTIClist=1&DGUIDlist=2021S05101575,2021A00051001254,2021A00051001228,2021A00051001263&HEADERlist=37,36,9,,21,19,,42,44,40,43,41,1&SearchText=long%20harbour

4.5 (13e) Projects Proximity to Lands of Significant for Indigenous Peoples

Located at the mouth of Conne River on Newfoundland's south coast, the Miawpukek First Nation is approximately 224 km away from the service hub of Gander, Newfoundland. Established in 1987 as a reserve, Miawpukek has witnessed rapid growth and development. The community, accessible by land, air, and water, boasts a total population of 3,100 as of April 2023, with 835 members residing in the Conne River reserve and an additional 2,263 living outside the reserve.

Established in 2011 under the Indian Act, the Qalipu First Nation is a Mi'kmaq Indigenous Band. While the Qalipu do not possess any reserve land, their collective representation of 67 Mi'kmaq communities in Newfoundland positions them as one of Canada's largest First Nations groups. This "landless band" is divided into nine electoral wards on the island's west or northern coasts. The membership, now exceeding 25,000 as of April 2023, spans various communities in the province. Their historical presence stretches from western to central Newfoundland, and they currently represent the nine Mi'kmaq bands formerly under the Federation of Newfoundland Indians (FNI).

4.6 (13f) Projects Proximity to Federal Lands

A Marine Navigation Light (property number 34873) located within Argnetia, is a federally owned property, and the closest to the PDA, situated about 2 km away which is operated by Fisheries and Oceans Canada, followed by a crown owned radio facility (property number 34849) located approximately 5 km from the PDA. The Miawpukek First Nation is roughly a 500 km drive from the PDA.

4.7 (14) Overview of the Existing Natural Environment

The following sections summarize the Project's current biophysical environment. This document captures components of the natural environment, namely the atmospheric, terrestrial, and marine settings. The descriptions of the natural environment are derived from initial biophysical desktop studies conducted in 2022 and 2023. Additionally, this summary incorporates information from sources such as Atlantic Canada Conservation Data Centre (AC CDC) reports, literature reviews, best management practices, and official government publications.

4.7.1 Weather

According to the most recent data available from Canadian climate Normals from 1991-2020 from the Gander, NL station, the daily average temperatures in the area ranges from a low of -6.6°C to a high of 16.6°C, with extreme temperatures recorded as low as -31.1°C and as high as 35.6°C. On average, Gander receives approximately 103 mm of precipitation annually (Environment Canada 2023).

DILLON CONSULTING

Husky Energy's summary of general weather conditions for the area notes that thunderstorms occur less frequently over Placentia Bay compared to the surrounding land areas. However, they have the potential to occur throughout the year, particularly during the summer months, and are often accompanied by hail. In Argentia specifically, the fall season exhibits the highest frequency of visibility exceeding 10 km. Conversely, reduced visibility is more prevalent during late spring and early summer. Poor visibility conditions, with less than 2 km visibility, increase during the spring and reach a peak in July, occurring over 30% of the time (Husky 2012).

4.7.2 Atmospheric Environment

The 2022 Ambient Air Monitoring Report from the NL Department of Environment and Climate Change has provided insights into the air quality near the PDA. A monitoring station located near Tricentia Academy school in Arnold's Cove, NL is part of the joint effort between the NLDECC and ECCC through the National Air Pollution Surveillance (NAPS) network collected two years tabular summary information and five years of graphical tends. This station, positioned close to the school, continuously observes the levels of sulphur dioxide (SO_2) and fine particulate matter ($PM_{2.5}$). For the entirety of 2022, the levels of SO_2, a primary pollutant from the burning of fossil fuels, consistently met the set air quality benchmarks. This indicates a healthy ambient atmosphere in the vicinity, safeguarding residents, especially vulnerable groups like children and the elderly, from the harmful impacts of this compound (NLDECC 2023a).

The $PM_{2.5}$ measurements, denoting fine particles in the air, largely adhered to air quality standards. However, there were two observed exceedances in January and February. Notably, these spikes were attributed to adverse weather patterns rather than direct emissions. Such findings accentuate the importance of atmospheric conditions, like stagnant air or temperature inversions, in potentially trapping or accumulating these particulates, thereby impacting air quality (NLDECC 2023a).

Overall, the region around the monitoring site generally boasts commendable air quality. Nonetheless, it is crucial to highlight the role of atmospheric dynamics alongside emission sources in influencing these metrics.

4.7.3 Geology and Hydrology

The Argentia Peninsula's landform classification, provided by the provincial government's Landforms and Surficial Geology of the Argentia Map Sheet, is designated as Marine-terrace (Mt) in terms of its depositional environment. This classification encompasses a diverse range of materials, including clay, silt, and sand, gravel, and cobbles, primarily formed through fluvial and glaciofluvial erosion or marine wave action. Soils in Placentia Bay are typically characterized as glaciomarine gravelly-sand to sand and gravel with trace silt; underlain by mixtures of cobble and boulder rich sand and gravel; in turn underlain by clay and clay/silt/sand mixtures at depth (Stantec 2023). The seabed has undergone alterations due to ice sheet and glacier movement (Brushett *et al*. 2007).

The 2023 geotechnical investigation did not encounter bedrock, however, Argentia falls entirely within the Musgravetown group, Big Head Formation comprised of wavy bedded, gray to green tuffaceous siltstone and arkose; locally includes Whiteway Member consisting of red sandstone and siltstone (King 1988). The seabed in the area is gently sloping downward toward the east and northeast (Stantec 2023).

The proposed infill and wharf development area at Argentia Harbour has a shoreline that slopes eastward towards Cooper Cove water lot. The surface drainage in the area primarily flows to the east, with groundwater expected to follow a similar direction. It is anticipated that additional site drainage will be needed but will be confirmed at the design-build stage, as existing underground utilities and infrastructure could not be confirmed at this time. Surfaces adjacent the PDA to the north, south and west, also consist of asphalt paved and gravel surface areas.

4.7.4 Migratory Birds

Due to the coastal and marine habitats offered in the PDA within Placenta Bay, many species of birds including migratory birds are known to frequent the area.

The PDA itself, which consists of relatively deep water bounded by existing industrial infrastructure, and could potentially serve as foraging, migratory stopover and/or wintering habitat for a wide variety of seabirds. Species at risk (SAR) and species of conservation concern (SoCC) (defined in Section 4.4.7) have also been recorded within 5km of the PDA including; *Histrionicus histrionicus* (Harlequin Duck), *Pluvialis dominica* (American Golden-Plover), *Pluvialis squatarola* (Black-bellied Plover), and *Eremophila alpestris* (Horned Lark) (AC CDC 2023). SAR and SoCC are further described in Section 4.4.7. Although migrating and overwintering birds may visit the PDA for foraging purposes, there is no critical or well-suited habitat identified within the PDA.

The PDA is situated north of offshore breeding sites, such as provincial ecological reserve of Cape St. Mary's approximately 75 km south of the PDA which hosts *Morus bassanus* (Northern Gannet), *Rissa tridactyla* (Black-legged Kittiwake), *Uria aalge* (Common Muure) and *Uria lomvia* (Thick-billed Murre) breed and nesting birds such as *Alca torda* (Razorbill) , *Cepphus grille* (Black Guillemot), *Nannopterum auritum* (Double-crested Cormorant), *Phalacrocorax carbo* (Great Cormorant) and *Fulmarus glacialis* (Northern Fulmar) are found (NLDECC 2023).

However, given the existing level of human and industrial activity and associated sensory disturbance within the general area of the Project, the presence of any of these species near the PDA is anticipated to be transient and/or migratory in nature.

4.7.5 Terrestrial Habitat

Terrestrial habitat around the Project area falls within the Maritime Barrens Ecoregion (GNL 2020) and few terrestrial mammals are expected in the vicinity of the Project due to the industrial nature of the site. However, some animals like otters, muskrats, moose, rodents, snowshoe hares, minks, foxes, and masked shrews may be found in the Argentia area (ARG 1995; VBNC 2002). Placentia Bay is a habitat for a diverse range of bird species. It supports around 26 species of seabirds, 13 species of waterfowl, 10 species of shorebirds, and 7 significant species of raptors. These birds either reside in the bay permanently or visit it seasonally. During late spring, summer, and early fall, approximately 28 species of birds can be found in the bay, while at least 15 species use it as a breeding ground (DFO 2017). The closest protected area within the vicinity of the Project is the Cape St. Mary Ecological Reserve located approximately 75 km away and the Placenta Bay Important Bird Area, NF028 (IBA 2023).

The Project area lacks plant growth and forest cover and is predominantly comprised of open spaces and bare ground, consistent across Argentia Peninsula. Environmental conditions and historical land use practices have contributed to the absence of natural vegetation in the port. Instead, the landscape is characterized by paved surfaces, industrial infrastructure, and open fields, with little to no forested areas present.

4.7.6 Marine Environment

Placentia Bay, characterized by its uneven coastline featuring bays, inlets, islands, rocky headlands, gravel pocket beaches, and rock platforms (CEA Agency 2008), is nestled within two crucial management zones: the Placentia Bay - Grand Banks Integrated Management Area and the Placentia Bay - Grand Banks Large Ocean Management Area (LOMA). Together, these zones cover approximately 550,000 km2 off the coast of Placentia Bay and have been identified as a priority for Integrated Management (IM) in Canada. Placentia Bay, located within this LOMA, has been specifically identified as a Coastal Management Area due to the growing presence of human activities in the region (DFO 2012). Placentia Bay is also identified within the Newfoundland and Labrador Shelf Ecozone and the Atlantic Zone Monitoring Program which collects and analyses data to monitor the global climate system, ocean climate variability, ecosystems and plankton affecting regional climate annually.

The 2021 oceanographic conditions in the Atlantic Zone indicated that the winter sea ice conditions were at record lows, and bottom temperatures were substantially above normal. The abundance and biomass of zooplankton was mostly above normal on the Newfoundland Shelf, and the onset and magnitude of the spring phytoplankton bloom was early throughout the Atlantic Zone, with the exception of the Grand Banks. These findings indicate ongoing shifts and variability in the biogeochemical environment of the Atlantic Zone, with changes in productivity and zooplankton community structure. The interactions between environmental factors, such as temperature and nutrient availability, likely play a role in shaping these patterns (DFO 2021).

Nearshore habitats in Placentia Bay are home to various species like anemones, barnacles, sponges, sea urchins, sand dollars, mussels, scallops, hermit crabs, lobsters, and small (LGL 2007) and 14 groundfish species including *Gadus morhua* (Atlantic cod), *Cyclopterus lumpus* (lumpfish) *and Pseudopleuronectes americanus*, Winter Flounder; nine species of pelagic fish including *Scomber scombrus* (Mackerel), *Clupea harengus* (Herring) and *Mallotus villosus* (Capelin); seven species of shellfish including *Chionoecetes opilio* (Snow crab), *Homarus americanus* (Lobster), and *Pectinidae* (Scallop); and another 14 marine mammals such as the *Megaptera novaeangliae* (Humpback whale), seals, dolphins and the *Dermochelys coriacea* (Leatherback sea turtle) (DFO 2017). While these habitats are in close proximity, there are no sensitive areas located within the Project area (Figure 9). *Zostera* (Eelgrass), which has been identified as an ecologically significant species (ECCC 2020), is not anticipated to be found in the nearshore habitat within the Project footprint based on our understanding of the characteristics of Cooper Cove. However, it is noted that eelgrass has been observed in Argentia Harbour in areas approximately 1 km to the northeast of Cooper Cove. Capelin spawning on beaches near Argentia has historically been reported, with gravel substrate preferred.

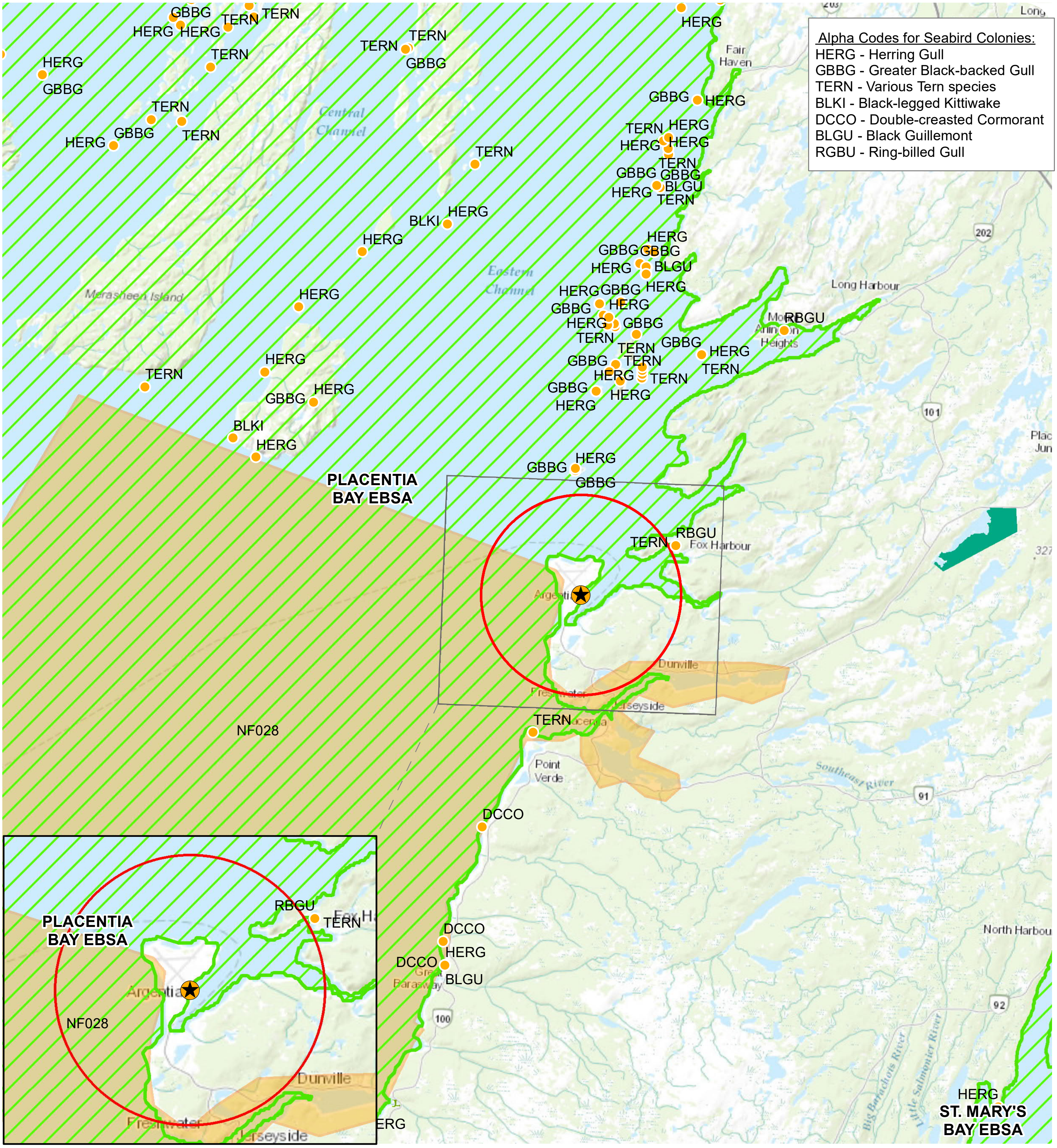
Fish species that could occur in Placentia Bay or surrounding areas could include:

- *Gadus morhua* (Atlantic cod);
- *Hippoglossoides platessoides* (American plaice)*;*
- *Anguilla rostrate* (American eel)*;* and
- *Salmo salar* (Atlantic salmon).

Cod is the most crucial species harvested in Northwest Atlantic Fisheries Organization (NAFO) Unit Area 3PSc (Placentia Bay), followed by snow crab and herring (Husky Energy 2012). Lobster accounts for a small percentage by weight but remains essential to fishers due to its high value. Commercial fishing in Placentia Bay is conducted year-round, with peak harvesting months in June and July (Husky Energy 2012). Cod fishing occurs throughout the year except March to mid-May; snow crab fisheries concentrate from April to June; the herring fishery has a spring and late fall/winter component; and lobster fishing takes place during the open season (typically mid- to late April to late June) in lobster fishing area (LFA) 10. Capelin is harvested in June and July over a brief period of six to eight days during the season (NAFO, summarized in Husky Energy 2012).

4.7.7 Species at Risk

A species at risk (SAR) is defined as a species that is extirpated, endangered, threatened, or of special concern as listed on Schedule 1 of the federal *Species at Risk Act* (SARA) or the Newfoundland and Labrador *Endangered Species Act* (NL ESA). A species of conservation concern (SoCC) is defined as those species that are not SAR but are listed in other parts of SARA, NL ESA, by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or are regionally rare or endangered by the Atlantic Canada Conservation Data Centre (AC CDC) (i.e., those species with AC CDC S-ranks of “Extremely Rare” [S1], “Rare” [S2], or “Uncommon” [S3]). As seen in Figure 10, there are no identified protected areas within the PDA.



Port of Argentia
Marine Terminal Expansion
Cooper Cove

Habitats and Protected Areas
FIGURE 10

MAP DRAWING INFORMATION:
DATA PROVIDED BY ESRI, Port of Argentia, CPAWS-NF, IBA Canada, DFO

MAP CREATED BY: SCM
MAP CHECKED BY: OLB
MAP PROJECTION: NAD 1983 UTM Zone 22N

0 0.5 1 2 3 4
Kilometres

SCALE 1:250,000

DILLON CONSULTING

PROJECT: 213088
Date: 2023-05-04

Document Path: \\dillon.ca\DILLON_DFS_projects\GIS\2021\213088\Product\Client\Updated Figures May 4 2023\Figure 2 Sensitive Areas.mxd

A number of species at risk have the potential to exist in or can migrate within the Project area (Appendix E) and may be affected by the Project activities. Based on a historical environmental assessment conducted in 2012 for a project within 1 km of the proposed PDA, it was determined that there were no known critical nesting, feeding, staging, or overwintering areas of at-risk bird and mammal species noted near the nearshore area (Husky Energy 2012). Englobe retained data in 2021 from the AC CDC, which is an organization dedicated to collecting, managing, and disseminating information related to biodiversity conservation along with new data requests made in 2023 by Dillon were reviewed to identify any historical observations of SAR that may occur within a 5 km radius of the Project area. This radius is sufficient to capture known species observations within the Project footprint. The whole of Placentia Bay was reviewed on the Fisheries and Oceans Canada SAR mapping tool (DFO 2023) was also used to identify aquatic SAR with potential to be found in the Project footprint. The most recent publicly available information was collected by Husky Energy in their 2012 Environmental Assessment (Husky Energy 2012). Considering this information is over a decade old, the POA may consider collecting baseline data to support identifying the potential effects of the Project on SAR and in consultation with appropriate legislative and regulatory agencies.

In 2021 a Baseline Marine Sediment Sampling Program and Multi-beam Survey outlined data from the AC CDC found seven historical records of rare animals within the vicinity of the Argentia Harbour. Three historical records of rare animals were for *Asio flammeus* (Short-eared Owl) and one for a *Histrionicus* (Harlequin Duck), both listed as special concern under SARA and COSEWIC and listed as vulnerable under the provincial *Endangered Species Act* (NL ESA). The other three rare animal historical records were for birds not considered globally rare (Englobe, 2021).

The 2023 AC CDC data search within 5 km radius of the PDA returned 15 historical records of rare animals and 8 historical records of rare plants within a 5 km radius of the PDA. Among the eight rare plant records, five were for the *Tillaea aquatic* (Water Pygmyweed), which is listed as vulnerable under the NL ESA. The other rare plant records do not appear on the NL ESA or federal SARA and COSEWIC lists, and outside of Newfoundland and Labrador, they are not considered globally rare (AC CDC 2023).

Regarding the 15 rare animal historical records, one was for the *Tringa flavipes* (Lesser Yellowlegs), listed as threatened under COSEWIC, one for the Harlequin Duck (special concern under SARA and COSEWIC, vulnerable under NL ESA), and four for the Short-eared Owl (threatened under SARA and COSEWIC, vulnerable under NL ESA). The rest of the animal records are for species not listed on the NL ESA or federal SARA or COSEWIC lists but considered rare on the Island of Newfoundland (AC CDC 2023).

In 2023, AC CDC search results for flora SAR or SoCC that may occur within a 5 km radius of the Project area include historical observations of the following:

- *Crassula aquatic* (Water pigmy-weed);
- *Stuckenia pectinate* (Sago pondweed);
- *Suaeda maritima* (Maritime sea-blite); and

- *Diphasiastrum digitatum* (Southern running-pine).

Bird SAR or SoCC that may occur in the area based on historical observations within 5 km of the PDA include:

- *Asio flammeus* (Short-eared Owl) ;
- *Histrionicus* (Harlequin Duck);
- *Pluvialis dominica* (American Golden Plover);
- *Pluvialis squatarola* (Black-bellied Plover);
- *Eremophila alpestris* (Horned Lark);
- *Circus hudsonius* (Northern Harrier);
- *Tringa flavipes* (Lesser Yellowlegs):
- *Tringa melanoeuca* (Greater Yellowlegs); and
- *Calidris alba* (Sanderlings).

Fish SAR or SoCC that could occur in Placentia Bay or surrounding areas based on historical observations within 5 km of the PDA include:

- *Gadus morhua* (Atlantic cod);
- *Hippoglossoides platessoides* (American plaice);
- *Anguilla rostrate* (American eel); and
- *Salmo salar* (Atlantic salmon).

Marine mammal SAR or SoCC that may occur in Placentia Bay and subsequent Cooper Cove based on historical observations within 5 km of the PDA include:

- *Balaenoptera musculus* (Blue whale);
- *Balaenoptera physalus* (Fin whale); and
- *Dermochelys coriacea* (Leatherback sea turtle).

Additionally, based on 2023 AC CDC projections, there is a possibility that the following species could possibly be found within a 5 km radius of the site, however no direct observations were noted:

- *Erioderma pedicellatum* (Boreal felt lichen);
- *Euphagus carolinus* (Rusty Blackbird);
- *Loxia curvirostra* (Red Crossbill);
- *Bucephala islandica* (Barrows Goldeneye); and
- *Fundulus diaphanous* (Banded killifish).

The DFO SAR mapping tool identified the following species as found, or potentially found, in Placentia Bay:

- *Balaenoptera musculus* (Blue whale);
- *Balaenoptera physalus* (Fin whale);
- *Dermochelys coriacea* (Leatherback sea turtle);
- *Eubalaena glacialis* (North Atlantic right whale);
- *Carcharodon carcharias* (White shark);
- *Anarhichas minor* (Spotted wolfish); and
- *Anarhichas denticulatus* (Northern wolfish).

A table of SAR and SoCC with the potential to utilize the PDA and surrounding area can be found below (Table 8).

4.8 (15) Regional Health, Social and Economic Context

During World War II, the presence of American troops at the Argentia Military Base led to a population surge in Placentia and nearby areas. The port of Argentia became a significant economic hub, directly and indirectly offering jobs. As a social consequence, numerous local people married American service members. After the War, many of these couples relocated elsewhere (TOP 2021a).

The decommissioning of the Base in 1994 negatively impacted the local economy, especially with the collapse of the fish stocks in in the early 1990s. The area was forced to change course and consider how it could diversify its economic sectors, and eventually became “open for business” (TOP 2021b). Since core assets and infrastructure were already in place at the decommissioned Base, this attracted large industrial projects connected with the province’s resource development sector to the Argentia site, providing a dynamic opportunity to Placentia’s regional economy (TOP 2021b). More recent operations in metal fabrication, light manufacturing, and marine transportation re-established Argentia (TOP 2021a). Placentia is also working on expanding its tourism operations and entrepreneurship through funding and grant opportunities and also has opportunities in construction and development, resource development, industrial fabrication, and metallurgical processing (TOP 2021b). The port of Argentia provides a massive opportunity for economic growth in the area, as it is ideally positioned to facilitate, host, and supply many different streams of business.

Projects of a similar nature in proximity to the Project area are identified in Table 9.

DILLON CONSULTING

Table 8: Summary of Fauna and Flora SAR/SoCC with the Potential to use the PDA

Scientific Name	Common Name	AC CDC Status	COSEWIC Status	SARA Status	NL ESA Status
Flora					
Crassula aquatica	Water Pigmy-Weed	S1	-	-	Vulnerable
Stuckenia pectinata	Sago Pondweed	S2	-	-	-
Suaeda maritima	Maritime Sea-blite	S3	-	-	-
Diphasiastrum digitatum	Southern Running-Pine	S2	-	-	-
Erioderma pedicellatum	Boreal Felt Lichen	S3	Endangered	Endangered	Vulnerable
Fauna					
Asio flammeus	Short-eared Owl	S3B, SUM	Threatened	Special Concern	Vulnerable
Histrionicus	Harlequin Duck	S3B, S2N, SUM	Special Concern	Special Concern	Vulnerable
Pluvialis dominica	American Golden-Plover	S3M	-	-	-
Pluvialis squatarola	Black-bellied Plover	S3M	-	-	-
Eremophila alpestris	Horned Lark	S3B, SUM	-	-	-
Circus hudsonius	Northern Harrier	S3B, SUM	-	-	-
Tringa flavipes	Lesser Yellowlegs	S3M	Threatened	-	-
Circus hudsonius	Northern Harrier	S3B, SUM	-	-	-
Tringa melanoeuca	Greater Yellowlegs	S3B, S4M	-	-	-
Calidris alba	Sanderling	S3M	-	-	-
Loxia curvirostra (percna subspecies)	Red Crossbill	S1S2	Threatened	Threatened	Endangered
Euphagus carolinus	Rusty Blackbird	S1S2	Special Concern	Special Concern	Vulnerable
Bucephala islandica	Barrows Goldeneye	S1N, SUM	-	-	Vulnerable
Gadus morhua (Laurentian North)	Atlantic Cod	S1N, SUM	Endangered	-	-
Hippoglossoides platessoides (Newfoundland and Labrador)	American Plaice	-	Threatened	-	-
Anguilla rostrata	American Eel	-	Threatened	-	Vulnerable

Scientific Name	Common Name	AC CDC Status	COSEWIC Status	SARA Status	NL ESA Status
Salmo salar (south Newfoundland)	Atlantic Salmon	-	Threatened	-	-
Fundulus diaphanous (Newfoundland)	Banded Killifish	S3	Special Concern	Special Concern	Vulnerable
Balaenoptera musculus (Atlantic)	Blue Whale	-	Endangered	Endangered	-
Balaenoptera physalus (Atlantic)	Fin Whale	-	Special Concern	Special Concern	-
Phocoena phocoena (North Atlantic)	Harbour Porpoise	-	Special Concern	Threatened	-
Dermochelys coriacea (Atlantic)	Leatherback Sea Turtle	-	Endangered	Endangered	-
Eubalaena glacialis	North Atlantic Right whale	-	Endangered	Endangered	-
Carcharodon carcharias)	White Shark	-	Endangered	Endangered	-
Anarhichas minor	Spotted Wolffish	-	Threatened	Threatened	-
Anarhichas denticulatus	Northern Wolffish	-	Threatened	Threatened	-

Sub-national (provincial) ranks (S-ranks) retrieved from the Atlantic Canada Conservation Data Centre (ACCDC) and are up to date as of July 2023 for the province of Newfound and Labrador.
S1 Critically Imperiled; S2 Imperiled; S3 Vulnerable; S4 Apparently Secure; S5 Secure.
B Breeding, N Non-breeding, M Migrant, SU Unrankable and SNA Not Applicable
Conservation Status Categories: E Endangered, T Threatened, V Vulnerable, SC Special Concern
Source: AC CDC (Atlantic Canada Conservation Data Centre). 2023. Response to Request for Data on the Port of Argentia, NL. Email and spatial data provided on April 27, 2023.

Table 9: Projects of a Similar Nature in Proximity to Project Area

Project Name	Location	Activities	Employment Strategy	# Workers
Placentia Bay Liquefied Natural Gas (LNG) Facility and Marine Terminal (2021)	Grassy Point, Arnold's Cove	• Offshore Gas Hub in the Jeanne d'Arc Basin; • Natural Gas Pipeline from Jeanne the d'Arc Basin to Placentia Bay, NL; and • Natural Gas Liquefaction Facility and marine export terminal at Grassy Point, Placentia Bay, NL.	Employment Equity Plan (2007) – set to be revised for the Grassy Point LNG Facility	13-1,500 peak construction and 350-400 Permanent jobs

Source: NLDECC (Newfoundland and Labrador Department of Environment and Climate Change). 2022. Placentia Bay Liquefied Natural Gas (LNG) Facility and Marine Terminal Environmental Assessment Registration.

5.0 Part D: Federal, Provincial, Territorial, Indigenous and Municipal Involvement and Effects

As outlined in Schedule I of the *Information and Management of Time Limits Regulations* under the IAA, information about federal, provincial, territorial, indigenous and municipal involvement and effects is provided in this section, including:

- A description of any financial support that federal authorities are, or may be, providing to the Project;
- A list of any federal land that may be used for the purpose of carrying out the Project;
- A list of any jurisdictions that have powers, duties or functions in relation to an assessment of the Project's environmental effects. This may include permits, licenses, or other authorizations that may be required by federal authorities or other jurisdictions; and
- A list of any changes to the environment or to health, social or economic conditions that may occur in Canada that are directly linked or necessarily incidental to the involvement of a federal authority that would permit or enable the Project to be carried out in whole or in part.

5.1 (16) Federal Financial Support

The estimated cost of the Cooper Cove Marine Terminal Expansion Project is $104 million. Funding for the expansion will be sourced from various channels. As outlined in Table 10, the National Trade Corridor Fund (NTCF), administered by Transport Canada, has approved nearly $38 million in funding for the Project, and a contribution agreement is currently being drafted. Additionally, the Port of Argentia will contribute up to $36 million towards the Project. As outlined in section 3.1 Pattern Energy's amended lease agreement stipulates the necessity of substantial capital investments, ranging from CAD$20-30 million, to upgrade the port's infrastructure for an ammonia storage and export terminal. Additionally, if Pattern Energy chooses to exercise its leasing option and proceed with the development of a wind farm and a green hydrogen/ammonia terminal (contingent upon Pattern's discretion), the company has committed to providing financial support for the Cooper Cove Project, with the precise amount subject to reduction if additional third-party contributors participate in the project.

Table 10: Cost Summary

Cost Summary	Amount to be Contributed to the Project ($CAD)
Eligible Costs (NTCF)	$ 84,333,363
Indelible Costs (NTCF)	$ 19,766,650
Total Project Costs	$ 104,100,013
Contributors	
Transport Canada, National Trade Corridor Fund	$ 37,950,013
Pattern Energy	$ 30,000,000
Port of Argentia	$ 36,150,000
Total Contributions towards Eligible Costs	$ 104,100,013

5.2 (17) Federal Lands

The proposed PDA falls wholly within Parcel 01-02 (372.5 ha land parcel) and P-21-2 (319 ha parcel) of harbour lands as defined under a 2001 and 2022 "Agreement to Transfer" from the Government of Canada to the POA (Appendix A). Therefore; no federal lands fall within the Project footprint.

The nearest federally owned property to the PDA is a Marine Navigation Light property operated by Fisheries and Oceans Canada located approximately 2 km away.

5.3 (18) Powers, Duties, or Functions of Federal Authorities and Provincial Authorities in Respect of the Project

When relevant, the POA will review, verify, and secure all necessary permits, licenses, and approvals before initiating the Project's construction. Below is a summary of the primary federal, provincial, and municipal legal frameworks expected to be relevant to the proposed Project.

The following is a list of the anticipated permits, licenses and approvals required for an undertaking of this nature.

5.3.1 Federal

The *Impact Assessment Act* (IAA) applies to Projects listed in the *Physical Activities Regulations* or those designated by the Minister. The *Physical Activities Regulations*, under its Section 53, encompasses the expansion of an existing marine terminal if the expansion requires the construction of a new berth designed to handle ships larger than 25,000 DWT and, if the berth is not a permanent structure in the water, the construction of a new permanent structure in the water. Therefore, this Initial Project Description is presented to meet the criteria for a specified Project, allowing the Impact Assessment Agency of Canada (IAAC) to decide if this specific Project necessitates an impact assessment under the IAA.

Additionally, several federal permits, approvals, or other forms of authorization will likely be required following the completion of the impact assessment, as listed in Table 11.

Table 11: Federal Powers, Duties, or Functions of Federal Authorities in Respect of the Project

Powers, Duties, or Functions of Federal Authorities (Including Approvals/Permits/Authorizations)	Federal Authority
[1]*Impact Assessment Act* - Impact Assessment	Impact Assessment Agency of Canada
**Canadian Environmental Protection Act* – Disposal at Sea Authorization	Environment and Climate Change Canada
* *Canadian Navigable Waters Act* (CNWA) Authorization	Transport Canada
* Request for Review and possible *Fisheries Act* Authorization	Fisheries and Oceans Canada
Provision of Federal Funding through the National Trade Corridor Fund (NCTF)	Transport Canada

Notes:
1) Interim Guidance on the Impact Assessment Act (October 26, 2023)
*denotes permits that are dependent on design

5.3.2 Provincial

Upon review of the NL *Environmental Assessment Regulations,* 2003 list of designated undertakings, an environmental assessment (EA) might not be necessary for the proposed Project activities. Despite this uncertainty, the NLDECC-EAD has been consulted early in the Project planning and design stages to clarify these potential requirements. Table 12 provides a list of probable provincial permits and approvals needed before initiating specific construction tasks, all aimed at preserving Newfoundland and Labrador's invaluable natural resources. In addition, the POA is dedicated to following several regulatory approvals, including guidelines from the NLDECC-WRMD regarding the construction and maintenance of wharves, breakwaters, slipways, and boathouses.

If a provincial EA is required, season-specific field studies may be necessary. The POA will consult with NLDECC regarding option for a cooperative impact assessment to reduce duplication and increase efficiencies in the review and Project approval process.

Table 12: Provincial Approvals, Permits, and Registrations Required for the Project

Provincial Approvals/Permits/Registrations	Provincial Agency
*Provincial Environmental Assessment	NL Department of Environment and Climate Change
Permit to Alter a Body of Water	NL Department of Environment and Climate Change, Water Resources Management Division (NLDECC-WRMD)

Provincial Approvals/Permits/Registrations	Provincial Agency
Water Use License	NL Department of Environment and Climate Change, Water Resources Management Division (NLDECC-WRMD)
*Permit for Construction a Non-Domestic Well	NL Department of Environment and Climate Change, Water Resources Management Division (NLDECC-WRMD)
*Certificate of Approval for Storage and Handling of Gasoline and Associated Products/Used oil used glycol control regulations	Service NL
*Certificate of Approval for management of various types of waste	NL Department of Environment and Climate Change
* Permits under Endangered Species Legislation	Department of Fisheries, Forestry and Agriculture
Certificate of Approval (Industrial Compliance)	NL Department of Environment and Climate Change, Pollution Prevention Division (NLDECC-PPD)

*denotes permits that are dependent on design-build

5.3.3 Municipal

The Project's current footprint aligns with the appropriate zoning. To this end, the POA actively engages in discussions with the Town of Placentia. Such ongoing dialogues are encouraged and essential to ensure full compliance with the *Land Use Zoning, Subdivision & Advertisement Regulations 2014-2024* (TOC 2015). The POA is committed to uphold these regulations throughout the Project's development.

5.4 Federal Interests

5.4.1 Fisheries Act

From 2012 to 2019, the Fisheries Act, specifically Section 35, emphasized avoiding "serious harm to fish" unless given authorization under Section 35(2). However, 2019 amendments saw the Act revert to its older terminology, preventing the "harmful alteration, disruption, or destruction" (HADD) of fish habitats without the said authorization. This concept, while not explicitly defined in the Act itself, is elaborated upon in a DFO publication (DFO 2019a), which describes HADD as any alteration, temporary or permanent, to fish habitats that undermines its support for fish life processes.

For projects impacting fish habitats, the responsibility is on proponents to reduce HADD wherever possible. When HADD can't be completely eliminated, proponents need to obtain authorization under Section 35(2). They also have to "offset" or counterbalance the adverse residual impacts on fish habitats by enhancing existing habitats, restoring degraded ones, or even creating new habitats where none existed (DFO 2019b).

When applying for this authorization, there is a criterion the Minister of Fisheries and Oceans Canada must consider, as detailed in Section 34.1 of the Act. This encompasses the fish habitat's contribution to fisheries productivity, management objectives, potential cumulative effects on fish habitats, and Indigenous knowledge provided to the Minister, among others.

The preliminary Project impacts and environmental effects assessment outlined in Section 6.6 suggests that the Project activities, such as dreading and infilling, will impact fish and fish habitat. Nonetheless, there's confidence that suitable mitigation and offsetting measures can be identified with collaboration among stakeholders.

For the Project to proceed legally, it requires a Section 35(2) authorization, for which the Minister will weigh factors listed in Section 34.1(1) of the Fisheries Act. This evaluation will also consider consultations with Indigenous communities, public feedback, Indigenous rights and knowledge, among other parameters.

This entire process, integrating avoidance, mitigation, and offsetting guided by the DFO ensures that the Project adheres to Section 5(2)(b) of the CEA Act, 2012 when obtaining authorization under Section 35(2) of the Fisheries Act.

5.4.2 Species at Risk

The federal Species at Risk Act (SARA 2002), managed by ECCC, defines species at risk as those that are extirpated, endangered, threatened, or of special concern. While a project could potentially impact both aquatic and terrestrial species at risk, the IAA, 2019 mandates only aquatic species assessments.

The Act's Section 32(1) prohibits actions that harm these species, but exceptions can be found in Section 73(1). For a permit to be issued under Section 73(1), the proposed activity must be for scientific research, directly benefit the species, or any adverse effects must be incidental. The Minister issuing the permit must also ensure minimal impact, that the best solutions have been adopted, and that the activity will not risk the species' survival or recovery.

A preliminary desktop assessment outlined in Section 4.7.7 and Table 8 highlights several species listed as Special Concern, Endangered, or Threatened. While species as Special Concern are not afforded legal protection through the general prohibitions of Section 32(1) of SARA, Section 58(1) of SARA does prohibit the destruction of any part of critical habitat without obtaining a permit under Section 73(1) of SARA. Some Endangered or Threatened listed within 5 km of the Project include Boreal Felt Lichen, Red Corssedbill, Blue Whale, and the Harbour Porpoise, to name a few. While the impact on these species might be considered minimal, any unintended harm could necessitate a permit. Before granting this permit, criteria from Sections 73(2) and 73(3) should be evaluated to guarantee the least possible damage and no threat to their survival. Environmental changes resulting from federal decisions must be defensible, with the goal of preventing lasting harm to vulnerable species. Compliance with Section 5(2)(b) of the IAA, 2019 alongside mitigation and restoration actions, is necessary.

5.4.3 Migratory Birds

The Canadian Migratory Birds Convention Act (MBCA) is legislation designed to protect migratory birds, their nests, and eggs within Canada. While the MBCA does not specifically address habitat loss or sensory disturbances, it mandates that activities like tree and vegetation removal occur outside the migratory bird breeding season (usually Mid-April - Mid-August) to prevent harm. If birds, their eggs, or nests are absent, the MBCA's rules typically do not apply. However, if activities might impact birds during the breeding season, consultation with the Canadian Wildlife Service of ECCC is needed, and a permit might be necessary after considering mitigation measures.

Despite the impacts on habitat and disturbances, the Project is not expected to hinder migratory birds. Any residual effects on these birds, particularly from habitat degradation or disturbances, are deemed insignificant due to the industrialized nature of the area.

The main federal involvement regarding migratory birds revolves around the potential need for a permit if vegetation removal cannot be done outside their breeding season. Legally, vegetation clearing is restricted during this season unless specifically permitted by ECCC. However, such activities can proceed without a permit after the birds' outward migration in the fall and before their return in the spring. The Project area does not require vegetation removal, however, if unavoidable circumstances arise that demand vegetation removal during the breeding season (while extremely unlikely), and ECCC grants permission, it indicates that the environmental impact is justifiable and not significantly harmful to the birds.

Any granted permit would reflect due consideration to environmental impacts, ensuring alignment with the IAA, 2019 requirements, especially when applying mitigation and restoration measures.

5.4.4 Canadian Navigable Waters Act

The *Canadian Navigable Waters Act* (CNWA) came into effect in 2019, taking the place of the earlier *Navigation Protection Act* (NPA). Its primary objective is to safeguard the public's right to navigate Canada's waterways while also considering the requirements of infrastructure development and environmental conservation.

Regarding marine wharf construction projects, it is critical to recognize the distinctions made by the CNWA between waterways listed on the Schedule to the Act (referred to as "scheduled waterways") and others. Waterways that make it to the Schedule are often of significant historical, commercial, or other notable importance. Consequently, any projects proposed on these scheduled waterways generally undergo a more meticulous approval process.

Before any work is initiated on a navigable waterway, especially for this Project, seeking approval from TC is mandatory. This approval process entails submitting comprehensive outline of the Project activities and then undergoing an assessment which determines any potential navigation impacts. The Act differentiates between what it deems "minor" and more significant works, with the Minor Works Order detailing the types of projects considered to be of minor impact. If the Project construction does not fit this "minor" categorization, it is likely to be subjected to an in-depth review.

Furthermore, there is often a need for public notification for specific projects. This system ensures that the public, including indigenous communities and local stakeholders, is informed and can voice any concerns related to navigation interference. Should the Projects construction activates pose potential hindrances to navigation, the POA will work with TC to introduce certain mitigating measures. These measures could vary from installing navigation aids, such as buoys or signs, to modifying the wharf design or even restricting certain construction activities to specific times. Additionally, the Port may participate in the TC Navigation Safety Assessment Process (NSAP) if deemed necessary. Accidents and malfunctions related to marine traffic is assessed in Section 6.6.8.

5.5 Planned Environmental Studies and Permitting

The Project requires a thorough analysis of current environmental and socio-economic conditions at and adjacent to the site. Preliminary desktop reviews of available information have been completed in the development of this IPD, including topographic and resource maps, aerial imagery, ecological databases, government websites, and previous regional assessments conducted in the Project area. Desktop studies completed to date include an infill feasibility study (Appendix F), and an environmental screening of species at risk within a 5 km radius of the PDA (Appendix E). Currently, Dillon has retained Stantec to complete the geotechnical for further determination if dredging and/or sediment disposal will be required, at which time additional studies and permits may be required. Results of the geotechnical study have been included in Appendix G.

Completion of an underwater benthic habitat survey is planned for the marine water lot within Cooper Cove, which will be coordinated with Fisheries and Oceans Canada. Findings from the technical report produced from this survey will be incorporated into the Project's mitigation planning. A Project-specific Request for Review application package will be submitted to Fisheries and Oceans Canada, while a *Canadian Navigable Waters Act* (CNWA) authorization application will be submitted to Transport Canada, Navigation Protection Program (NPP).

Finally, a "Permit to Alter a Body of Water" application package will be prepared and submitted to NLECC-WRMD following the Project's release from the NL Environmental Assessment process. This application package will seek permission to make changes to the water body within the PDA. Additionally, a provincial water use license along with a permit to drill a non-domestic well may be required once the detailed designs have been completed during the design-build stage of the Project.

6.0 Part E: Potential Effects of the Project

As outlined in Schedule I of the *Information and Management of Time Limits Regulations* under the IAA, information potential effects of the Project is provided in this section, including:

- A list of any changes that, as a result of the carrying out of the Project, may be caused to the following components of the environment that are within the legislative authority of Parliament:
  - fish and fish habitat as defined in subsection 2(1) of the *Fisheries Act*;
  - aquatic species, as defined in subsection 2(1) of the *Species at Risk Act* (marine plants); and
  - migratory birds, as defined in subsection 2(1) of the *Migratory Birds Convention Act, 1994*.
- A list of any changes to the environment that, as a result of carrying out the Project, may occur:
  - on federal lands;
  - in a province other than the province in which the Project is proposed to be carried out; or
  - outside of Canada.
- With respect to Indigenous peoples of Canada, a brief description of any impact - that, as a result of the carrying out of the Project, may occur in Canada and result from any change to the environment - on:
  - physical and cultural heritage,
  - the current use of lands and resources for traditional purposes, and
  - any structure, site or thing that is of historical, archaeological, paleontological or architectural significance, based on information that is available to the public or derived from any engagement undertaken with Indigenous peoples of Canada.
- A brief description of any change that, as a result of the carrying out of the Project, may occur in Canada to the health, social or economic conditions of Indigenous peoples of Canada, based on information that is available to the public or derived from any engagement undertaken with the Indigenous peoples of Canada;
- An estimate of any greenhouse gas (GHG) emissions associated with the Project; and
- A list of the types of waste and emissions that are likely to be generated - in the air, in or on water and in or on land - during any phase of the Project.

Additionally, although not required by the *Information and Management of Time Limits Regulations* under the IAA with respect to Initial Project Description contents, a preliminary impact assessment/environmental effects assessment for selected valued components (VCs) of relevance to the Project is provided, to assist the IAAC in making its determination under Section 16(1) of the IAA.

6.1 (19) Changes to Components of the Environment within Federal Jurisdiction

The Cooper Cove Marine Terminal Expansion is a major infrastructure project with potential implications for various components of the local environment. In line with federal guidelines, the POA has conducted a preliminary evaluation of the potential impacts of this Project on specific environmental elements within the jurisdiction of Parliament. This approach ensures our assessments are thorough and aligned with federal requirements.

The preliminary assessment outlined in Section 6.6 addresses three primary environmental components: fish and fish habitat as defined in subsection 2(1) of the Fisheries Act; aquatic species, as outlined in subsection 2(1) of the Species at Risk Act; and migratory birds as defined in subsection 2(1) of the Migratory Birds Convention Act, 1994. Recognizing the potential for the Project's construction and operational activities to interact with these components, it is imperative to detail and understand any possible effects. This understanding will form the foundation for subsequent planning and potential mitigation measures.

6.2 (20) Changes to the Environment on Federal and Transboundary Lands

In compliance with the *Impact Assessment Act*, 2019 (S.C., 2019), an evaluation of potential environmental changes that might arise from implementing the Cooper Cove Marine Terminal Expansion was completed in Section 6.6.

As a result, no environmental changes are anticipated on federal lands as a direct or indirect consequence of the proposed Project. The Project is situated within the POA-tenured lands (Appendix A) without any overlap with federal territories. Furthermore, our assessment has determined that there will be no environmental ramifications in provinces other than the one in which the Project is set to be conducted.

Moreover, the Project does not anticipate inducing any environmental shifts outside of Canada. All potential environmental interactions and effects are restricted within Canadian boundaries.

As defined in section 81 of the IAA, 2019, the Project will neither impact federal lands nor have environmental repercussions in other provinces or outside of Canada.

6.3 (21) Changes to the Environment on Indigenous Peoples

The POA is committed to respecting the rights and interests of the Indigenous peoples of Canada, a preliminary assessment was undertaken regarding the potential impacts of the Project on Indigenous communities, particularly the Miawpukek First Nation (MFN). It is important to note that the MFN reserve lands are located approximately 500 km by road from the PDA, which establishes a significant distance between the two entities. The potential impacts to Indigenous interests have been further described in Section 6.6.5.

6.3.1 Impact on Physical and Cultural Heritage and Traditional Land Use

Based on available public information and consultations undertaken with the Indigenous peoples of Canada, no direct impact on the physical and cultural heritage of the MFN or any other Indigenous communities is anticipated. Additionally, the significant distance between the PDA and the MFN reserve lands minimizes potential disruptions to the current use of lands and resources for traditional purposes. Preliminary assessments have not identified any structures, sites, or entities of historical, archaeological, paleontological, or architectural significance within the project's vicinity that would be impacted.

6.4 (22) Health, Social, or Economic Conditions

Taking into consideration the distance between the PDA and the MFN reserve lands, as well as data from public sources and engagement sessions with Indigenous communities, no notable changes to the health, social, or economic conditions of the MFN or other Indigenous peoples in Canada are projected as a result of the Cooper Cove Marine Terminal Expansion. This is discussed further in Sections 6.6.6 and 6.6.7.

It is worth emphasizing that these findings are based on the currently available data and the engagements conducted to date. Continued consultations and partnerships with Indigenous communities will remain a priority as the project progresses, ensuring that any new or previously unconsidered concerns are addressed adequately.

6.5 Preliminary Impact Assessment/Environmental Effects Assessment

Although not required by the *Information and Management of Time Limits Regulations* under the IAA with respect to IPD contents, a preliminary impact assessment/environmental effects assessment for selected valued components (VCs) of relevance to the Project is provided in this section, to assist the IAAC in making its determination under Section 16(1) of the IAA.

6.5.1 Selection of Valued Components

Valued components (VCs) encompass elements of the biophysical and socioeconomic settings that hold importance for regulatory bodies, the general public, other stakeholders, and Indigenous communities. The criteria for VC selection encompass regulatory factors, scientific considerations, existing laws, policies, guidelines, and mandates. Additionally, input from consultations with regulatory agencies, the general public, indigenous communities, stakeholder groups, field observations, and professional expertise play a pivotal role in this selection.

For the Project, the identified VCs include:

- Atmospheric Environment;
- Acoustic Environment;
- Potable Water Resources;
- Marine ecosystem (covering fish and their habitats);
- Freshwater environment (including fish and fish habitat);
- Wetlands and terrestrial vegetation;
- Terrestrial fauna and their habitats;
- Socioeconomic conditions;
- Human Health;
- Navigation;
- Heritage resources; and.
- Indigenous Rights.

The core of the environmental/impact assessment lies in recognizing how the Project might intersect with these VCs, potentially leading to environmental consequences. Given that each stage of the Project has distinct activities and might have varying interactions with the VCs, the effects assessments for the construction and operation phases were conducted distinctly.

6.5.2 Scope of Assessment

6.5.2.1 Spatial Boundaries

The evaluation's spatial boundaries, defining where potential effects might manifest, are generally determined by natural system boundaries for biophysical VCs and administrative or political boundaries for socioeconomic VCs. The assessment of possible environmental interactions with the VCs spans two primary areas: the Project Development Area (PDA) and the Local Assessment Area (LAA) as depicted in Figure 11.

FILENAME: G:\CAD\DANIELLE BOWERING\213088-1401-COOPER COVE\CAD FILES FOR IPD\C11 - PROJECT DEVELOPMENT AREA AND LOCAL AREA ASSESSMENT.DWG PLOTTED BY: BOWERING, DANIELLE ST. JOHN'S
PLOT DATE: 2023-11-02 @ 3:45:44 PM PLOT SCALE: 1:25.4 PLOT STYLE: DILLON-STANDARD.CTB

Conditions of Use

Verify elevations and/or dimensions on drawing prior to use. Report any discrepancies to Dillon Consulting Limited.

Do not scale dimensions from drawing.

Do not modify drawing, re-use it, or use it for purposes other than those intended at the time of its preparation without prior written permission from Dillon Consulting Limited.

DILLON CONSULTING

No.	ISSUED FOR	DATE	BY
0	ISSUED FOR REPORT	3-NOV-2023	DSB

DESIGN: S. PEARCE	REVIEWED BY: S. PEARCE
DRAWN: D. BOWERING	CHECKED BY: D. BOWERING
DATE: MAY 2023	
SCALE: AS SHOWN	

COOPER COVE
MARINE TERMINAL EXPANSION

PROJECT DEVELOPMENT AREA
LOCAL AREA ASSESSMENT

PROJECT NO. 21-3088-1401

SHEET NO. C11

Project Development Area (PDA)

The Project Development Area (PDA) is defined as the area of physical disturbance (or physical footprint) associated with the Projects activities. As outlined in Section 4.1, the PDA consists of a total area of up to approximately of 103, 000 m^2 of the marine water lot extending from the existing wharf at the POA into Cooper Cove. Land use for this Project will be determined as part of the design-build stage.

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 13.

Table 13: Local Assessment Areas (LAA) for Valued Components

Valued Component	Local Assessment Area (LAA)
Atmospheric environment	A 0.5 km buffer around the PDA
Acoustic environment	A 0.5 km buffer around the PDA
Potable Water Resources	A 0.5 km buffer around the PDA
Marine environment (including fish and fish habitat)	The PDA within Cooper Cove
Freshwater environment (including fish and fish habitat);	The PDA within Cooper Cove
Wetlands and terrestrial vegetation	The PDA within Cooper Cove
Terrestrial wildlife and wildlife habitat	0.5 km around the PDA
Socioeconomic environment	The PDA and surrounding communities
Human health	A 0.5 km buffer around the PDA
Navigation	The PDA and Port of Argentia travel routes in Placentia Bay
Heritage resources	Within the boundaries of the PDA
Indigenous rights	The PDA and those lands that are encompassed within surrounding communities

6.5.2.2 Temporal Boundaries

Temporal boundaries vary according to the different Project phases and potential effects. In typical construction phases, specific construction-related effects are typically short-term (for example, effects related to the design-build activities).

The temporal boundaries for the Project correspond to the timing of the Project phases as were defined in the Project schedule in Figure 5.

6.5.2.3 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) and baseline studies 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 which are further outlined in Table 21.

6.5.2.4 Significance Descriptors

The descriptors that will be used to assess the significance of impacts/environmental effects are provided in Table 14.

Table 14: Effects Significance Evaluation

Characterization Criteria	Criteria Definition	Range of Criteria
Duration	The length of time the residual effect is expected to persist	Short-term: Effect lasts less than 1 year (i.e., during one specific sub-phase of the project such as dredging or infilling). Medium-term: Effect lasts 1-5 years (i.e., the duration of the construction phase of the project) Long-term: Effect lasts greater than 5 years until the end of useful life of the Project. Permanent: Indefinitely; beyond the useful life of the Project.
Magnitude	The expected size or intensity of the residual effect on a VC	Negligible: No detectable changes from baseline conditions. Low: Change that is not likely to have a definable, detectable, or measurable effect above baseline (i.e., potential effect is within a normal range of variation) or is below established thresholds of acceptable change (e.g., water quality guideline) Moderate: 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. High: 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	Discrete: Effect occurs within the PDA. Local: Effect extends beyond the PDA but not beyond the LAA. Regional: Effect occurs beyond the LAA but within the regional area (i.e., within the Town of Placentia Bay and surrounding communities). Beyond Regional: Effect extends beyond Placentia Bay.
Frequency	How often the residual effect occurs	Once: Effect occurs once during any phase of the Project. Intermittent: Effect occurs at intermittent or sporadic intervals during any phase of the Project. Regular: Effect occurs at regular intervals during any phase of the Project. Continuous: Effect occurs continuously during any phase of the Project.
Reversibility	The degree of permanence of a residual effect and whether the residual effect can be reversed once the physical activity or activity causing the disturbance ceases	Reversible Short-Term: Effect ceases when the activity ceases and is readily reversible over a short period of time (i.e., within a 1-year period). Irreversible: Effect that persists even after the activity causing it ceases, and cannot be reversed (i.e., is permanent).
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 in which the VC have 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 in which the VC is located 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 in which the VC are located relatively pristine and have not been affected by human activities.

6.6 Project-Valued Component Interactions

A preliminary assessment, presented in Table 15, was conducted to determine potential interactions between the Project and each VC. Only those interactions predicted to result in a tangible negative impact on the VCa underwent a preliminary assessment (Table 15). VCs that still showed residual impacts post-mitigation were further evaluated for the significance of these effects (Table 21). Conversely, any impacts that did not indicate a substantive environmental change as a result of proposed activities required for the Project were not further assessed.

Table 15: Project Interactions with Value Components (VC) of the Environment

Valued Component (VC)	Project Phases				
	Construction				Operation
	Phase 1 Dredging	Phase 2 Caisson Placement	Phase 3 Infilling	Phase 4 Top-side Infrastructure	
Atmospheric environment	✓	✓	✓	✓	✓
Acoustic environment	✓	✓	✓	✓	✓
Potable water resources					
Marine environment (including fish and fish habitat)	✓	✓	✓	✓	✓
Freshwater environment (including fish and fish habitat)					
Wetlands and terrestrial vegetation					
Terrestrial wildlife and wildlife habitat					✓
Indigenous rights*	✓	✓	✓		✓
Socioeconomic environment	✓	✓	✓	✓	✓
Human health	✓	✓	✓	✓	✓
Navigation	✓	✓			✓
Heritage resources	✓				

Legend: ✓ = Potential interaction; *= Preliminary interactions identified; to be confirmed through consultation and engagement.

In the table above, the interaction with a particular VC is identified when the interaction first occurs. VCs for which an interaction occurs are carried forward in the environmental effects evaluation below.

The VCs with no anticipated interactions with any Project phase include:

- Potable Water Resources: the Project is not anticipated to have any interactions with potable water resources. Potable water is provided to though Placentia municipal services. Furthermore, the PDA encompasses primarily the marine environment (which is not considered a potable resource) or lands directly adjacent to the marine environment, which would not have interaction with potable water resources. The closest Public Water Supply Area is Larkin's Pond, located approximately 4 km from the PDA (GNL 2023).

- Freshwater Environment (including fish and fish habitat): the Project is not anticipated to have any interactions with the freshwater environment. There are no freshwater watercourses located within 100 m of the PDA.
- **Wetlands and Terrestrial Vegetation:** the Project is not anticipated to have any interactions with wetlands or terrestrial vegetation. The Project is located on a heavily industrialized site with no vegetation, and no wetlands are located on or near the Project.

6.6.1 Atmospheric Environment

Construction activities, particularly the intensified use of heavy machinery, contribute to a notable rise in airborne emissions. Activities such as stockpiling and transferring fill materials further add to the concentration of airborne particulates. To mitigate these environmental impacts, construction equipment must be consistently maintained in top condition. There's also an emphasis on controlling material drop heights and the volume of infill being transferred to reduce dust generation. In conditions where wind might exacerbate dust dispersion, measures like applying water are crucial. Additionally, operations result in airborne exhaust emissions from marine vessels using auxiliary engines while docked and from heightened vehicular traffic. A proposed mitigation strategy is to undertake a comprehensive Port electrification study. This study would explore the potential of shore power technologies, allowing vessels to shut down their auxiliary engines, thus reducing emissions.

6.6.2 Acoustic Environment

During construction, various sources of noise are anticipated, including vehicle traffic on the site and access road, on-site equipment, and specific construction activities like blasting to meet grade requirements. Additionally, marine noise is expected due to infilling operations. To address these concerns, a noise management plan will be implemented detailing the construction activities, equipment, and their timing and duration, especially those that produce high noise levels. The use of equipment and machinery that meet noise emission standards will be prioritized, and construction activities will be scheduled during non-sensitive hours, such as weekdays and daytime, to lessen the impact on neighboring community.

Furthermore, the public will be kept informed through warning signals and communication channels about ongoing construction activities and potential noise levels. Construction activities will be meticulously scheduled to avoid sensitive periods for marine life, such as their migration, spawning, or breeding seasons. Personnel will be trained to identify and report the presence of marine mammals and other marine life near the construction area. If any marine life is detected, construction activities will be halted immediately to ensure their safety.

6.6.3 Marine Environment

The construction activities associated with the proposed PDAs and the greater Placenta Bay marine environment could have far-reaching environmental effects including effects to fish and fish habitat as defined in subsection 2(1) of the *Fisheries Act*. One of the primary concerns is the potential disruption and degradation of the local marine habitat which provides food, shelter, and attachment sites for various organisms, especially juvenile fish as a result of dredging and infilling activities. Soft bottom habitats offer burrowing sites, while hard bottoms like cobble, boulder, canyons, and shelf edges provide structural habitat. Biogenic habitats created by living marine plants and animals, such as corals, sponges, kelp, rockweed, and eelgrass, are complex and productive (DFO 2012). If determined by Fisheries and Oceans Canada (DFO) that the Project may cause HADD (harmful alteration, disruption or destruction) of fish habitat, POA shall apply for and obtain an authorization under Section 35(2) of the Fisheries Act, with applicable offsetting and monitoring. Additionally, carrying out work in water works that may disturb marine mammals will be conducted in accordance with the *Canada's Marine Mammal Regulations* (SOR/93-56*)* under the *Fisheries Act* and in coordination with DFO through the Request for Review/Fisheries Act Authorization process.

In addition to habitat loss, extending the existing wharf can introduce construction noise and increase sedimentation into the marine environment. Construction noise can be highly disruptive to marine life, particularly species that rely on sound for communication, navigation, and prey detection (DFO 2022). The loud and constant noise from construction activities can disorient marine animals and interfere with their ability to find mates, locate food, or avoid predators. Moreover, the increased sedimentation resulting from the construction process can suffocate fish eggs, destroy protective mucous covering the eyes and scales increasing susceptibility to infections and disease, and increase water temperatures adding stress on marine life (GOC 2023c).

Increased marine traffic is also anticipated, which can further adversely affect the marine ecosystem. The constant movement of vessels, including large ships and smaller boats, can generate underwater noise, physical disturbances that disrupt the behavior and activities of marine life and increase the potential for fuel spills and other environmental emergencies. The POA will conduct shoreline classification and sensitivity mapping in strategic zones surrounding the marine terminal and along ship transit routes. This would provide crucial data to environmental emergency response planning for vessel mishaps like collisions or groundings that might lead to fuel spills, especially of marine diesel and Bunker C fuel oil, which could threaten the nearby marine environment. Furthermore, the evolving threat of climate change necessitates forward-thinking. In our mitigation and contingency planning and design for dock and shoreside infrastructure, hazardous materials storage and handling and shoreline stability is crucial to factor in potential climate change repercussions such as; extreme weather occurrences, storm surges, and sea-level rise.

6.6.4 Terrestrial Wildlife and Wildlife Habitat

Adverse effects on the terrestrial environment within the project area as a result of construction activities are not anticipated. This is due to the prevailing conditions of an industrial port environment. The surrounding areas of the PDA are not expected to have a significant presence of terrestrial mammals (VBNC 2002). Although potential resident terrestrial wildlife such as otters, muskrats, and moose may exist in the Argentia area, their occurrence specifically on the Argentia Peninsula is considered less likely (VBNC 2002).

The Argentia Peninsula is known for its diverse bird population, including nesting colonies of gannets, alcids, and gulls during the summer which operational activities may impact. Additionally, foraging communities of shearwaters can be found within the inshore zone of Placentia Bay. While the nearshore waters of Placentia Bay witness a significant presence of waterfowl during the winter months, construction activities are not anticipated to impact their residence, feeding, staging, or overwintering behaviors (VBNC 2002).

6.6.4.1 Species at Risk

The effects of the Project activities, such as; infilling and dredging activities on SAR within a 5 km radius of the Project area, were examined. The Water Pygmy-Weed (*Crassula aquatica*), listed as vulnerable provincially, thrives in semiaquatic environments near the coast. However, it is not expected to inhabit the shores within the Project boundary as it is exclusively found on the southern Avalon and Burin Peninsulas of Newfoundland (Wildlife Division, 2021). The Short-eared Owl (*Asio flammeus*) and Harlequin Duck (*Histrionicus*) are highly susceptible to the impacts of construction, such as habitat loss and disturbance. The Red Crossbill (*Loxia curvirostra - percna subspecies*) and Boreal Felt Lichen (*Erioderma pedicellatum*), however, these species are unlikely to be directly affected due to the absence of vegetation and suitable nesting and feeding grounds in the project area.

Sensitive habitats within the nearshore Project area, including eelgrass beds, capelin beaches, coastal wetlands, Important Bird Areas, and seal haul-outs, need careful consideration. Eelgrass, a productive habitat for juvenile fish, was observed in Argentia Harbour and plays a crucial role in supporting various fish species. Capelin spawning on beaches near Argentia has historically been reported, with gravel substrate preferred.

The mouth of Placentia Bay is home to major seabird colonies, such as Cape St. Mary's Seabird Ecological Reserve, an important bird area (IBA). Placentia Bay has also been identified as an ecologically and biologically significant area (EBSA) by the DFO, highlighting its special biological and ecological significance within the region.

While the presence of SAR and sensitive habitats or the use of the area for SAR to reside, feed, stage, or overwinter are not found on the Argentia Peninsula (VBNC 2002), thorough planning and appropriate mitigation measures to reduce potential adverse impacts are still a commitment of the POA.

6.6.4.2 Migratory Birds

The proposed PDA does not fall within an area identified as a migratory bird sanctuary or other conserved area by ECCC (ECCC 2023), however the PDA is within 75 km of the provincial ecological reserve of Cape St. Mary's as well is within a close proximity of Placenta Bay, NF028 (IBA 2023), an IBA. Migratory birds, as defined in subscription 2(1) of the *Migratory Birds Convention Act* are not anticipated to be directly affected by the Projects construction activities. However, indirect effects such as noise disturbances and increased light during construction and increased marine traffic can negatively affect the migration, breeding success, foraging patterns, and overall population dynamics of these migratory birds within the vicinity of the Project area.

6.6.5 Indigenous Rights

The Project is located within the ancestral homelands of the Beothuk, on the island of Ktaqmkuk (Newfoundland) as the unceded, traditional territory of the Beothuk and the Mi'Kmaq. The nearest community to the Project is Miawpukek First Nation, located 477 kilometers by vehicle. Qalipu First Nation does not manage any reserve lands; however, membership is spread across 67 traditional Mi'kmaq communities over 9 electoral wards in the northern and western parts of Newfoundland. While there are historical accounts of traditional land use and hunting on the shores of Placentia Bay going back to the 1590s, it is unknown whether those activities took place near the Port of Argentia (QFN 2023). There are additional archival reports of the presence of Mi'kmaq families near Placentia in the years 1680, 1705, and 1707 (QFN 2023) it is also unknown if there was any historical presence of Mi'kmaq families in the current Project area.

In the absence of feedback from Indigenous communities at this time, considering information on this subject from nearby projects (i.e., Vale's Long Harbour Commercial Nickel Processing Plant), as well as historical information, the POA is of the understanding that this Project will have a low impact on Indigenous peoples, as outlined in Section 6.3. This classification of low impact indicates that the Proponent is not aware of concerns or interests by a potentially affected Indigenous group or community, but this does not imply that the impact do not exist. This level of impact was determined based on the proximity of Indigenous communities to the PDA, the absence of practicing of Aboriginal and/or Treaty Rights in and around the Port of Argentia, and the current and past level of industrial activity near the PDA.

The POA is committed to continued engagement with Indigenous communities and working in collaboration with federal and provincial regulators to coordinate engagement initiatives and consultation requirements to better understand the Project's impacts on Indigenous peoples, and if necessary, mitigate impacts to the health, social, or economic conditions.

6.6.5.1 Food, Social and Ceremonial Fishing

Food, Social, and Ceremonial (FSC) Fishery is a collective (i.e., communal) Indigenous right protected under Section 35 of the *Constitution Act, 1982*. The FSC Fishery designates an Indigenous Nation the right to harvest and catch what is necessary for themselves for FSC purposes, unlike commercial fisheries that sell their catch (DFO 2022). Additionally, FSC fishing may occur at times of the year that are not necessarily aligned with commercial fishing. FSC licences are issued by Fisheries and Oceans Canada (DFO) according to the *Aboriginal Fishing Licences Regulations* (DFO 2022). As of April 2018, there were 40 groundfish communal commercial licenses authorized in the Newfoundland and Labrador region to the following groups (DFO 2019c):

- Nunatsiavut Government (NG);
- Innu Nation;
- Nunatukavut Community Council (NCC);
- Miawpukek First Nation (MFN);
- Qalipu Mi'kmaq First Nation Band (QMFNB).

In a search conducted by DFO in 2023, they concluded that both MFN and QMFNB both have fishing interests in Northwest Atlantic Fisheries Organization (NAFO) Subdivision 3Psc, which overlaps Placentia Bay (DFO 2016). Specifically, Miawpukek First Nation holds both FSC licences and Aboriginal, Commercial Communal licences in 3Psc. Based on information provided by DFO in 2023, Mi'kmaq Alsumk Mowimsikik Koqoey Association, representing both Miawpukek First Nation and Qalipu First Nation Band, holds only Communal Commercial fishing licences for 3Psc. DFO has indicated that in the 3Psc subdivision, Atlantic cod, snow crab, lobster, sea cucumber, whelk, scallop, and Atlantic and Greenland halibut are species of interest to these organizations. Therefore, impacts to the FSC Fishery right must be considered in the context of this Project.

There are potential impacts to fish and fish habitat and right to fish resulting from construction of the Project and increased marine traffic during operation in the short and long-term. Impacts such as noise, changes/loss to habitat (via dredging and infill), etc. would be localized to the PDA. While the FSC licences exist in the same subdivision as the POA, it is unlikely that there will be overlap between the Project area and FSC fishing locations for Miawpukek First Nation and Qalipu First Nation. Without confirmation from either of these First Nations groups, however, it would not be appropriate to assume that the Project has low-level impacts on fish and fish habitat and the right to fish at this time. The POA is committed to continued engagement with those participating in the FSC Fisheries throughout the Project planning stage.

6.6.5.2 Land, Traditional Land and Resource Use

Since the 1940s, the port continues to be a highly industrial area as it supports the transportation, container shipping, renewable energy, offshore energy, seafood, critical metal smelting (nickel, copper, cobalt), and metal recycling industries. The POA is unaware of any traditional land use (e.g., hunting or trapping) in or near the Project area, however, it is possible that this area was historically a culturally important site for nearby Indigenous groups. It is expected that as the engagement process progresses, more information will be provided as to the current land use in or near the Project area and proper mitigation measures can be considered for such impact.

In the absence of that information, the Proponent is of the understanding it is unlikely there will be limits to traditional land use in or near the PDA. Should there be impacts ranging from the Project construction activities impacts will be short-term, and are not expected to impact food security, mental health, or well-being.

6.6.5.3 Plans for Future Engagement

To date, POA has conducted early Indigenous and stakeholder engagement. Understanding the requirements as set out by the IAAC, the POA further committed itself to the following future engagement as the regulatory process unfolds:

- An additional follow-up letter to Indigenous organizations requesting feedback on the Project sent on August 18, 2023;
- A letter to each of the non-government organizations provided by the Agency, sent on August 22, 2023; and
- Follow up emails and phone calls to Indigenous and non-government organizations as required.

The Port of Argentia is committed to ongoing dialogue with Indigenous communities, public stakeholders including community organizations, non-governmental organizations, and interested parties. While all involved parties have shown interest in staying informed about the Project's progress, feedback has been limited since the Project is in its initial phases of formal engagement. Future consultation and engagement initiatives will be specifically designed for Indigenous communities and organizations needing to provide input, and may include:

- **Project Introduction Workshops**: Since the Project is in its early planning stages, initiate “Project Introduction Workshops” specifically for interested parties to clarify the Project's scope and outline potential impacts, including impacts to Indigenous rights, health, social and economic well-being;
- Public and Stakeholder Open Houses: Organize these sessions approximately bi-annually or based on Project milestones to serve as platforms for direct interaction, addressing concerns, and providing clarifications;
- Virtual Engagement Sessions: Considering stakeholders' diverse geographical locations, ensure virtual sessions' availability (align with above mentioned workshops and open houses as well as upon request); and,

- Feedback Sessions: Use surveys, feedback forms during open houses, and dedicated email addresses to gather and address concerns, suggestions, and feedback.

Activities and materials will be planned and utilized to provide information and solicit feedback from Indigenous communities, public stakeholders including community organizations, non-governmental organizations, and interested parties. The engagement and communication strategies will encompass a range of communication mechanisms which can be tailored specifically to the interest group. These mechanisms include notification letters, direct mail/email campaigns, and newspaper advertisements. Additionally, to foster open dialogue and provide accessible information, the Port of Argentia will participate in public and stakeholder open houses. These sessions will be conducted in person and virtually, ensuring that all interested parties can participate, regardless of their geographical location or preference.

The POA will continue updating the existing Record of Engagement (Appendix B) to summarize and track all communications. An Issues Tracking Sheet (Appendix B) has also been developed in the event that issues, concerns, or questions related to the Project are brought forward. The Issues Tracking Sheet will determine whether the issue, concern, or question has been appropriately accommodated, mitigated, etc. The POA is committed to continued engagement with Indigenous communities, working in collaboration with federal and provincial regulators to coordinate engagement initiatives and consultation requirements. In line with responsible development principles, POA is committed to engaging in constructive and positive relationships with stakeholders throughout the entire Project lifecycle.

6.6.6 (**22**) Socioeconomic Environment Impacts

The POA has played a vital role in the socio-economic development of Newfoundland and Labrador. As a working harbour, it has supported a range of industries, including offshore oil and gas, shipping, fisheries, commercial forestry, and both historical and active mineral claims. The POA has provided approximately 400 full time positions and 80 part time positions over the past three years, creating opportunities and income for local and surrounding communities and contributed to their economic well-being.

The POA has served as a gateway for international trade, facilitating the movement of goods and services between North America and Europe. This has led to the development of various industries, such as shipping, tourism, and transportation, which have created employment opportunities and contributed to the province's economic growth. For example, the construction of the Hibernia oil platform in the 1990s brought new economic opportunities to the port, significantly increasing activity and investment.

The POA now has the potential to generate significant economic benefits for Newfoundland and Labrador with this Project. It is estimated that 315 person-years of direct employment and the creation of up to 800 jobs during construction.

The Project has the potential to be a critical economic asset for Newfoundland and Labrador, providing employment, income, and opportunities for trade and investment for many years to come. This expansion could benefit the region significantly and contribute to its long-term socio-economic growth.

From a health perspective, there may be both positive and negative effects as a result of the Project. Service by one acute care facility, offering 24-hour emergency care, obstetrics, physiotherapy, occupational therapy, x-ray, laboratory services along with a diabetic clinic and palliative care, the Placentia Health Care Centre is the areas primary healthcare facility. On the positive side, the economic prosperity generated by the project could improve health outcomes by enabling better access to healthcare and reducing poverty and income inequality. However, the Project might also pose physical risks to construction workers may include accidents, exposure to hazardous materials, and work-related stress, the POA will require comprehensive Health and Safety Plans for all work conducted at the PDA. For the wider community, increased effects of anthropogenic impacts such as increased marine vessel traffic in the Project area could have long term effects on the local communities. Furthermore, the project could lead to changes in the local marine environment, potentially impacting fish populations and other marine life, which could harm local fisheries and food security, with indirect consequences for the community's health and wellbeing. Therefore, careful planning and management are crucial to mitigating these potential impacts.

6.6.6.1 Gender-Based Analysis Plus

The POA is committed to learning about how the Project may impact women, men, gender-diverse people, as well as Indigenous peoples due to the fact that people experience impacts differently. As engagement for this Project progresses, the POA hopes to understand the positive and negative impacts of the Project and mitigate those accordingly.

Some of the questions POA hopes to answer as engagement progresses include:

- Will the Project impact the standard of living of nearby residents, including housing and social services due to potential influx of workers?
- Who might be affected by the project? How do we know? Will these positive or negative impacts be different for sub-groups in each Indigenous community?
- How does the social and historical context of the Indigenous community affect how people may be differentially impacted by the project?
- Are baseline profiles of Indigenous communities available, disaggregated by age, ethnicity, sex or other community-relevant factors to support analysis?
    - Dillon reached out to the Office Indigenous Affairs and Reconciliation for this information in the absence of community feedback in September 2023. They concluded that the Office does not

keep disaggregated data related to Indigenous communities. The Office also noted that there are no established Indigenous communities in the Placentia region.

6.6.6.2 Social Impacts

The Placentia Bay region, situated on the southeastern coast of Newfoundland, is home to 3,289 residents, boasting a population density of 56.9 per km^2. The area's diverse terrains offer ample recreational opportunities for both locals and tourists, including fishing, trapping, camping, and hunting. While there are no First Nations lands close to the site, the Miawpukek First Nation is roughly 150 km away. Placentia Bay includes Food, Social and Ceremonial and Commercial Fisheries. The Castle Hill National Historic Site is 10 kilometres from the PDA, and the Cape St. Mary's Ecological Reserve is about 75 kilometres away.

The Placentia Bay region has a rich historical and social context defined by its coastal communities, unique culture, and relationship with the sea. The local areas economy has historically been rooted in fishing, driven primarily by the cod fisheries. However, over the years, with the decline in fish stocks and the cod moratorium, communities within the bay have had to diversify their economic endeavours. Today, the economic landscape includes fishing, aquaculture, oil and gas services, and tourism. The bay has witnessed infrastructure projects in the past, such as the construction of the Hebron oil platform, indicative of its evolving economic base (TOP 2021).

The proposition of a marine terminal expansion in Argentia presents both opportunities and challenges. On the positive side, such an expansion can boost the local economy by generating direct and indirect employment opportunities during the construction and operational stages of the Project. This can lead to increased income for families and greater commercial activity for local businesses, as well as support local governments fund development for adequate public infrastructure such as roads, bridges, and water and wastewater facilities (FCM 2017). Additionally, it can pave the way for larger ships, expanding trade, and fostering the growth of related industries like shipping, logistics, and even tourism. Conversely, potential adverse effects include job displacement in traditional sectors or short-term employment spikes leading to economic volatility once construction is complete.

To manage and mitigate any negative employment impacts, the POA proposes a multi-pronged approach include skills training and transition programs for workers displaced from traditional industries, ensuring that they are aptly equipped for jobs in newer sectors. Job assurance or rotational job programs can be introduced to guarantee employment beyond the construction phase. Furthermore, investing in community and economic development projects, which can provide long-term sustainable benefits to the community, can counteract short-term economic fluctuations.

6.6.6.3 Economic Impacts

POA engaged Strategic Concepts, Inc. (SCI) to assist with the estimation of high-level economic impacts associated with the Project. The analysis was completed using economic impact parameters from recent engagements and adjusting for the nature of the forecasted activity. SCI made high-level estimates of the impacts on the NL and Canadian economies.

The approach to economic modelling involved starting with the forecasted capital and operating expenditures for the Project. From there, a direct labour estimate was made as a share of Capex and Opex costs to generate labour costs. Average annual labour costs per full-time equivalent (FTE) were applied to the total labour costs to generate an estimate of direct employment.

Indirect and induced employment was estimated based on SCI's value-added model whereby the non-labour expenditures associated with the Project were considered and based on the nature of those expenditures and SCI's knowledge of previous projects and the NL supplier industry, estimates were made as to the potential share of non-labour that could be supplied by NL-based firms.

The impacts include those resulting from the direct capital expenditures for the Project itself as well as the potential projects that would be enabled by the completion of the Project. The table below shows the estimated impacts on employment specifically from the construction phase of the Project only.

Economic impacts of the Project are summarized in Table 16.

Table 16: High-Level Economic Impacts, Marine Terminal Expansion – (FTEs)

	NL	Rest of Canada (ROC)	CAN Total
Employment – Wharf Capex			
Direct	315	0	315
Indirect	145	60	205
Induced	220	75	295
Total Employment – Wharf Capex	670	135	805
Income - Wharf Capex (M$)			
Direct	25	0	25
Indirect	2	2	4
Induced	3	2	5
Total Income - Wharf Capex	30	4	34

As illustrated in Table 16, the Project is anticipated to generate 805 person years of employment over a three-year construction period including 670 person years of employment in NL, of which 315 person years will be direct employment.

The Project is expected to generate significant investments in new industries at the POA. More than $4 billion in capital expenditures could result from investments in the following:

- A renewable wind-hydrogen project;
- Monopile marshalling yard, and
- Offshore spool base

Table 17 below summarizes some high-level potential economic impacts resulting from the capital expenditures for the NL and Canadian economies. These impacts from capital expenditures are expected to occur over a 6–8-year time period. In total, the Project could lead to the generation of approximately 20,000 person years of employment from capital investments over the next ten years, including 11,000 person years of employment in NL.

Table 17: High-Level Economic Impacts, Marine Terminal Expansion and Investments in Renewable Energy, Spool Base and Monopile Marshalling Yard – (FTEs)

	NL	Rest of Canada (ROC)	CAN Total
Employment – Wharf Capex			
Direct	5,649	2,824	8,473
Indirect	1,430	2,824	4,255
Induced	3,979	3,276	7,255
Total Employment - Capex	11,058	8,925	19,983
Income - Capex			
Direct	452	226	678
Indirect	79	184	262
Induced	159	164	323
Total Income - Capex	690	573	1,263
Taxation - Capex			
Direct	117	123	-
Indirect	10	23	-
Induced	33	31	-
Total Taxation - Capex	160	178	-

Estimates are also provided for the annual level of operating impacts that would result from the potential projects. These figures are based on very preliminary estimates and are provided to indicate the potential level of direct impacts from the capital expenditures for the POA and potential projects that would be enabled by the Project.

During operations, the total annual direct employment is expected to be in the 600–800-person range, with another 300-400 indirect and induced jobs expected to be generated by the economic activity in Newfoundland and Labrador.

6.6.6.4 Labour Availability and Occupations Required

The occupations required for the construction of the Project are typical jobs required for civil construction and include positions that fall within the following National Occupational Classification (NOC) codes (as the final Project scope and design are finalized, the numbers of persons required for each type of position will get better defined). On a preliminary basis, the following occupations summarized in Table 18 may be employed on the Project.

Table 18: National Occupational Classification

FTEs by NOC Code	2023-24	2024-25	2025-26	2026-27	2027-28	Totals
12010 - Supervisors, general office and administrative support workers	-	-	0.9	0.7	0.9	2.4
12100 - Executive assistants	-	-	0.4	0.4	0.4	1.2
12101 - Human resources and recruitment officers	-	-	0.4	0.4	0.4	1.2
12102 - Procurement and purchasing agents and officers	0.8	0.7	0.6	0.5	0.6	3.3
12200 - Accounting technicians and bookkeepers	-	-	1.9	1.6	1.9	5.5
20010 - Engineering managers	-	-	4.3	7.2	4.3	15.8
21120 - Public and environmental health and safety professionals	1.9	1.8	-	-	-	3.7
21201 - Landscape architects	0.6	0.6	-	-	-	1.2
21203 - Land surveyors	1.0	1.0	-	-	-	2.0
21300 - Civil engineers	1.3	1.2	-	-	-	2.5
21310 - Electrical and electronics engineers	0.6	0.6	-	0.5	0.5	2.2
22210 - Architectural technologists and technicians	0.6	0.6	-	-	-	1.2
22212 - Drafting technologists and technicians	0.6	0.6	-	-	-	1.2
22213 - Land survey technologists and technicians	0.6	0.6	-	-	-	1.2
22231 - Engineering inspectors and regulatory officers	0.6	0.6	-	-	1.2	2.4
22232 - Occupational health and safety specialists	0.6	0.6	-	-	-	1.2
22233 - Construction inspectors	0.6	0.6	4.3	7.2	3.4	16.1

FTEs by NOC Code	2023-24	2024-25	2025-26	2026-27	2027-28	Totals
22300 - Civil engineering technologists and technicians	1.0	1.0	-	-	-	2.0
22310 - Electrical and electronics engineering technologists and technicians	0.4	0.4	-	0.2	0.2	1.2
70010 - Construction managers	1.3	1.2	4.3	7.2	4.3	18.2
72011 - Contractors and supervisors, electrical trades and telecommunications occupations	-	-	-	0.5	0.5	1.0
72013 - Contractors and supervisors, carpentry trades	-	-	2.5	5.6	3.6	11.6
72021 - Contractors and supervisors, heavy equipment operator crews	-	-	6.9	11.1	6.4	24.4
72105 - Ironworkers	-	-	3.5	7.8	8.9	20.2
72201 - Industrial electricians	-	-	-	2.9	2.9	5.8
72310 - Carpenters	-	-	10.0	22.3	16.2	48.5
72401 - Heavy-duty equipment mechanics	-	-	5.0	7.5	4.1	16.7
72500 - Crane operators	-	-	2.6	5.6	1.7	9.9
73300 - Transport truck drivers	-	-	2.9	5.6	2.0	10.5
73400 - Heavy equipment operators	-	-	30.9	34.8	17.9	83.6
75101 - Material handlers	-	-	2.6	5.6	1.7	9.9
75110 - Construction trades helpers and labourers	-	-	6.8	12.5	7.5	26.8
Totals	12.8	12.1	90.8	147.7	91.6	355.0

6.6.6.5 Labour Force by Occupation

Data at the 4-digit occupational level is not available for NL. The 2021 Census results for the NL labour force is summarized in the Table 19.

Table 19: Labour Force Occupation

Occupation	Total	Male	Female
Occupation - not applicable	6,930	3,810	3,120
0 Legislative and senior management occupations	2,045	1,195	845
1 Business, finance and administration occupations	32,540	8,655	23,880
2 Natural and applied sciences and related occupations	15,155	11,765	3,390
3 Health occupations	21,510	3,785	17,730
4 Occupations in education, law and social, community and government services	33,725	9,490	24,235
5 Occupations in art, culture, recreation and sport	4,735	2,040	2,700
6 Sales and service occupations	59,440	24,065	35,370
7 Trades, transport and equipment operators and related occupations	47,285	43,685	3,600
8 Natural resources, agriculture and related production occupations	10,740	8,785	1,960
9 Occupations in manufacturing and utilities	9,225	6,410	2,820
Totals	243,330	123,685	119,650

6.6.6.6 Employment and Procurement

As a corporation, the POA is committed to the sustainable and socially acceptable development of the Project, based upon the values of respect, accountability, transparency, and inclusion. Its goal is to operate in a way that will build positive and meaningful relationships with all stakeholders and contribute to local well-being and prosperity and the minimization of adverse environmental effects.

POA is and will ensure its contractors are committed to the recruitment and selection creation of a diverse and inclusive workforce which provides full and fair opportunity for the employment and retention of qualified provincial residents, suppliers, and contractors.

As part of this commitment, the POA will work with key stakeholder organizations to develop and implement strategies to facilitate access to employment and contracting opportunities for members of underrepresented groups such as women, persons with disabilities and members of visible minorities. POA will also institute special measures directed at youth to encourage the development of skills which will facilitate access the Port's employment opportunities.

Initiatives respecting gender equity, diversity and inclusion are based upon six objectives:

- Corporate Culture: to establish and maintain a ‘whole of company’ commitment to diversity and inclusion.
- **Education and Training**: to overcome barriers to entry into the Project workforce, promote skills development and create a long-term supply of trained and qualified women and gender diverse persons, youth, persons with disabilities and members of visible minority groups.
- **Recruitment, Retention and Promotion**: to implement recruitment, retention and promotion processes based on fairness, diversity and equal opportunity and elimination of any biases that function as barriers to the recruitment of underrepresented groups in order to maintain a stable and diverse workforce.
- **Workplace Conditions**: to create a workplace culture and environment which is respectful, diverse, culturally sensitive, and inclusive and free from harassment and discrimination.
- **Communication and Outreach**: the development and implementation of an effective communication strategy to publicize initiatives, goals and targets and ongoing engagement with stakeholders to monitor and review initiatives to work towards continuous improvement.
- **Education and Training**: to overcome barriers to entry into the Project workforce, promote skills development and create a long-term supply of trained and qualified women and gender diverse persons, youth, persons with disabilities and members of visible minority group.

POA’s performance will be evaluated based upon accepted key performance indicators and measured against industry best practice standards.

POA will monitor and annually report on the success of the measures. Reports will be both quantitative and qualitative and will contain disaggregated employment and training information relating to underrepresented groups. Results will be reviewed to identify areas for improvement. POA will continue to meet with stakeholders and community groups throughout the life of the Port to review progress on the implementation of measures and to consult on future efforts and initiatives to allow for continuous improvement.

Corporate Culture

Full commitment to diversity and inclusion requires a ‘whole of company’ approach which establishes diversity and inclusion as priorities and sets the tone and expectation for employees of both POA and its Contractors. The corporate commitment to diversity will be reflected in the following measures:

- Creation of a corporate Diversity and Inclusion Committee at the Board level to:
    - Document existing, diversity and inclusion commitments and policies and practices.
    - Conduct an organizational analysis of leadership roles and employment data through a diversity lens.
    - Analyze corporate communications to ensure the use of inclusive language and representative images.
    - Meet on a quarterly basis to review the effectiveness of diversity and inclusion measures.

- Designation of an individual or individuals who will lead diversity and inclusion initiatives and communicate consistent support for diversity and inclusion throughout the organization.
- Recognition of the right of all employees to self-identify with respect to gender, Indigenous affiliation, disability status and to use personal pronouns of choice.
- Development and implementation of corporate and workplace policies on diversity and inclusion
- Engagement with external stakeholders, including provincial and municipal governments, training institutions, industry and professional associations, interest, and advocacy groups.
- Monitoring compliance with all corporate and regulatory diversity and inclusion requirements.
- Ensuring that all procurement documentation (EOIs, RFPs and commercial contracts) state that contractors and sub-contractors must operate in a manner consistent with the POA's diversity and inclusion policies.
- Holding regular internal business update sessions to provide information on structural changes that may create opportunities for women, Indigenous persons, visible minorities and persons with disabilities.

Education and Pre-Employment Training

POA recognizes that facilitating the participation of women and other diverse peoples at the Port begins at the pre-employment stage. The identification of training needs and resources is critical to the creation and maintenance of a diverse and inclusive workforce and POA will continue to build relationships with key stakeholder groups in order to identify and respond to training gaps and needs. While POA does not plan to directly offer pre-employment training, it will actively work toward skills development and the creation of a long-term supply of diverse workers through the following education and training measures:

- Work with the College of the North Atlantic, Women in Resource Development Corporation, the Office to Advance Women Apprentices, Inclusion NL and other advocacy organizations to identify required training courses and opportunities for upgrading and upskilling and promote those opportunities in the communities and with other stakeholders.
- Work with Women in Resource Development Corporation, the Office to Advance Women Apprentices, the Association of New Canadians, and other key advocacy groups to identify potential candidates for apprenticeship opportunities during the construction and operations phases at the Port.
- Support initiatives by advocacy groups and professional associations to obtain funding for training programs to prepare women for employment at the Port.
- Support education and training programs which encourage women to pursue employment in non-traditional and STEM fields, by offering mentorships and work terms.
- Work with advocacy organizations representing women, persons with disabilities and other underrepresented groups to deliver periodic information sessions respecting career and training opportunities.
- Regularly disseminate projected human resources requirements to communities, and stakeholders in a timely manner to increase awareness of employment and training opportunities.

- Utilize databases maintained by organizations representing women, Indigenous persons, persons with disabilities and visible minorities to identify candidates for upskilling.

Recruitment, Retention and Promotion

Recruitment

POA will implement a recruitment and selection process based on fairness, gender equity and equal opportunity to enhance success in diverse workers. The objective will be to overcome any biases, whether conscious or unconscious, that may function as barriers to the recruitment of qualified candidates.

In order to promote recruitment and selection of qualified female candidates POA will:

- Build relationships with educational institutions, community organizations and industry associations to provide information on employment opportunities in order to encourage women and members of underrepresented groups to apply for employment at the Port.
- Implement targeted promotional efforts to recruit members of underrepresented groups, including women and persons with disabilities.
- Ensure that all advertised job postings state POA's commitment to equal opportunity and gender equity and use neutral and inclusive language in position descriptions and recruitment materials.
- Implement a bias-free hiring process by:
  - Ensuring diversity on selection committees.
  - Screening interview questions to remove gender bias, race bias and disability bias.
  - Ensuring all qualifications are weighted equitably.
- Include these measures in commercial arrangements with contractors and require contractors.
  - to develop a gender equity, diversity, and inclusion compliance strategy in alignment with POA's.
  - develop and implement recruitment and selection processes that align with the principles of fairness, equal opportunity and gender equity, diversity and inclusion.
- Support research activities by advocacy groups directed at the identification and elimination of barriers to employment by women, Indigenous persons, persons with disabilities and visible minorities.
  - Establish an applicant tracking system to monitor and report on participation by women, Indigenous persons, persons with disabilities and visible minorities in the Project workforce.
  - Ensure that all advertised postings are accessible and state POA's commitment as an equal and equitable opportunity employer which is committed to the establishment of a diverse and inclusive workforce.

Retention and Promotion

In order to ensure a stable and gender diverse workforce, POA will implement the following measures to minimize turnover and encourage the retention of a diverse workforce:

- Create personal development plans and identify areas within the organization for development opportunities for employees to enhance skill sets with a preference for female employees or other members of underrepresented groups where development opportunities are limited.
- Foster a workplace culture and environment which is committed to diversity and inclusion and the elimination of biases and discriminatory practices.
- Avoid using seniority as the principal criterion in making promotion decisions and consider criteria which ensure that members of underrepresented groups are given equal consideration.
- Ensure that all promotional opportunities are:
  - posted in areas which are visible and accessible to all employees.
  - presented in gender neutral and culturally appropriate language.
  - administered by individuals who have received diversity and inclusion training.
  - awarded through a process which is administered by individuals who have received diversity and inclusion training and who base decisions on bona fide occupational requirements.
- Celebrate success stories of diverse employees in non-traditional occupations on the Project website, on social media and in newsletters and other communications.
- Institute training, coaching and mentoring to support employees in skills development.

Workplace Culture and Conditions

POA will create a workplace culture and working environment which is respectful, culturally sensitive and free from harassment and discrimination. Workplace policies and practices will include:

- On-site infrastructure design consistent with gender concerns related to safety and gender equity – facilities that are appropriate for men and women, including washroom facilities and living arrangements, well-lit worksites and common areas, trained security personnel and providing reasonable accommodation for persons with disabilities.
- Establishing and maintaining a sensitive and inclusive work environment with zero tolerance for harassment and discrimination.
- Use of gender-neutral and inclusive language in all signage, on-site materials, job titles, equipment and work expressions.
- Allow employees to self-identify and choose personal pronouns.
- On-site communication of policies and practices relating to gender equity diversity and inclusion.
- Establishment of a grievance and complaints mechanism to address allegations of discrimination, violence and harassment.
- Consideration of flexible working schedules for off-site employees to accommodate work and family responsibilities.
- Mandatory onboarding/orientation sessions for all employees (both direct and through contractors) as a condition to on-site presence, including training on gender-sensitivity, anti-harassment and diversity – training content to be reviewed annually.
- Respectful workplace training for all employees – training content to be reviewed annually.
- Highlighting special events such as International Women's Day, Pride Week, National Indigenous Person's Day, Canadian Multiculturalism Day; and International Day of Persons with Disabilities.

Communications and Community Outreach

POA will implement a communications and community outreach strategy consisting of the following measures:

- Ensuring that women, Indigenous persons, persons with disabilities and visible minorities are visibly represented and inclusive language is used in accessible promotional and public relations material.
- Use of diverse, inclusive and accessible language and illustrations in job postings, advertisements and training materials.
- Holding accessible and inclusive public information sessions targeted at women, Indigenous persons, persons with disabilities and visible minorities.
- Partnering with, supporting and participating in programs and presentations for women, Indigenous persons, persons with disabilities and visible minorities to provide accessible and inclusive information on opportunities for employment and business access on the Project.
- Holding regular accessible stakeholder update sessions to identify successes and areas for potential improvement.
- Participation in community events and community investment to promote gender equity, diversity, inclusion and accessibility.

6.6.6.7 Reporting and Monitoring

POA is committed to the ongoing review and monitoring of the initiatives outlined above to ensure Provincial Residents and Provincial Suppliers are provided a full and fair opportunity and first consideration for employment and procurement opportunities during construction. To ensure it is responsive to the specific needs of members of labour, business, and under-represented groups, POA will prepare qualitative and quantitative reports on a monthly basis throughout the construction period 600broken out by National Occupational Classification Code for residency (Newfoundland or Labrador/Other Canadian/Foreign), journeypersons, apprentices (by level), gender, and diversity status (i.e., First Nations, visible minority, persons with disabilities) for the period:

i. Total number of positions and person-hours of work in the Province in the month; and
ii. Cumulative total number of positions and person-hours work in the Province to date.

Monthly reports will also provide the following:

i. Total value of goods and services purchased that month;
ii. Total value of goods and services purchased from businesses in the Province by location that month;
iii. Cumulative total value of goods and services purchased to date;
iv. Details of all contracts awarded to businesses owned by women and businesses owned by members of other under-represented groups that month (First Nations, persons with disabilities, and visible minorities); and
v. Detailed summary of measures taken to ensure the principles of full and fair opportunity and first consideration for Provincial Residents and Provincial Suppliers for employment and procurement opportunities were being adhered to.

6.6.7 (21) Human Health Impacts

The construction phase of the Project could introduce potential health effects for the local community. Increased noise and dust resulting from construction activities might lead to sleep disturbances, stress, and respiratory challenges for nearby residents. Moreover, the rise in construction-related vehicular traffic could amplify local air pollution levels. Diesel emissions, rich in particulate matter and other health-compromising pollutants, can lead to cardiovascular and respiratory conditions. Water quality might also face temporary disturbances during construction, potentially releasing contaminants that could affect local fisheries and those who rely on their catch. The added influx of workers and heightened vessel traffic could also stretch local healthcare services if not adequately managed. Though several of these impacts can be mitigated, continuous monitoring paired with community engagement remains crucial to maintaining public health priorities throughout the Project's span.

According to Health Canada's guidelines for evaluating environmental impacts on human health, the marine wharf expansion might bring about changes in the natural environment that indirectly affect human health. Construction activities like seabed disturbances could release sediments, potentially dispersing contaminants into the water. Such degradation can pose risks for those consuming marine delicacies like fish and shellfish, which might absorb these contaminants (Wenger et al., 2017). The framework for understanding these impacts on country foods is further detailed in the government's guide on evaluating human health impacts in this context (GOC, 2017). Beyond construction, the post-expansion phase, characterized by increased shipping, holds risks like oil spills or ballast water discharge. Such occurrences might introduce harmful substances or even invasive species into the marine environment. Direct contact or consumption of contaminated marine foods can pose health threats to the community.

Furthermore, elevated marine traffic noise can cause disturbances. According to Health Canada, sustained noise, particularly from transportation, can lead to adverse health effects, including sleep disruptions, cardiovascular diseases, and even cognitive impacts in children (Health Canada, 2011). Such noise can interfere with marine ecosystems in a marine setting, potentially affecting fisheries and community food sources. It's also worth noting that persistent noise can compromise the peace of coastal locales and revered sites, potentially affecting the mental health of the inhabitants.

6.6.8 Navigation Impacts

The Project could have several implications for navigation in the area. Placentia Bay is already a notable hub for marine traffic, with its history rooted in fishing, shipping, and offshore oil support activities. An expanded marine wharf could increase vessel traffic, both from larger commercial ships and potentially more frequent smaller vessel movements. This heightened traffic could lead to congested waterways, potentially posing challenges for existing marine operators, especially those engaged in fishing activities, as they navigate their routes. Increased traffic necessitates modifications to navigation channels or the introduction of new marine traffic regulations and protocols to ensure safe and efficient movement.

The physical infrastructure of the expanded wharf itself is not anticipated to alter the current navigational routes. The construction activities may create bottlenecks or obstructions, necessitating vessels to adjust their usual paths. This could be particularly concerning during adverse weather conditions, which are not uncommon in Placentia Bay, as navigating around the expanded wharf infrastructure might become more challenging. Furthermore, there's a potential for increased sediment disturbance during and post-construction, which could affect water clarity and depth, further complicating navigation for local mariners. Thus, while the expansion aims to boost marine activities and the local economy, it's crucial to ensure that it harmoniously integrates with existing navigation patterns and practices to maintain safety and efficiency in Placentia Bay.

The POA is committed to devising comprehensive migration strategies to ensure minimal disruption to navigation during construction. Recognizing the potential impacts of the activities, the POA is also focused on establishing clear communication protocols to keep stakeholders informed and engaged throughout the construction phase.

6.6.8.1 Limitations and Assumptions Related to Marine Traffic

The anticipated expansion of the port brings with it several limitations and assumptions that warrant consideration. Firstly, it's important to acknowledge that while the expansion aims to accommodate more vessels, there may still be limitations on the maximum size and draft of ships the port can handle. These limitations could be influenced by factors such as water depth, navigational constraints, and the availability of suitable berths. Assumptions related to vessel size must consider these physical constraints to ensure that expectations align with the port's actual capabilities. To address this limitation, water depths at the wharf expansion and new dock will range from a minimum of 12 m at the dock face to a maximum of 16 m within the berthing area, accommodating various vessel sizes.

Another assumption involves the types of cargo the port can effectively handle after the expansion. While efforts may be made to diversify cargo handling capabilities, the port's infrastructure and equipment may be optimized for specific types of cargo, such as bulk goods, containerized freight, or specialized project cargo. The ability to efficiently accommodate various cargo types depends on the design and adaptability of the expanded facilities as well as the needs of the tenants. Stevedore crews servicing the port are trained in off-loading numerous types of cargo and certified to handle hazardous material, including explosives.

The POA's ability to accept more vessels with the proposed increased berthage may require the port authorities such as the Atlantic Pilotage Authority and Transport Canada to enhance their management systems and practices to ensure ships' safe and efficient movement as well as maintain requirements of the International Ship and Port Facility Security Code (ISPS). The POA will consult TC through the Navigation Safety Assessment Process as described above in section 5.4.4 as part of the assessment of Project activities to determine any potential navigation impacts during construction.

6.6.9 Heritage Resources

Placentia, NL, situated on the Avalon Peninsula's Placentia Bay, has a rich heritage dating back to the late 1500s when it was a Basque fishing station named Plaisance. Its original name, Plasencia, might be rooted in a Basque seaport on the Spanish coast. Designated as the first official French colony in Newfoundland in 1662, it served as the French capital of Newfoundland, overseeing fishing activities until the Treaty of Utrecht in 1713. The town played a pivotal military role, with various forts protecting it and serving as bases for raids. Following the treaty, Placentia became a British stronghold and saw additional fortifications. Its strategic location and abundant beaches propelled its growth as a fishing and trading hub in the 1800s (Pitt and Pitt 2015).

By the end of World War II, the once modest fishing villages of Argentia and Marquise had been transformed into a massive US military base, a result of the Leased Bases Agreement with Britain in 1940. The project was marked by large-scale investment from the US but led to the upheaval of Argentia and Marquise's 750 residents. Within a year, inhabitants from both villages, including three cemeteries, were relocated as construction crews transformed the area. The choice of Argentia was influenced by its landlocked harbor, flat terrain perfect for runways, and an existing railway terminal. As construction escalated, it provided employment opportunities for thousands of Newfoundlanders, a welcome relief after the economic downturn following World War I and the Great Depression. However, the progress also came with costs. Residents of Argentia and Marquise were dislocated, receiving compensation that many deemed insufficient, causing them to form a citizens' committee advocating for their rights. Most relocated to Freshwater, while others settled in Placentia and nearby communities. Economic challenges, like the COD fishery collapse in 1992 and the base's decommissioning in 1994, led to Placentia merging with neighbouring communities (HNL 2023). Today, with a focus on tourism, it boasts attractions such as the O'Reilly House museum and the Castle Hill National Historic Site approximately 10 km from the PDA.

While the area has a rich history and heritage, no known heritage properties, archaeological resources, or Indigenous lands located within the immediate vicinity of the Project. If, however, historic resources are encountered during construction and/or operations, work in the area should be stopped immediately and the appropriate authorities should be notified in accordance with the *Historic Resources Act* (1985).

6.7 (23) Greenhouse Gas Emissions Associated with the Project

The Port of Argentia is at the preliminary stages of the design development for the Project. As such, the detailed information required for a comprehensive Greenhouse Gas (GHG) Mitigation Assessment will not be available until after the design-build stage of the Project. However, the POA is committed to provide a meaningful GHG Mitigation Assessment for the Project when more detailed design information becomes available.

The GHG Mitigation Assessment associated with the Project will aim to comprehensively evaluate the GHG emissions and carbon sinks while considering potential climate change hazards. The assessment will adhere to mandatory requirements outlined in federal and provincial environmental assessment processes and the emission inventories will be developed based on the requirements:

- ISO 14064-1: 2018 – Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals (ISO 14064-1); and
- ISO 14064-2: 2019 – Part 2: Specification with guidance at the project level for quantification, monitoring, and reporting of greenhouse gas emission reductions or removal enhancements (ISO 14064-2).

6.7.1 Greenhouse Gas Emission Calculations

The POA has awarded an electrification study which aims to inventory its organization's GHG emissions in accordance with ISO 14064-1 with the view of establishing an emissions baseline for its operations. This will allow the Port to develop a holistic plan in reducing its existing carbon footprint and to focus Project engineering design on zero-to-low carbon systems, elements and processes during Project construction and operations. In advance of the POA electrification study a preliminary estimate of the maximum annual net GHG emissions for the construction phase of the project has been completed below.

The following information on construction equipment was provided on behalf of the POA and is further outlined in Appendix H:

- Equipment type (i.e., crane, excavator) and model;
- # of units;
- # operating weeks;
- # of work days per week;
- # of operating hours per day;
- Fuel type specified as diesel for all pieces of equipment;
- Horsepower (hp);
- Tier category; and
- Fuel usage (L/hr) estimated for each unit.

Dillon relied on the above information to estimate GHG emissions resulting from construction.
The total number of operating hours for each piece of equipment was calculated based on the number of operating weeks, workdays per week and operating hours per day.

$$Total\ Operating\ Hours = (\#of\ operating\ weeks) \times (\#\ of\ work\ days/week) \times (\#hours/day)$$

Emission factors for Mobile Equipment were sourced from the 2023 National Inventory Report 1990-2021, Part 2; Greenhouse Gas Source and Sinks in Canada, Table A6.1-14. Emission factors are summarized in Table 20.

Due to absence of information available on the age of the construction equipment, the emission factor values that have been applied correspond to Tier 4 Off-road Diesel Vehicles, as this approach results in a conservative estimate of GHG emissions.

Table 20: Emission Factors for Construction Equipment

Greenhouse Gas	Emission Factor (g/L)
	Off-road Diesel Vehicles ≥19 kW, Tier 4
CO_2	2680.50
CH_4	0.073
N_2O	0.227

GHG emissions were estimated as follows:

$$GHG\ emissions\ (tonnes) = (\#of\ units) \times (\#of\ total\ operating\ hours\ per\ unit) \times (fuel\ usage\ in\ L/hr) \times (Emission\ Factor\ in\ g/L) \times (10^{-6}\ g/tonne)$$

The total GHG emissions were expressed in units of CO_2 equivalents (CO_2e) using the respective Global Warming Potential (GWP) values for each GHG type. GWP values were sourced from the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5). GWP values are summarized in Table 21.

Table 21: Global Warming Potentials

Greenhouse Gas	Global Warming Potential
CO_2	1
CH_4	28
N_2O	265

GHG emissions were converted to CO_2e as follows:

$$GHG\ emissions\ (tonnes\ CO_2e) = [CO_2\ emissions\ (tonnes) \times 1] + [CH_4\ emissions\ (tonnes) \times 28] + [N_2O\ emissions\ (tonnes) \times 265]$$

Total GHG emissions from construction activities were estimated to be 22,511 tonnes CO_2e. Current GHG assessment focussed on the development of GHG estimates for construction related emissions only. No information has become available at this point on baseline or project scenario operating conditions (i.e., fuel usage on site, such as natural gas or electrical usage, equipment operations on site). Therefore, an assessment of baseline or project emissions is not feasible at this point, however, will be completed as part of the POA Electrification Study.

6.7.2 Identification of Greenhouse Gas Mitigation Opportunities

The POA will develop mitigation strategies including a GHG mitigation plan. These strategies will aim to reduce emissions and track GHG emissions during the Project lifespan. The POA is committed to reducing its carbon footprint and operating the newly constructed marine infrastructure as a zero-to-low carbon operation. The POA will actively encourage its tenants and facility users to adopt zero-to-low emission practices and services, further contributing to GHG reduction efforts.

Additionally, the POA role as a host for renewable energy companies will indirectly support global GHG mitigation. With significant investments from renewable energy firms over the next five years, the POA will foster the establishment of wind energy, green hydrogen and ammonia production facilities, and offshore wind farm construction projects. By serving as an alternative port location, the POA will minimize vessel travel distances, leading to reduced overall GHG emissions.

Considering these measures and the commitment to incorporate advanced emissions reduction technologies as they become available, the Project aims to mitigate its environmental impact and promote sustainable practices throughout its construction and operation phases.

6.8 (24) Project-Related Emissions and Wastes

In the construction phase, air emissions will mainly come from machinery exhaust and dust, while water contamination risks include sediment runoff and potential oil leaks. Land-based waste will consist of construction debris and unused materials. In the operation phase, emissions may stem from ship operations, potential minor oil leaks, and wharf maintenance waste. Table 22 provide a summary of anticipated emissions and wastes during the construction and operation phases of the Project.

Table 22: Anticipated Emissions and Wastes during Construction and Operation

Environmental Component to which Emissions and Wastes are Released	Applicable Project Phase	Type/Source or Emission or Waste
Air	Construction	• Dust emissions • Emissions from heavy equipment • Noise • Light
	Operation	• Dust emissions • Emissions from heavy equipment • Noise • Light

Environmental Component to which Emissions and Wastes are Released	Applicable Project Phase	Type/Source or Emission or Waste
Land	Construction	• Solid waste • Regulated industrial solid • Vibration
	Operation	• Solid and domestic waste • Regulated industrial solid • Vibration
Water	Construction	• Temporary increased sedimentation • Liquid waste • Domestic sewage • Storm water runoff
	Operation	• Storm water runoff

6.8.1 Contaminants of Potential Concern

During the construction and operation of a marine wharf, several contaminants of potential concern (COPCs) can be introduced into the environment, requiring diligent monitoring and management in accordance with the following:

- *Canadian Environmental Protection Act*;
- *Fisheries Act*;
- *Storage and Handling of Gasoline and Associated Product Regulations*;
- *Used Oil control Regulations*; and
- *Environmental Control Water and Sewer Regulations*.

Among these are BTEX compounds (i.e., benzene, toluene, ethylbenzene, xylenes), which are commonly associated with petroleum products and can be emitted from machinery exhaust, fuel spills, or the handling of related materials. PAHs, or polycyclic aromatic hydrocarbons, are another significant group. These chemicals occur naturally in coal, crude oil, and gasoline and are released when these fuels are burned. Their presence can result from construction activities that involve combustion or the regular operations of ships docking at the wharf.

Additionally, PHCs, or petroleum hydrocarbon compounds, can be found in the water or soil due to accidental oil spills or leaks during construction and operation phases. TBT, tributyltin, a chemical once popularly used in marine anti-fouling paints, can contaminate marine environments, affecting aquatic life. Lastly, VOCs, or volatile organic compounds, encompass a broad range of organic chemicals, many of which can evaporate under normal atmospheric conditions. Their sources can be varied, including paints, solvents, and certain ship emissions. The presence of these contaminants underscores the importance of completing an environmental site assessment (ESA) prior to construction activities and adopting rigorous environmental safety measures during the construction and operation phases of a marine wharf to protect the surrounding ecosystem. Contaminants of potential concern associated with the Project are outlined in Table 23.

Table 23: Contaminants of Potential Concern

Contaminants of Potential Concern (COPC)	Activity	Project Phase	Environmental Risks
PHC, VOCs, BTEX, metals	Potential release of fuels and oils during transfer or storage.	Construction, Operation and Maintenance, and Decommissioning	Accidental release to the marine environment and/or land.
Metals, VOC	Potential release during infilling and dredging activities	Construction and Decommissioning	Accidental release of contaminated sediment to the marine environment through infilling and dredging activities.
Chlorophenols, PAHs, PHCs, TBT	Potential release in the construction and decommissioning of wharves.	Construction and Decommissioning	Release to land though storage and/or improper disposal.

Legend:
BTEX benzene, toluene, ethylbenzene, xylenes
PAHs polycyclic aromatic hydrocarbons
PHCs petroleum hydrocarbons compounds
TBT tributyltin
VOCs volatile organic compounds

6.8.2 Potential Environmental Impacts, Accidents and Malfunctions during Construction

The POA is committed to ensuring that legislative and regulatory requirements are met during the Project's construction phase as well, the POA is committed to ensuring environmental risks and accidental environmental impacts are mitigated. To achieve this, the POA mandates the development of Environmental Protection Plans (EPP) with the following key objectives:

- Documenting environmental concerns and relevant protective actions;
- Offering straightforward instructions to project staff about how to safeguard the environment;
- Serving as a guide for staff when organizing or conducting specific activities in particular areas;
- Communicating program alterations through a structured revision process; and
- Highlighting relevant legislative, regulatory requirements and guidelines.

The EPP stands as a pivotal framework for all components of the Project, aligning every activity with crucial environmental considerations and ensuring compliance with regulatory requirements. Following the development of the EPP, detailed plans for onsite activities will be developed and implemented on site, such as;

- Environmental Management Plans (EMPs);
- Environmental Health and Safety Contingency Plans (EHS);
- Environmental Emergency Response Plans (EERP); and
- Best Management Practices (BMPs) for construction activities.

EMPs and BMPs will mitigate environmental impacts from onsite activities such as infill and dreading activities, while EHS and EERP will be developed to account for accidents and/or malfunctions. Accidents can stem from external threats like severe weather events or other physical dangers that could compromise the project's infrastructure or activities. Additionally, the following sections have been compiled as a preliminary list detailing various accident and malfunction scenarios, such as during the transportation, storage, or handling of hazardous materials, and have discussed their potential impact on human health. By adhering to these plans and procedures, the POA will aim to reduce air pollution, safeguard the environment, and protect the health of construction workers and surrounding communities. Environmental Health and Safety Contingency Plans will also be developed in anticipation of the construction phase. The following sections outline potential environmental impacts as a result of construction activities.

6.8.2.1 Unexploded Ordnance (UXO) Legacy Sites Program

The Department of National Defence (DND) has a program addressing Unexploded Ordnance (UXO) at Legacy Sites, such as the Port of Argentia. As per Schedule F – UXO Agreement, the POA acknowledges and agrees to follow the guidance provided in the UXO Protocol datasheet attached in Schedule C of the agreement (Appendix A). After reviewing the draft IPD and assessing the proposed Project, DND has categorized the UXO risk level as medium. Due to the medium risk associated with activities like dredging and caisson installation, DND has recommended consulting a specialist UXO firm. This is to ensure all potential health and safety issues related to this UXO risk are appropriately addressed during the project. DND strongly advises that the project leader hire a reputable UXO firm to craft a comprehensive UXO Risk Mitigation Plan, ensuring the safety of workers on site. While the expert UXO firm will guide through the risk mitigation process, it is always crucial to follow standard safety measures if any ammunition-related items are discovered now or in future constructions. DND is open to providing more information and advice on this topic, and the Agency stands ready to facilitate such a discussion if needed.

6.8.2.2 Dredging and Infilling

The Project's dredging and infilling activities (Figure 7 and Figure 8) could have various environmental impacts on the marine environment, including the permanent loss of fish habitat due to infilling. These activities can disrupt or destroy marine and fish habitats. Furthermore, temporary changes to fish habitat can occur during the dredging process.

If Fisheries and Oceans Canada determines that the Project could harm fish habitat, the Project will require authorization under the Fisheries Act. This authorization will come with offsetting and monitoring measures. Before construction begins, benthic habitat surveys will be conducted, and ongoing collaboration with DFO will occur in the development of mitigation measures and offsetting plans. Mitigation measures will be incorporated into Project environmental protection plans to minimize or eliminate any potential environmental effects during the Projects dreading and infilling activities. Additionally, dredge materials will be disposed of in approved areas, and only approved materials will be used for land expansion. Efforts will be made to limit ground disturbance and avoid scheduling work during storm events. Turbidity will be monitored during dredging, and equipment will be cleaned to prevent the transfer of invasive species.

If blasting becomes necessary, a controlled plan following DFO guidelines will be implemented, considering migration periods and using acoustic measures to deter fish and mammals before blasting. The Project will adhere to the Canada Shipping Act and its related regulations concerning vessel inspection and operator certification. In-water work will follow the conditions set by DFO and NLDECC-WRD approvals.

6.8.2.3 Hazardous Materials and Waste Management

Particular attention will be given to the management of hazardous waste. The POA is dedicated to implementing rigorous measures that prevent any hazardous waste from being released into the environment. This will involve the development of a comprehensive waste management plan detailing specific procedures and protocols for efficient handling, storage, and disposal of waste.

Preparation for unforeseen circumstances is also a cornerstone of our approach. An Environmental Health and Safety Contingency Plan, including; up to date catalogue of Material Safety Data Sheets (MSDS) and safe handling procedures will be established, embodying the best environmental practices and aligning with regulatory requirements. This plan represents our commitment to maintaining the highest standard of environmental protection throughout the project.

The POA also acknowledges the importance of collaborating with regional and local waste management authorities to ensure effective waste management, recycling, and disposal. In light of the absence of hazardous waste recycling or final disposal facilities in NL, the POA will require only approved and licensed hazardous waste handlers and transporters to secure the safe transportation of hazardous waste to licensed facilities elsewhere in Canada or North America.

6.8.2.4 Surface Water Quality

The potential impact on surface water quality during the construction of the Project is an area of concern highlighted by Health Canada. Project-related activities that might adversely affect the water quality of neighbouring surface water bodies and not anticipated due to the industrialized nature of the Project area; however, the following activities have been identified as having potential impacts to surface water quality;

- Dredging and Infilling of the Port: This process can disturb the sediment at the bottom of water bodies, releasing previously settled contaminants and affecting the balance of aquatic ecosystems.
- Increased Marine Traffic: Increased marine vessels can lead to potential fuel and oil discharges, propeller wash that suspends bottom sediments, and increased risk of significant spills or accidents.
- Potential Spills from Waste at the Port and Marine Traffic: Accidental release of contaminants from waste stored at the port or directly from marine vessels could directly pollute the water, harming aquatic life and impacting water quality.

The alteration in water quality in these surrounding water bodies might expose human receptors to various contaminants. Such exposure can happen through multiple pathways, such as direct skin contact with contaminated water, unintended water ingestion, or through the food chain, where contaminants are taken up and bioaccumulated in local foods (GOC 2022b). This endangers aquatic life and may increase health risks for local communities and other consumers relying on these water bodies and associated food sources. Given these potential risks, a comprehensive evaluation and mitigation plan are essential to ensure that the Project does not compromise human or environmental health.

6.8.2.5 Airborne Emissions

Airborne exhaust emissions from construction as a result of increased heavy equipment operations during construction. Increase in airborne particulates through the generation of dust during construction activities including; stockpiling, loading and unloading equipment with fill materials. Specific mitigation measures are as follows:

- Ensure all construction equipment is in good working condition and maintained throughout use during the Project will be a part of this.
- Material drop heights and the volume of infill being relocated will be limited, with the height from loaders to receiver bins being controlled.
- Dust suppression measures (e.g., water) will be applied to materials in windy conditions if required.

6.8.2.6 Noise

During construction, potential noise sources include vehicle traffic on the site and access road, on-site equipment, and other construction activities, such as blasting, that may be necessary to meet grade requirements. Additionally, marine noise is anticipated with infilling operations. Specific mitigation measures are as follows:

- Implementing a noise management plan that outlines the types of construction activities, equipment, and the duration and timing of activities that generate high noise levels.
- Using equipment and machinery that meet noise emission standards to reduce noise levels.
- Scheduling construction activities during non-sensitive hours, such as weekdays and daytime hours, to minimize the impact on nearby residents and businesses.
- Providing warning signals and communication channels to inform the public of the construction activities and potential noise levels;
- Schedule construction activities to avoid sensitive periods for marine life, such as migration, spawning, or breeding seasons; and,
- Train personnel to identify and report marine mammals and other marine life near the construction area and stop construction activities if any are detected.

6.8.2.7 Light Pollution

Light pollution can become a significant concern during construction, impacting the surrounding environment and local communities. Existing conditions at the PDA indicate that the fraction of natural sky brightness ranges from 0.33 to 0.58, rising to a higher level of 15.59 to 27. This implies that the site's natural night sky brightness is considerably altered already by existing anthropogenic light sources (IDA 2023). As outlined in the Excessive or improperly directed artificial lighting can disrupt nocturnal wildlife behavior. Specific mitigation measures are as follows:

- Use of low-glare lighting directed downward to focus light on construction area;
- Reduction of work hours after dusk where possible; and,
- Incorporating motion sensors or timers on construction site lighting to only activate when necessary, reducing energy consumption and limiting light exposure to the surrounding environment.

6.8.2.8 Liquid Effluent/Waste

The *Fisheries Act* strictly prohibits the release of deleterious substances into water frequented by fish, as such the POA will consult with DFO and the NLDECC-WRMD for permission to ensure free passage for fish and protection of fish and fish habitat while carrying out construction activities. Effluent discharge may be required during the infill activities to manage surface water resulting from precipitation, groundwater seepage, or other water sources on the site. This may require installing drainage systems or constructing retention basins to manage water flows and prevent flooding and to mitigate any contaminates entering the marine environment. Additionally, equipment used during the infill activities may require cleaning, generating wastewater that requires treatment before discharge.

Moreover, runoff from the site can also be a source of effluent discharge. Runoff can be generated from precipitation events and may carry sediment, debris, and other pollutants from the site. To prevent the release of sediment-laden runoff, erosion, and sediment control measures such as silt fences, sediment basins, and gravel bags may be installed to minimize sediment-laden runoff. Specific mitigation measures that may be implemented are as follows:

- Development of waste management plan, environmental health and safety contingency plans, EPP and/or BMP.
- Implement erosion and sediment control measures:
  - Silt fences
  - Sediment basins
  - Gravel bags
- Minimize sediment-laden runoff and release of contaminants of potential concern.
- Obtain permits and approvals required for effluent discharge, this may include a Water Use Licence for dewatering and/or Permit to Alter.
- Testing and analysis of effluent prior to release to ensure liquid effluent meets:
  - *Environmental Control Water and Sewer Regulations*; and
  - Determination if wastewater treatment/management is required.
- Employ good housekeeping practices:
  - Keep site clean and well-organized; and
  - Reduce risk of contaminating stormwater runoff.

6.8.2.9 Hazardous Liquid Waste

Hazardous liquid waste is generated as part of standard construction activities and normal operation of the POA include; storage, use and handling of chemical and petroleum products such as fuels, solvents, adhesives, sealants, lubricants etc. Specific mitigation measures are as follows:

- Development of waste management plan, environmental health and safety contingency plans, EPP and/or BMP with special attention to the following;
  - Identify potential sources (fuel spills, chemicals, wastewater);
  - Outline containment measures, handling procedures, disposal methods; and
  - Ensure compliance with regulations.
- Obtain permits and approvals required for storage and handling of hazardous liquid waste, this may include approvals under the provincial *Used oil Used Glycol Control Regulations* and the *Gasoline and Associated Products Regulations*.
- Complete Environmental Site Assessments to determine soil and groundwater characteristics to ensure they do not exceed regulatory limits.
- Storing liquid hazardous waste in approved containers with secondary containment and in accordance with applicable regulations.
- Train on-site workers in:
  - Handling, storing, and transporting hazardous liquids; and
  - Spill response and emergency procedures.

- Provide temporary storage facilities (tanks, drums):
  - Adequately designed and maintained; and
  - Prevent leaks and spills.
- Utilize secondary containment measures:
  - Berms, spill trays.
- Conduct regular inspections and maintenance.
- Use licensed waste carriers for off-site transport:
  - Send waste to authorized facilities.

6.8.2.10 Solid Non-Hazardous Waste

Solid non-hazardous waste will be generated as a result of construction activities and will require disposal and or recycling. This may include wood, metals, cardboards, plastics and other non-hazardous solid wastes. Specific mitigation measures are as follows:

- Development of waste management plan, environmental health and safety contingency plans, EPP and/or BMP.
- Complete Environmental Site Assessments to determine soil and groundwater characteristics to ensure they do not exceed regulatory limits;
- Optimize material usage.
- Separate containers for wood, metals, cardboard, plastics, etc.
- Identify reusable materials on-site.
- Partner with local waste management and recycling facilities.
- Follow local regulations and guidelines for waste disposal.

6.8.2.11 Solid Hazardous Waste

Solid hazardous waste may be generated as part of the construction activities during the Project; however, volumes are not anticipated to be large. This may include treated lumber, containers with liquid hazardous waste residues, electronic waste and batteries, paints and solvents, contaminated soils etc. Specific mitigation measures are as follows:

- Development of waste management plan, environmental health and safety contingency plans, EPP and/or BMP.
- Obtain permits and approvals required for storage, handling and transportation of hazardous solid waste, this may include a certificate of approval under the NL Environmental Protection Act.
- Storing solid hazardous waste in approved containers with secondary containment and in accordance with applicable regulations.
- Identify, classify, and segregate hazardous materials.
- Develop strict protocols and guidelines for:
  - Handling;
  - Storing;
  - Transporting; and

  - Disposing of hazardous waste at a provincially approved facility.
- Ensure safe isolation from non-hazardous waste and the environment.
- Use companies/facilities with Certificates of Approval for hazardous waste management:
  - Transportation; and
  - Final disposal.

6.8.2.12 Potential Causes of Resource Conflicts

While Cooper Cove is not currently identified as an active fishing area, there may occasionally be recreational and commercial fishing vessels in the vicinity of the Project area. During stakeholder consultations, it is anticipated that Argentia area fish harvesters may identify potential causes of resource conflicts associated with the Project with the anticipated increased in vessel traffic in Argentia Harbour which may interfere with local fishing boats and other vessel traffic, from the following construction activities:

- Infilling and wharf construction activities in the nearshore area;
- Designated safety zones around the construction footprint; and
- Potential in-water blasting.

Timing construction activities for the late fall through winter period, during a period of limited fishing activity and less vessel traffic, would help mitigate interactions. Vessel traffic associated with the Project will likely be negligible in comparison to the routine vessel traffic currently in the area.
Fill material from an existing northland stockpile or the bund wall materials from the adjacent Husky Graving Dock Project (Stantec 2019), may be considered. However, if the POA decides to utilize bund wall material in Cooper Cove as a potential marine infill option the POA will consider the implications for Husky Energy's commitments and regulatory requirements related to infilling “the pond” (Stantec 2019). The POA will assess these implications with Husky Energy and engage the province on how diverting the bund wall material from The Pond may impact its future beneficial use. This assessment will help determine the potential effects on Husky Energy's commitments and the regulatory obligations associated with infilling activities. Alternatively, the POA may require sourcing infill materials from other means such as “quarrying of a quarry materials” as defined in the *Quarry Materials Act*, 1998 and if the dimension stone where quarry operations cover an area that is greater than 10 ha. If this activity meets these stipulations, the Project may be considered an undertaking under the *Environmental Assessment Regulations*, 2003. The POA will notify NLDECC early in the planning phase to consult on the best path forward.

Other considerations may be required as public feedback and other inputs are gathered during stakeholder consultation activities.

6.8.2.13 Climate Change Considerations

In addition to existing regulations and policies, the infrastructure engineering at the proposed PDA will consider the impacts of extreme weather events and projected climate-related trends. Specifically, catchment design should consider capacities needed to capture runoffs during peak rainfall and snow melt. Dock and shoreside infrastructure design should accommodate long-term intertidal extents and storm surge changes. Application of appropriately sized and positioned buffer zones would minimize runoff during heavy rainfall periods mitigating surface contaminants entering the water.

6.8.3 Potential Environmental Impacts, Accidents and Malfunctions during Operation

Upon completion of the Project construction phase, the facility's operation will involve the utilization of infilled area designated for buildings, equipment operation, and material laydown. The new marginal wharf will also be established to accommodate transhipping vessels, offshore industry vessels such as shuttle tankers, drilling rigs, and floating, production, storage and offloading (FPSO) vessels. The Project operations will encompass; increased vessel traffic, and temporary on-site and off-site traffic.

Earlier in this document, we emphasized the importance of environmental mitigation measures to reduce potential impacts, especially during the construction phase. However, these measures aren't exclusive to construction; they can also be applied during operations, especially for unforeseen events that may pose a risk to the environment and safety. Therefore, we will develop Environmental Management Plans (EMPs), Environmental Health and Safety Contingency Plans (EH&SP), Environmental Emergency Response Plans, (EERP) and adopt Best Management Practices (BMPs) for ongoing operations. The POA is commitment to sustainable practices and environmental stewardship by extending these mitigation measures to ongoing operations. This approach ensures that potential environmental risks and impacts are continuously monitored and addressed, promoting the long-term conservation of natural resources and the protection of local ecosystems.

In the Project planning and for consideration for discussions with regulatory agencies, the POA will consider implementing and assume the following Project specific mitigation measures during operation so as to mitigate potential sources of pollutants and emissions from entering the environment. These mitigation measure will be in addition to both regulated and non-regulated waste management and mitigations efforts mentioned above.

6.8.3.1 Airborne Emissions

Airborne exhaust emissions during operations can significantly rise due to the increased use of auxiliary engines by marine vessels while at berth and heightened vehicle traffic. The POA will complete a comprehensive Port electrification study to baseline GHG and look for opportunities to reduce these harmful emissions. This study will explore shore power technologies, enabling vessels to switch off their auxiliary engines, thereby reducing these emissions.

- Mitigation Measure: Complete Port electrification study to examine shore power technologies to allow or vessels to turn off auxiliary engines.

6.8.3.2 Noise and Light Pollution

In Canada, both federal and provincial regulations emphasize the importance of noise and light control, especially in areas like marine terminals. The Canadian Environmental Protection Act, 1999 (CEPA) underscores the need to avert environmental nuisances, such as excessive noise, which can disturb both marine life and the surrounding natural environment. Additionally, the Canada Marine Act and the Navigation Protection Act require marine terminals to ensure their operations, including noise and light, do not hinder navigation or interfere with vessel communications. Health agencies, recognizing the detrimental impacts of noise on human health and well-being, further advocate for reduced environmental noise. Moreover, provincial and municipal land use and zoning regulations often stipulate noise guidelines to foster harmony between various land uses and prevent disturbances, particularly in sensitive areas.

Marine terminals must be attentive to noise levels to maintain harmonious relations with neighbouring communities, avoid public complaints, and stave off potential legal liabilities. This vigilance is especially pertinent given the rights of Indigenous peoples in Canada, which, as recognized under Section 35 of the Constitution Act, 1982, could be infringed upon by excessive noise, especially if it impacts traditional activities.

Light pollution can disorient migratory birds, causing them to stray from their traditional migration pathways, leading to prolonged and more energy-intensive journeys. The bright lights, especially in tall buildings and structures, can attract birds, leading them to collide with these structures. Furthermore, the Impact Assessment Act mandates that new projects, including marine terminals, undergo evaluations that consider noise and lighting impacts.

To mitigate noise and light pollution from operational activities, the POA has proposed the following:

- Mitigation measure: Implement noise barriers, mufflers, and use low-noise equipment. Use low-intensity and directional lighting to minimize light pollution. Schedule activities during daytime hours whenever possible to reduce disturbance to neighboring communities.
- Mitigation measure: Develop noise reduction plan for operations.
- Mitigation measure: Conduct a comprehensive ecological impact assessment and bird survey. Implement time-bound and seasonal restrictions on operational activities to avoid critical periods for bird migration and nesting. Install bird-friendly lighting and incorporate bird-friendly designs in structures.

6.8.3.3 Increased Marine Traffic

The Canada Shipping Act, 2001 is the primary legislation addressing maritime transport and safety at the federal level. This Act underscores the importance of mitigating risks associated with marine traffic, including potential environmental hazards, collisions, and navigational challenges. Increased marine traffic, especially near marine terminals, can pose heightened risks of accidents, spills, and disturbances to marine ecosystems. To mitigate these risks, the POA will ensure the following mitigation measures are in place for operation.

- Mitigation measure: Develop a comprehensive maritime traffic management plan. The plan will establish designated routes, traffic vessels will maintain appropriate separation distances, and enforce speed limits for vessels. The POA in coordination with Transport Canada, will implement and maintain regular communication with local fishing boats and other stakeholders. The traffic management plan will additionally provide training and awareness programs for vessel operators regarding collision prevention, navigation safety, and emergency response procedures.
- Implementation of alternative for show power to reduce the use of auxiliary engines.

6.8.3.4 Liquid Effluent/Waste

Liquid effluent waste is a major environmental concern in Canada, especially regarding marine environments and freshwater systems. These waste discharges, originating from various industrial operations, including marine terminals, often contain a mix of chemicals, heavy metals, and organic matter. When released untreated or insufficiently treated into the aquatic ecosystems, they can have devastating effects. The pollutants in the effluent can lead to eutrophication, where an overabundance of nutrients causes rapid algae growth, subsequently depleting oxygen levels and harming aquatic life. Additionally, heavy metals and chemicals can accumulate in marine and freshwater organisms, making their way up the food chain, impacting aquatic life and posing risks to human health when they consume contaminated seafood. Recognizing the significance of these issues, the POA will ensure the following mitigation measures are in place for operations.

- Mitigation measure: Consult with DFO and NLDECC-WRMD. Implement strict ballast and bilge water management procedures, including the use of ballast water treatment systems to eliminate invasive species and contaminants. Monitor and enforce compliance with local and international ballast and bilge water discharge regulations.
- Alteration of water level views may interfere with recreational and commercial activities.
- Mitigation measure: Consult with DFO and NLDECC-WRMD. Conduct a visual impact assessment and consider alternative designs or site layouts to minimize visual impacts. Establish buffer zones and maintain or enhance natural vegetation to screen views of the PDA. Engage with local communities and stakeholders to address concerns related to aesthetics and potential impacts on recreational and commercial activities.

6.9 Summary of Residual Impacts/Environmental Effects and Significance Determination

Based on the above, a summary of the residual impacts/environmental effects of the Project after mitigation has been applied, and the significance of those impacts/environmental effects, is provided in Table 24.

7.0 (25) Part F: Summary

Part F plain language summaries in both French and English have been submitted separately as part of the IPD and EARD.

Table 24: Summary of Potential Residual Effects during Construction and Operation, and Significance Determination

Valued Component (VC)	Potential Effects (Without Mitigation)	Mitigation Measures	Residual Effects (After Mitigation has been applied)	Characterization of Residual Effect	Significance with Mitigation	Confidence
Atmospheric Environment	Construction -Emissions of combustion gases from the combustion of fossil fuels by heavy equipment and vehicles associated with on-site construction activities and from transport of materials on- and off-site could result in air contaminants that could disperse in the atmosphere to off-site receptors. -Emissions of fugitive dust from earth moving activities, and from transport of materials on- and off-site during construction activities could be generated and disperse in the atmosphere to off-site receptors. -The combustion of fossil fuels from the operation of mobile equipment and on-site trucks during construction activities could result in emissions of greenhouse gases. Operation -Emissions of combustion gases and greenhouse gases from the combustion of fossil fuels by heavy equipment and vessels associated with the operation of the Project could result in air contaminants that could disperse in the atmosphere to off-site receptors. -Marine vessels using of auxiliary engines while at berth and increased vehicle traffic.	-Complete GHG assessment and emission inventory. -Monitoring of weather (wind conditions and storm events) and stabilization of construction materials to minimize airborne fine particulate matter. -Vehicles and equipment will be maintained in proper working order. -A non-idling policy will be implemented and followed. -Adopting best management practices during construction such as minimization of the quantity of aggregate stockpiled at the construction site, minimizing drop distances for material transfer, and appropriate stockpile formation (slope angles and direction). -Complete Port Electrification Study. -Complete baseline assessment and SACC if required. -Water will be used to reduce dust, as necessary. Chemical dust suppressants will not be used at the proposed PDA.	Construction -Interactions between the Project and the atmospheric environment are expected to be primarily related to the operation of heavy mobile equipment and vehicles as well as the transport of materials on- and off-site. These activities have the potential to result in changes to the local air quality through the generation of emissions of fugitive dust and particulate matter from material movement as well as combustion emissions associated with the combustion of fossil fuels in heavy equipment. -Emissions of combustion gases from the combustion of fossil fuels by heavy equipment and vehicles during on-site construction activities and from transport of materials on- and off-site will be mitigated by implementing a non-idling policy and ensuring that equipment is in good working order. -Similarly with emissions of combustion gases, the emissions of greenhouse gases from the operation of mobile equipment and on-site trucks during construction activities will be mitigated by an anti-idling policy. Equipment will also be in good working order which will also keep emissions of GHGs as low as possible. Operation -Although an increase in emissions due to operational capacity increases are expected; the POA will be looking at options for electrification at the POA.	Magnitude: low Geographic Extent: local Duration: long term Frequency: intermittent Reversibility: reversible Ecological or Socioeconomic Context: high	Not significant	High

Valued Component (VC)	Potential Effects (Without Mitigation)	Mitigation Measures	Residual Effects (After Mitigation has been applied)	Characterization of Residual Effect	Significance with Mitigation	Confidence
Acoustic Environment	<u>Construction</u> Elevated noise levels at adjacent and nearby receptors during Project construction phases related to heavy equipment use, materials movement/delivery potential blasting. <u>Operation</u> Elevated noise levels at adjacent and nearby receptors during Project operation phases.	-A noise reduction plan will be established and communicated to the contractors and operators prior to construction. -Vehicles and equipment will be properly muffled and maintained according to noise suppression standards. -During construction, nearby residents will be notified of the schedule for construction activities and the likely duration. -Construction equipment will be well maintained and will be turned off when not in active use to minimize excess idling. -POA will ensure drivers know the designated vehicle routes, parking locations, no-idling policy, normal delivery hours, and use of engine brakes policy. -Complaints related to noise from the construction will be addressed by POA.	<u>Construction</u> -Interactions between the Project and the acoustic environment are expected to be primarily related to the operation of heavy mobile equipment and vehicles as well as the transport of materials on- and off-site. Developing a noise reduction plan to consider the closes residential receptor (Sunset RV Park), located approximately 2.5 km from the PDA. <u>Operation</u> -Although elevated noise levels are anticipated during Project operation phase; they are not anticipated to be substantially more than current operations and as such residual effects due to the operations phase are not anticipated.	Magnitude: low Geographic Extent: local Duration: long-term Frequency: intermittent Reversibility: reversible Ecological or Socioeconomic Context: high	Not significant	Moderate
Marine Environment	<u>Construction</u> -The permanent loss of fish habitat (i.e., harmful alteration, disruption, or destruction of fish habitat) from dredging and marine infilling activities. -Temporary change to fish habitat (through dredging activities). -A change in local surface water quality in POA due to the potential release of deleterious substances, including sediment, petroleum hydrocarbons and/or chemicals. -Change in marine fish populations and fish habitat (e.g., adult fish, juveniles, eggs and larvae, invertebrates and marine plants) through direct mortality, disruption (due to construction associated noise), injury or indirectly through alteration or destruction of habitat. -Introduction or spread of invasive species in the marine environment. <u>Operation</u> -The marine environment may be impacted by the operation of the new facility through	-If determined by Fisheries and Oceans Canada (DFO) that the Project may cause HADD (harmful alteration, disruption or destruction) of fish habitat, POA shall apply for and obtain an authorization under Section 35(2) of the *Fisheries Act*, with applicable offsetting and monitoring. -Complete dive survey (underwater benthic habitat study) in consultation with DFO. -The work will be conducted in accordance with a site-specific Environmental Protection Plan (EPP) to systematically reduce the likelihood of potential effects. -Dredge spoils will be disposed of in approved areas and as outlined in the EPP and approved by appropriate regulatory authorities. -Only clean fill material from a provincially approved source will be used to develop the land level expansion. -Dredging will be limited to areas required for the Project. -Ground disturbance shall be minimized to the extent possible to reduce the potential for construction debris to reach the marine environment. -Construction material and stockpiled materials will be set back a minimum of 30 m from Cooper Cove. -If practical, work will be scheduled so as to avoid periods of significant storm events. -Construction material and stockpiled materials will be checked daily, and prior to major storm events, to ensure they are properly stored/secured. -Visual monitoring of the turbidity will be required in the vicinity of the dredging to ensure that the turbidity is limited. If excessive change occurs in the turbidity (i.e.,	<u>Construction</u> -Approximately 103,000 m^2 of work (i.e., infilling) will occur below the high-water mark. Of that area, approximately 57,000 m^2 will be the land level expansion and result in the permanent loss of fish habitat. Approximately 32,000 m^2 will be temporarily altered beyond the permanent footprint with an additional 14, 000 m^2 required for cribbing. This temporary impact area will be a sloped transition to provide stability to the land level expansion and is expected to infill naturally overtime returning to existing conditions and function. Furthermore, although mitigation measures to prevent and minimize death of fish will be implemented, some incidental death of fish may occur during the construction phase of the Project. -The fish habitat within the PDA is not specialized or limited with abundant habitat similar in nature throughout the harbour. Given the industrial/commercial nature of the POA, habitat is not expected to be of high quality and higher quality habitat is expected	<u>Dredging:</u> Magnitude: moderate Geographic Extent: site-specific Duration: short-term Frequency: intermittent Reversibility: reversible Ecological or Socioeconomic Context: high <u>Marine Infilling:</u> Magnitude: moderate Geographic Extent: site-specific Duration: permanent Frequency: intermittent	Not Significant	Moderate

Valued Component (VC)	Potential Effects (Without Mitigation)	Mitigation Measures	Residual Effects (After Mitigation has been applied)	Characterization of Residual Effect	Significance with Mitigation	Confidence
	changes in local surface water quality related to use of typical chemicals and equipment used in shipbuilding due to the proximity of the Project to the marine environment. -The marine environment may be impacted by elevated noise levels during operations, causing sensory disturbance to fish or marine mammals.	distinct colour difference) beyond the harbour entrance as a result of the dredging activities, the work will stop. -Equipment that has been in the marine environment (i.e., excavators, piping, etc.) will be cleaned of any sediments, plants or animals and washed before and after construction to avoid the transfer of invasive species. -Best management practices will be adopted during the dredging activities to minimize sedimentation such as: low ascent and decent speeds of the dredging bucket. -A bubble curtain will be used to isolate the site and to assist in the prevention of sedimentation being transported off-site. -All Project work must follow the *Canada Shipping Act, 2001* and its regulations and requirements for inspection and certification of vessels used in the project, as well as the appropriate training and certification of competency for operators. More information on the Act can be found at the following: http://www.tc.gc.ca/ActsRegulations/acts/2001c26/menu.htm -For in-water work during dredging and land level expansion, the contractor will adhere to the conditions set by DFO and NLDECC-WRD approvals. -Should blasting be required, prior to commencing with underwater blasting, a blast control and monitoring plan that adheres to DFO's "Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters" will be submitted and approved by DFO and the UXO legacy sites program approved by DND. -Underwater blasting will be scheduled to the extent possible to avoid peak and sensitive migration periods, in consultation with DFO. -Acoustic measures (hazing) will be used to repel fish and mammals immediately prior to underwater blasts as directed by DFO. -Underwater blasting will be conducted in accordance with the "Measures to Avoid Causing Harm to Fish and Fish Habitat" on DFO's website. POA will ensure that procedures are in place to address the safe handling and storage of hazardous products. Furthermore, the facility will have an Environmental Emergency Response Plan.	to be available elsewhere. Furthermore, the area of temporary impact is expected to infill naturally overtime returning to existing conditions. <u>Operation</u> Residual effects are not anticipated from daily operations as they will not be substantially different than current operations.	Reversibility: irreversible Ecological or Socioeconomic Context: high <u>Other Construction and Operation Activities:</u> Magnitude: low Geographic Extent: local Duration: short-term to permanent Frequency: intermittent Reversibility: reversible Ecological or Socioeconomic Context: high		

Valued Component (VC)	Potential Effects (Without Mitigation)	Mitigation Measures	Residual Effects (After Mitigation has been applied)	Characterization of Residual Effect	Significance with Mitigation	Confidence
Terrestrial Wildlife and Wildlife Habitat	<u>Construction</u> -Sensory disturbance from construction activities could result in disruption to wildlife species and avoidance of the PDA. -Heavy equipment use during the construction activities may cause direct injury or death of birds through collisions and destruction of food sources; and -Food scraps remaining at the PDA could enhance populations of scavenging birds in the active construction area. <u>Operation</u> -Though unlikely to be present, terrestrial wildlife may be impacted by the operation of the new facility through potential wildlife interactions at the PDA.	-All workers will adhere to the *Migratory Birds Convention Act, 1994* and the *Migratory Birds Regulations* (MBR), which protect migratory birds from undue harm, injury, harassment, or death, and outlines that no migratory bird nests or eggs may be moved or obstructed during the construction and operation phases of the Project. -Project-related lighting during construction and operation shall be directed downwards to the extent possible and will be shielded as necessary to prevent undue attraction of birds. -Though no clearing is expected to take place to accommodate the Project, the ground shall be visually surveyed for the presence of nesting activity by ground-nesting bird species during this period prior to carrying out earth moving activities or stockpiling of dredge spoils. -If a nest or young birds are encountered, the contractor shall immediately cease work in the immediate area of the nest and contact the POA HSE and/or biologist representative. -Concentrations of seabirds, waterfowl, or shorebirds should not be approached. -To minimize bird encounters, the site and working areas shall be kept clean of food scraps and garbage and will be removed from the site daily. -In the case of bird or nest encounters, the following shall be implemented. -No attempt will be made by any worker at the PDA to chase, catch, divert, follow, or otherwise harass birds by vehicle or on foot. -If the nest of any bird is encountered during construction and operation activities, work around the nest shall immediately cease until a biologist representative assesses the situation and appropriate mitigation measures are applied. -A 100 m buffer zone shall be established around any discovered nests, within which no work will be permitted to take place until a biologist can confirm that the chicks have fledged, and the nest is empty. -To minimize disruptions with bird activity at night, the Project construction activities will be limited to daylight hours. -In the event of a mortality of a bird species at risk, or if mortality of 10 birds of any species occurs, ECCC and the NL Department of Fisheries, Forestry and Agriculture shall be notified within 24 hours of the discovery. Should interaction with wildlife become problematic during the operations phase, POA will develop a response plan.	<u>Construction</u> -Development of the Project will not result in the permanent loss of terrestrial wildlife habitat; however, it may interact with wildlife through sensory disturbances such as noise vibration, light or by increased traffic during construction and operation if wildlife species are present. Due to the lack of vegetation and industrial activities at the PDA, terrestrial wildlife (with the exception of birds) are not expected to occur within the PDA. Furthermore, although migrating and overwintering birds may visit the PDA for foraging purposes, there is no critical or well-suited habitat identified within the PDA. -Project activities are likely to result in sensory disturbances to birds and thus most bird species are likely to avoid the areas during each phase of work, thereby limiting the potential for injury or mortality of bird species. <u>Operation</u> -Although there is the potential for interactions with wildlife during operations, these interactions would be similar to present day activities and as such, residual effects on wildlife and wildlife habitat during operations are not anticipated.	Magnitude: low Geographic Extent: site-specific Duration: long-term Frequency: intermittent Reversibility: reversible Ecological or Socioeconomic Context: high	Not Significant	High

Valued Component (VC)	Potential Effects (Without Mitigation)	Mitigation Measures	Residual Effects (After Mitigation has been applied)	Characterization of Residual Effect	Significance with Mitigation	Confidence
Socioeconomic Environment	Construction -With an increasing number of high-density developments, there is a greater chance of land use conflicts between industrial and residential uses, in the form of dust particles and noise-pollution from Project activities -Creation of jobs during the construction phase of the Project. Operation -Ongoing job creation and economic activity in the Placentia Bay region from the ongoing operation of the POA.	-Refer to atmospheric environment VC for mitigation related to air quality. -Refer to acoustic environment VC for mitigation related to noise. -POA will engage with local residents prior to and throughout the Project to identify and consider concerns. -Vehicles and equipment will be equipped with mufflers and maintained, and dust suppression will be applied to stockpiled soil during dry periods. -Working hours will conform to site operations policies and should work be completed during nighttime conditions within allotted working times, directional lighting will be used on site with a downward lateral focus to minimize light leaving the site. -A transportation plan will be developed for the Project to manage truck and equipment flow on-site and off-site. -Although not anticipated, all necessary permits will be obtained, and industry best practices will be followed for special moves or traffic interruptions on public roads. -Where possible, the labour force will be drawn from the local economy. -Inclusion of Gender-based Violence (GBV) in the Health and Safety Plans for all work conducted at the PDA. -Development of Hiring Strategy that includes Diversity and Inclusion Policy.	Construction -Refer to atmospheric environment VC for residual effects related to air quality. -Refer to acoustic environment VC for residual effects related to noise. -With a growing local economy, it is likely that the labour force will be absorbed into other construction projects in the region after this shipyard expansion is complete. -As the POA continues to prioritize economic growth within the Placentia areas, there will continue to be increased residential density within the surrounding communities in proximity to the PDA. -With the incorporation of the above outlined measures, in combination with additional planning and development by-laws at the municipal level, residential effects are not anticipated. Operation -As the new facility operations are not anticipated to be substantially different than current operations, adverse residual effects are not anticipated. The Shipyard will continue to create jobs and provide economic activity for the Placentia Bay region.	Magnitude: low Geographic Extent: local Duration: long-term Frequency: intermittent Reversibility: reversible Ecological or Socioeconomic Context: high	Not significant	High
Human Health	-Worker safety and occupational health and safety are beyond the scope of this IPD. The only other pathway that might result in effects to human health is from emissions to the atmospheric environment. The potential environmental effects of the Project on human health would be from fugitive air emissions, which are assessed in under the atmospheric environment VC. As such, the atmospheric environment and human health VCs were assessed together. Please refer to the atmospheric environment VC for potential interactions, mitigation measures and residual effects pertaining to human health.	Refer to atmospheric environment above.	Refer to atmospheric environment above.	Magnitude: low Geographic Extent: local Duration: long-term Frequency: intermittent Reversibility: reversible Ecological or Socioeconomic Context: neutral	Not significant	High

Valued Component (VC)	Potential Effects (Without Mitigation)	Mitigation Measures	Residual Effects (After Mitigation has been applied)	Characterization of Residual Effect	Significance with Mitigation	Confidence
Navigation	<u>Construction</u> Temporary delay or access disruption to vessel traffic (commercial or recreational) due to marine construction phase. <u>Operation</u> The new facility will interact with recreational and commercial boat movement during operation.	All Project work must follow the *Canada Shipping Act, 2001* and the *Navigation Protection Act* as well as their Regulations (permits from TC will be obtained for impediments to navigation caused by the Project); -To the extent practical, work will be scheduled so as to avoid periods when the Project activities are anticipated to affect navigation in the harbour; and The POA will coordinate harbour activities for the duration of the Project so as to avoid unnecessary interference with harbour users.	<u>Construction</u> -While the Project is not anticipated to impede use of existing wharf facilities nor the social, economic, or cultural purposes among the public particularly after mitigation measures are implemented. -Disruptions to navigation during construction are not anticipated to have residual effects. <u>Operation</u> -Though the Project is not anticipated to impede the flow of vessels. -Applications to TC will be submitted for approval in order to proceed with the Project. From the proponent's perspective the Project effects on navigation are not significant, however this will be confirmed by TC in the review and permitting process.	Magnitude: low Geographic Extent: local Duration: long-term Frequency: continuous Reversibility: irreversible Ecological or Socioeconomic Context: high	Not significant	High
Heritage Resources	<u>Construction</u> -Accidental disruption/destruction of heritage resources within the PDA Project development area during construction due to dredging and caisson placement activities. <u>Operation</u> Not applicable	-Minimize the extent of disturbance of the PDA by planning as small a disturbance area as possible.	<u>Construction</u> -The PDA is in an area of historically used as a Naval Base. Alternation to the site are not anticipated to have any impact to historical resources. <u>Operation</u> -Not applicable	Magnitude: low Geographic Extent: site-specific Duration: short-term Frequency: intermittent Reversibility: irreversible Ecological or Socioeconomic Context: Neutral	Not significant	Moderate

Valued Component (VC)	Potential Effects (Without Mitigation)	Mitigation Measures	Residual Effects (After Mitigation has been applied)	Characterization of Residual Effect	Significance with Mitigation	Confidence
Indigenous Rights*	<u>Construction</u> -Based on feedback during pre-engagement and available information, the highest level of impact is assumed to relate to potential impact on fisheries in POA, due to the Project's impact on the marine habitat through marine dredging and infrastructure placement associated with the Project that will result in loss of fish habitat within the footprint of the Project-related facilities. -The Project activities of dredging, caisson placement, and infilling have potential effects on the following Indigenous rights: Food Social and Ceremonial Fishery, and the Right to a Moderate Livelihood (Commercial Fishing). -Project activities were assessed against the Hunting, Trapping and Gathering Rights; the Right to land and to Establish Treaties, and the Right to Ceremony. The potential effects of the Project activities on these rights was determined to be low, given the Project's industrial location, absence of known archaeological findings, and the absence of known ceremonial activities taking place within the PDA. -To date no concerns have been raised through engagement efforts*. <u>Operation</u> -Potential interactions between the Project and Indigenous rights during the operation phase are not anticipated.	-The Proponent will continue to engage Indigenous persons and communities (if they so choose) throughout the Project to share Project-related information, exchange ideas, address issues and concerns, and seek further clarity on which, if any, Indigenous rights are being affected by the Project, to what extent, and how they might be accommodated. -Refer to the marine environment VC for mitigation related to fish and fish habitat. -The POA is interested in other ways that it can mitigate any cultural impacts associated with this Project and will continue work toward building a stronger relationship with communities including finding ways of addressing real or perceived barriers to Indigenous employment at the POA.	<u>Construction</u> -Refer to the marine environment VC for the evaluation of residual effects to fish and fish habitat. -Indigenous people have an inherent right to fish, including within the POA. Although the footprint of the Project is relatively small in comparison to the amount of habitat available in the Placentia Bay , the Project will impact fishing activities in Cooper Cove , and while fishing activity is not known to occur at this location, this does not extinguish the right of Indigenous people to fish in these waters if they so choose. -Even with mitigation measures in place, building relationships with Indigenous communities will continue. The mitigation efforts will additionally not account for the cumulative effects that stem from historical colonization and the displacement of Indigenous people where the Project is located. These effects are historical and not connected to the Project itself. <u>Operation</u> As the new facility operations are not anticipated to be substantially different than current operations, adverse residual effects are not anticipated.	Magnitude: low Geographic Extent: regional Duration: long-term Frequency: intermittent Reversibility: irreversible Ecological or Socioeconomic Context: neutral	Not significant	Moderate

8.0 Closing

This Initial Project Description was prepared by Dillon Consulting Limited (Dillon) on behalf of the Port of Argentia (POA). 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 the Port of Argentia.

Sincerely,
DILLON CONSULTING LIMITED

Michelle Roche, EP, RPF
Associate, Project Manager

9.0 References

ARG (Argentia Remediation Group). 1995. Phase III/IV, Environmental Site Assessment, U.S. Naval Facility, Argentia, NF. Report 2: Site Characterization; Volume 3: Ponds and Outlying Sites. Report to Public Works and Government Services Canada.

Atlantic RBCA (Risk Based Corrective Action). 2022. Ecological Tier I Environmental Quality Standards (EQS) for Sediment. Available at: https://atlanticrbca.com/wp-content/uploads/2022/07/Ecological_Tier_I_Environmental_Quality_Standards_for_Sediment_V2.pdf (Accessed: 02 October 2023).

AC CDC (Atlantic Canada Conservation Data Centre). 2023. Response to Request for Data on the Port of Argentia, NL. Email and spatial data provided on April 27, 2023.

BLI (Bird Life International). 2023. Canada's Important Bird and Biodiversity Areas directory. https://www.ibacanada.com/explore_how.jsp?lang=EN (Date Accessed: May 23, 2023)

Catto, N.R., R.G. Hooper, M.R. Anderson, D.A. Scruton, J.D. Meade, L.M.N. Ollerheadand U.P. Williams. 1999. Biological and geomorphological classification of Placentia Bay: A preliminary assessment. Canadian Technical Report of Fisheries and Aquatic Sciences, 2289: v + 35 pp.

Dillon Consulting. 2019. Cooper Cove Infill Feasibility Study, Argentia, NL.

DFO (Fisheries and Oceans Canada). 2016. Groundfish (NAFO) Division 3Ps - Updated 2016. Available at: https://www.dfo-mpo.gc.ca/fisheries-peches/ifmp-gmp/groundfish-poisson-fond/groundfish-poisson-fond-div3p-2016-eng.html (Date Accessed: September 5, 2023)

DFO (Department of Fisheries and Oceans Canada). 2019a. Fish and Fish Habitat Protection Policy Statement, August 2019. Available at: https://www.dfo-mpo.gc.ca/pnw-ppe/policy-politique-eng.html

DFO (Department of Fisheries and Oceans Canada). 2019b. Policy for Applying Measures to Offset Adverse Effects on Fish and Fish Habitat under the *Fisheries Act*. December 2019. Available at: https://www.dfo-mpo.gc.ca/pnw-ppe/reviews-revues/policies-politiques-eng.html#_685

DFO (Fisheries and Oceans Canada). 2019c. Groundfish Newfoundland and Labrador region NAFO subarea 2 + divisions 3KLMNO. Available from: https://www.dfo-mpo.gc.ca/fisheries-peches/ifmp-gmp/groundfish-poisson-fond/2019/groundfish-poisson-fond-2_3klmno-eng.htm

DFO (Fisheries and Oceans Canada). 2022. Food, social, and ceremonial fisheries. Available from: https://www.dfo-mpo.gc.ca/fisheries-peches/aboriginal-autochtones/fsc-asr-eng.html

DFO (Fisheries and Oceans Canada). 2023. Species at Risk Mapping Tool. Available from: https://www.dfo-mpo.gc.ca/species-especes/sara-lep/map-carte/index-eng.html

DFO (Fisheries and Oceans Canada). 2022. Mitigating the impacts of ocean noise. https://www.dfo-mpo.gc.ca/oceans/noise-bruit/index-eng.html (Date Accessed: May 22, 2023)

DFO (Fisheries and Oceans Canada. 2021. OCEANOGRAPHIC CONDITIONS IN THE ATLANTIC ZONE IN 2021. https://waves-vagues.dfo-mpo.gc.ca/library-bibliotheque/41073320.pdf (Date accessed: May 5, 2023)

DFO (Fisheries and Oceans Canada). 2017. Integrated Management Planning, Placentia Bay, Newfoundland and Labrador. https://www.dfo-mpo.gc.ca/oceans/publications/imnfld-tnlgi/index-eng.html (Date accessed: May 2, 2023).

DFO (Fisheries and Oceans Canada). 2012. Large Ocean Management Area. Integrated Management Plan (2012-2017), Placenta Bay/Grand Banks. https://waves-vagues.dfo-mpo.gc.ca/library-bibliotheque/347923.pdf (Date Accessed: May 22, 2023)

ECCC (Environment and Climate Change Canada).2023. Canadian Climate Normals 1991-2020 Gander, NL Station. Available at: https://climate.weather.gc.ca/climate_normals/results_1991_2020_e.html?searchType=stnProv&lstProvince=NL&txtCentralLatMin=0&txtCentralLatSec=0&txtCentralLongMin=0&txtCentralLongSec=0&stnID=65000000&dispBack=0 (Date modified: February 20, 2019; Date accessed: May 2, 2023).

ECCC (Environment and Climate Change Canada).2020. Canadian Environmental Sustainability Indicators: Eelgrass in Canada. Available from: www.canada.ca/en/environment-climate-change/services/environmental-indicators/eelgrasscanada.html.

ECCC (Environment and Climate Change Canada).2023. Greenhouse gas emissions — National Inventory Report (NIR): Canadian Centre for Energy Information. Get started: Canadian Centre for Energy Information. Available at: https://energy-information.canada.ca/en/subjects/greenhouse-gas-emissions-national-inventory-report-nir

Englobe. 2021. Baseline Marine Sediment Sampling Program and Multibeam Survey, Argentia Harbour, Argentia, Newfoundland and Labrador. Public Services and Procurement Canada.

GOC (Government of Canada). 2019. Impact Assessment Act (S.C. 2019, c. 28, s. 1) https://laws.justice.gc.ca/PDF/I-2.75.pdf (Date accessed November 20, 2023).

GOC (Government of Canada). 2023a. Registered Populations of Miawpukek. https://fnp-ppn.aadnc-aandc.gc.ca/FNP/Main/Search/FNRegPopulation.aspx?BAND_NUMBER=47&lang=eng (Date accessed May 5, 2023).

GOC (Government of Canada). 2023b. Registered Populations of Qalipu Mi'kmaq First Nation. https://fnp-ppn.aadnc-aandc.gc.ca/fnp/Main/Search/FNRegPopulation.aspx?BAND_NUMBER=34&lang=eng (Date Accessed: May 5, 2023).

GOC (Government of Canada). 2023c. Water pollution: erosion and sedimentation. https://www.canada.ca/en/environment-climate-change/services/water-overview/pollution-causes-effects/erosion-sedimentation.html (Date Accessed: May 21, 2023)

GOC (Government of Canada). 2023d. Treasury Board of Canada Secretariat – Castle Hill Historic Site. https://www.tbs-sct.gc.ca/dfrp-rbif/pn-nb/00094-eng.aspx?qid=27765220#tabs_parcels (Date Accessed: November 20, 2023)

GOC (Government of Canada). 2023e. Treasury Board of Canada Secretariat – Placentia Mall Site. https://www.tbs-sct.gc.ca/dfrp-rbif/pn-nb/23687-eng.aspx?qid=27765314 (Date Accessed: November 20, 2023)

GOC (Government of Canada). 2022a. Guidance: Collaboration with Indigenous Peoples in Impact Assessments, Government of Canada, Canada.ca. Available at: https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/practitioners-guide-impact-assessment-act/collaboration-indigenous-peoples-ia.html (Accessed: 30 September 2023).

GOC (Government of Canada). 2022b. Releases of harmful substances to water. Available at: https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/releases-harmful-substances-water.html (Date Accessed: September 22, 2023)

GOC (Government of Canada). 2022c. Strategic Assessment of Climate Change - Canada.ca. Available at: https://www.canada.ca/en/services/environment/conservation/assessments/strategic-assessments/climate-change.html (Accessed: 30 September 2023).

GOC (Government of Canada). 2022d. Draft technical guide related to the Strategic Assessment of Climate Change: Assessing climate change resilience. Government of Canada, Canada.ca. Available at: https://www.canada.ca/en/services/environment/conservation/assessments/strategic-assessments/draft-second-technical-guide-strategic-assessment-climate-change.html (Accessed: 30 September 2023).

GOC (Government of Canada). 2021a. Public Participation for Impact Assessment
Government of Canada, Canada.ca. Available at: https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/public-participation-impact-assessment-fact-sheet.html (Accessed: 30 September 2023).

GOC (Government of Canada). 2021b. Policy Context: Indigenous Participation in Impact Assessment. Available at: https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/practitioners-guide-impact-assessment-act/policy-indigenous-participation-ia.html (Accessed: September 20, 2023)

GOC (Government of Canada). 2021c. Draft technical guide related to the strategic assessment of climate change. Government of Canada, Canada.ca. Available at: https://www.canada.ca/en/environment-climate-change/corporate/transparency/consultations/draft-technical-guide-strategic-assessment-climate-change.html (Accessed: 30 September 2023).

GOC (Government of Canada). 2019a. Regional Assessment of Offshore Wind Development in Newfoundland and Labrador. Government of Canada, Impact Assessment Agency of Canada. Available at: https://iaac-aeic.gc.ca/050/evaluations/proj/84343 (Accessed: 30 September 2023).

GOC (Government of Canada). 2019b. Regional Assessment of Offshore Oil and Gas Exploratory Drilling East of Newfoundland and Labrador. Government of Canada, Impact Assessment Agency of Canada. Available at: https://iaac-aeic.gc.ca/050/evaluations/proj/80156 (Accessed: 30 September 2023).

GOC (Government of Canada). 2019c. Assessing the cumulative effects of marine shipping, Transport Canada. Available at: https://tc.canada.ca/en/campaigns/protecting-our-coasts-oceans-protection-plan/better-protected-coastal-ecosystems/assessing-cumulative-effects-marine-shipping (Accessed: 30 September 2023).

GOC (Government of Canada). 2017. Guidance for evaluating human health impacts in environmental assessment: country foods. Available at: Guidance for evaluating human health impacts in environmental assessment: country foods. H129-54/5-2018E-PDF - Government of Canada Publications - Canada.ca (Accessed: September 24, 2023)

GNL (Government of Newfoundland and Labrador). 2020. Labrador Ecoregions. Available at: https://storymaps.arcgis.com/stories/b4c0ccf3c38a44da87916c1aec95032e (Date Accessed: May 5, 2023).

GNL (Government of Newfoundland and Labrador). 2023. Water Resources Portal. Available at: https://gnl.maps.arcgis.com/apps/webappviewer/index.html?id=8f9cddf172014b8d89eaa118bdfdfb40 (Date Accessed: Sept 18, 2023)

NLDECC (Newfoundland and Labrador Environment and Climate Change). 2022. Placentia Bay Liquefied Natural Gas (LNG) Facility and Marine Terminal Environmental Assessment Registration. Available at: https://www.gov.nl.ca/ecc/projects/project-2177/ (Date Accessed: July 25, 2023)

Husky Energy. 2012. White Rose Expansion Project Environmental Assessment Registration WH-DWH-RP-0013. Available at: https://iaac-aeic.gc.ca/050/evaluations/proj/68249 (Date Accessed: May 5, 2023)

IBA (Important Bird Area Canada). Placentia Bay (NF028). Available at: https://www.ibacanada.ca/mobile/site.jsp?siteID=NF028 (Date Accessed: September 19, 2023)

IDP (International Dark Sky Association). 2023. Anthropogenic light intensity mapping. https://www.cleardarksky.com/maps/lp/large_light_pollution_map.html (Date accessed May 22, 2023)

Janet E.m. Pitt, Robert D. Pitt. 2012. Placentia, The Canadian Encyclopedia. Available at: https://www.thecanadianencyclopedia.ca/en/article/placentia#:~:text=3898%20(2006c).-,The%20Town%20of%20Placentia%20is%20located%20on%20PLACENTIA%20BAY%20on,seaport%20on%20the%20Spanish%20coast. (Date Accessed: 26 September 2023).

Jenny Higgin. 2006. Argentia. Newfoundland and Labrador Heritage. Available at: https://www.heritage.nf.ca/articles/politics/argentia-base.php (Accessed: 26 September 2023).

King, A.F. 1988. Geology of the Avalon Peninsula, Newfoundland (parts of 1K, 1L, 1M, 1N and 2C). Map 88-001 (coloured). Scale: 1:250 000. Government of Newfoundland and Labrador, Department of Mines and Energy, Mineral Development Division. GS# NFLD/1680. Available at: https://www.gov.nl.ca/iet/files/88-01.pdf (Accessed: 26 September 2023).

LGL. 2002. Harlequins Ducks in Placentia Bay. LGL Rep. SA914E to SNC Lavalin and Newfoundland and Labrador Refinery Corporation.10 p. + app VBNC (Voisey's Bay Nickel Company). Argentia Hydrometallurgical Demonstration Plant Project Registration. vi + 93 pp. + Appendix.

MFN (Miawpukek First Nation). 2023. About Culture & Heritage. Available at: https://mfngov.ca/about/ (Date Accessed: September 15, 2023).

NLDECC (Newfoundland and Labrador Department of Environment and Climate Change). 2023a. 2022 Abient Air Monitoring Report. Available at: https://www.gov.nl.ca/ecc/files/2022-Air-Quality-Annual-Report.pdf (Date Accessed: September 20, 2023).

NLDECC (Newfoundland and Labrador Department of Environment and Climate Change). 2023b. Cape St. Mary's Ecological Reserve. Available at: https://www.gov.nl.ca/ecc/natural-areas/wer/r-csme/ (Date Accessed: September 20, 2023).

QFN (Qalipu First Nation). 2023a. Important Dates Timeline. https://qalipu.ca/qalipu/wp-content/uploads/2021/11/Qalipu-Timeline.pdf (Date accessed: May 23, 2023).

QFN ((Qalipu First Nation). 2011. Comprehensive community Plan. Available at: https://qalipu.ca/qalipu/wp-content/uploads/2021/11/Comprehensive-Community-Plan.pdf (Date accessed: September 19, 2023)

Stantec. 2019. Desktop Study of Marine Geotechnical conditions for Infill Feasibility Study, Cooper Cove, Argentia, NL.

Stantec. 2023. Marine Geotechnical Investigation Report – Cooper Cove, Argentia, NL.

Statistics Canada. 2021. Census Profile, Placentia, Newfoundland and Labrador.

Statistics Canada. 2023. Census Profile, 2021 Census of Population. Available at: https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/details/page.cfm?LANG=E&GENDERlist=1,2,3&STATISTIClist=1&DGUIDlist=2021S05101575,2021A00051001254,2021A00051001228,2021A00051001263&HEADERlist=37,36,,21,19,,42,44,40,43,41&SearchText=long%20harbour. (Date Accessed: September 08, 2023)

TOC (Town of Placentia). 2015. Land Use Zoning, Subdivision & Advertisement Regulations 2014-2024 (Development Regulations). Available at: https://www.gov.nl.ca/mpa/files/registry-community-placentia-files-placentia-development-regulations.pdf (Date Accessed: September 20, 2023)

TOC (Town of Placentia). 2023a. To appreciate our future you have to walk through our past. Available at: https://www.placentia.ca/history/ (Date Accessed: May 15, 2023)

TOC (Town of Placentia). 2023b. The core fuel for business is opportunity. Available at: https://www.placentia.ca/doing-business-in-placentia/ (Date Accessed: May 15, 2023)

DILLON CONSULTING

VBNC (Voisey's Bay Nickel Company). 2002. Argentia Hydrometallurgical Demonstration Plant Project Registration. vi + 93 pp. + Appendix. Available at: https://www.gov.nl.ca/ecc/files/env-assessment-projects-y2002-1040-1040-argentia-demo-plant-registration.pdf (Date Accessed: May 15, 2023)

Wenger, A. S., Harvey, E. S., Wilson, S. K., Rawson, C. A., Newman, S. J., Clarke, D. G., Saunders, B. J., Browne, N. K., Travers, M. J., McIlwain, J. L., Erftemeijer, P., Hobbs, J. A., McLean, D. L., Depczynski, M., & Evans, R. D. (2017). A critical analysis of the direct effects of dredging on fish. Fish and Fisheries, 18(5), 967–985. Available at: https://doi.org/10.1111/faf.12218 (Date Accessed: September 15, 2023)

Appendix A

Agreement to Transfer

AGREEMENT TO TRANSFER

THIS AGREEMENT made in duplicate as of the 1st day of DECEMBER, 2022.

BETWEEN: **HIS MAJESTY THE KING IN RIGHT OF CANADA ("His Majesty")**, represented by the Minister of Public Works and Government Services (**"Minister"**),

OF THE FIRST PART

AND: **PORT OF ARGENTIA INC.**, a body corporate under the laws of the Province of Newfoundland and Labrador, operating as **PORT OF ARGENTIA ("POA")**

OF THE SECOND PART

WHEREAS the Minister is the owner in fee simple of the lands and lands covered by water located in Argentia, Electoral District of Placentia, Province of Newfoundland and Labrador, more particularly identified as Parcel 2021-2, on PSPC Plan S-6675-W, described in Schedule A, and shown in Schedule "B", both attached hereto, and also referred to herein as "Parcel 2021-2", or for the purposes of this Agreement, the "Lands".

AND WHEREAS POA is the owner and operator of the Port of Argentia, in the Province of Newfoundland and Labrador, saving and excepting certain lands, including the aforementioned Parcel 2021-2.

AND WHEREAS POA has requested a conveyance of Parcel 2021-2 from the Minister, which conveyance the Minister is currently formalizing approval and conducting its due diligence, in preparation for entering into this Transfer Agreement with the POA, all pursuant to standing approvals and authority;

AND WHEREAS, after the Closing Date as defined herein, His Majesty has and will retain regulatory authority and enforcement powers with respect to standards of safety and security for the marine industry and travelling public at ports in Canada;

NOW THEREFORE THIS AGREEMENT WITNESSES that, in consideration of the mutual covenants and agreements herein and subject to the terms and conditions hereinafter set out, the parties agree as follows:

ARTICLE 1 – DEFINITIONS

Section 1.01 Definitions

1.01.01 In this Agreement:

"Agreement" means this Agreement to Transfer, and includes the documents attached Schedules "A" through "E", inclusive, which form an integral part of this Agreement;

"Applicable Environmental Laws" means all federal and provincial environmental laws of general application in the Province of Newfoundland and Labrador respecting environmental matters, as those laws apply to POA or the Port or His Majesty. In the event of conflict of laws, the highest standard shall be met;

"Business Day" means a day other than a Saturday, Sunday or statutory holiday in the Province of Newfoundland and Labrador;

"Canadian Inspection Services" means inspection services as provided by legislation of the CIS Departments including the act of collecting revenue and of receiving, controlling, examining, interviewing, searching, detaining, removing and clearing conveyances, travelers and goods entering, departing or transiting Canada;

"CIS Departments" means those departments or agencies of His Majesty or any successor department or agency which provide Canadian Inspection Services at Canadian ports and includes:

(a) Agriculture and Agri-Food Canada;
(b) Canada Border Services Agency;
(c) Canadian Food Inspection Agency;
(d) Canada Revenue Agency;
(e) Environment Canada;
(f) Health Canada;
(g) Public Safety Canada; and
(h) Transport Canada.

"Closing" means the execution and delivery of the Instruments listed in Section 2.02 of this Agreement and the concurrent delivery of other documents as agreed between the parties;

"Closing Date" means the 9TH day of the month of DECEMBER, 2022 or such other date as the Minister and POA may agree as the date on which the Closing shall take place;

"Contaminant" means any substance, howsoever defined in any Applicable Environmental Laws, which is hazardous to persons, animals or plants and which affects the soil of or the water (including sediment) in, on, over or under the Lands;

"Costs" means all expenses, losses, charges and payments relating to an event and including any professional, consultant and legal fees (on a "solicitor and his own client" basis) of professionals and consultants retained by a party hereto;

"Damages" means any loss, cost or damage including, but not limited to direct, indirect, incidental, special, exemplary, consequential or otherwise, loss of profits or revenue, interference with business operations, loss of tenants, lenders, investors or buyers, diminution in value of the Port or any part thereof, inability to use any part of the Port and Costs;

"Instruments" means the documents listed in Section 2.02 when executed and delivered;

"Instrument of Grant" means the document of that name referred to in Section 2.02 when executed and delivered;

"Lands" means all and singular that certain parcel or tract of land and premises situate, lying and being in Argentia in the Electoral District of Placentia, in the Province of Newfoundland and Labrador, identified as Parcel 2021-2, on PSPC Plan S-6675-W, more particularly described in Schedule "A" and shown in Schedule" B" to this Agreement;

"Minister" means the Minister of Public Works and Government Services or any person authorized in writing to act on the Minister's behalf;

"Navigation Aids" means

(a) light houses, light ships, floating and other lights, lanterns and other signals, buoys and beacons, radio aids to marine navigation, anchors and landmarks acquired, constructed, repaired, maintained, improved, erected, placed or laid down for the greater security and facility of marine navigation, and

(b) any equipment or special electrical distribution cables required to bring electrical power to or to operate any aids contemplated in Paragraph (a) of this definition;

"Person" means any individual, company, corporation, partnership, firm, trust, sole proprietorship, government or government agency, authority or entity, however designated or constituted;

"Port" means the Lands;

"**Reports**" mean those environmental reports listed on Schedule "D" in relation to the Lands; and,

"Unexploded Ordnance" or **"UXO"** shall mean a munition containing explosive material which has not been armed and/or fired, or failed to function, explode or detonate as intended after being armed and/or fired. UXO is commonly associated with munitions which failed to function as designed when used/fired in designated range training areas or in combat zones. UXO may also be associated with outdated, malfunctioning or surplus munitions which were buried as a means of disposal.

ARTICLE 2 – UNDERTAKINGS

Section 2.01 Use of the Port

2.01.01 The parties agree that as of the Closing Date:

(a) Otherthan those government functions mentioned in Subsection 2.01.02, His Majesty shall vacate and cease to own and manage the Lands; and

(b) POA shall take possession of and manage the Lands on its own behalf and not on behalf of His Majesty, in accordance with any other agreement between the parties regarding the Lands, and applicable law.

2.01.02 Subject to any other agreement which the parties may make regarding the Lands or navigable waters adjacent to the lands, nothing in this Agreement precludes His Majesty from continuing, on or after the Closing Date, to carry on or cause to be carried on at the Lands or navigable waters adjacent to the Lands, governmental functions including, without limitation:

(a) functions relating to marine navigation and traffic control, including functions relating to Navigation Aids administered by the Department of Fisheries and Oceans (Canadian Coast Guard) or any successor department or agency;

(b) certain law enforcement functions, particularly as they relate to marine security and the prevention of terrorism;

(c) Canadian Inspection Services;

(d) functions relating to inspection and security for which the Department of Transport is responsible, or any successor department or agency; and

(e) the enforcement of law.

2.01.03 This Agreement is subject to POA giving Marine Atlantic Inc. or a successor Crown corporation or entity,the right to unimpeded and uninterrupted passage of its ferry vessels through, into, across and out of the Lands, at no cost to Marine Atlantic Inc.

Section 2.02 Closing

2.02.01 The parties undertake to deliver, on the Closing Date, each of the following documents duly executed by the parties:

(a) Instrument of Grant, in the form attached as Schedule "C";
(b) Executed UXO Agreement, attached as Schedule "F";

2.02.02 Each party shall, at any time, and from time to time, take any and all steps, and execute and deliver any and all further documents and assurances as the other party may reasonably request to carry out the provisions of this Agreement.

2.02.03 The transfer of title of the Lands from His Majesty to POA shall be by way of fee simple at or for the nominal price or sum of One Dollar ($1.00), as set out in the Instrument of Grant prepared by His Majesty in Schedule "C", and the parties agree that there are no representations, warranties, collateral agreements or conditions relating to the title of the Lands except as specified in this Agreement. The Lands are to be transferred subject to any registered or unregistered easements or restrictive covenants that run with the Lands.

2.02.04 Each Party shall pay for and be liable for its own legal costs. POA shall be responsible for its own costs, including but not limited to costs of registration of the Instrument of Grant and payment of any applicable land transfer tax. POA shall ensure that its solicitor undertakes to register the Instrument of Grant in the Provincial Registry of Deeds.

ARTICLE 3 – CONDITIONS PRECEDENT

Section 3.01 Conditions Precedent to His Majesty's Obligations

3.01.01 The obligations of His Majesty under this Agreement are subject to the satisfaction of or compliance with the following conditions precedent, namely:

(a) that all of the written representations and warranties of POA made in this Agreement, and in any other agreement or certificate made or delivered pursuant to this Agreement, including the representations and warranties made by POA as set forth in Subsection 4.01.01, are true and correct at and as of the Closing Date and with the same effect as if made at and as of the Closing Date. On the Closing Date, POA shall provide His Majesty with the following:

(i) a certificate of a knowledgeable and authorized officer of POA setting out the representations or warranties made by POA in Paragraphs 4.01.01 (a) to (i) inclusive and certifying that they are true and correct at and as of the Closing Date; and

(ii) a legal opinion from POA's Solicitor in a form and content satisfactory to the Minister to the effect that all representations and warranties made by POA as set out in Paragraphs 4.01.01 (a) to (i) inclusive are true and correct at and as of the Closing Date. In providing such legal opinion, POA's Solicitor may rely upon the certificate of a knowledgeable and authorized officer of POA with respect to any matter of fact.

(b) **Marine Atlantic Inc.** POA shall issue a letter to Marine Atlantic Inc. prior to the Closing Date in a form and content satisfactory to the Minister confirming the right of Marine Atlantic Inc. to unimpeded and uninterrupted passage of its ferry vessels through, into, across and out of the Lands, at no cost to Marine Atlantic Inc.

Section 3.02 Acknowledgment

3.02.01 The parties acknowledge that the conditions precedent set out in Subsection 3.01.01 is for the exclusive benefit of His Majesty and may be waived in writing by the Minister in whole or in part.

Section 3.03 Conditions Precedent to POA's Obligations

3.03.01 The obligations of POA under this Agreement are subject to the satisfaction of or compliance with all of the following conditions precedent:

(a) **Truth and Accuracy of Representations and Warranties at Closing Date.** All of the written representations and warranties of His Majesty made in this Agreement, and in any other agreement or certificate made or delivered under this Agreement, including the representations and warranties made by His Majesty as set forth in Subsection 4.02.01, are true and correct at and as of the Closing Date and with the same effect as if made at and as of the Closing Date. On the Closing Date, His Majesty shall provide POA with a certificate of the Minister setting out the representations or warranties made by His Majesty in Subsection 4.02.01 and certifying that they are true and correct at and as of the Closing Date.

Section 3.04 Acknowledgments

3.04.01 The parties acknowledge that each of the conditions precedent set out in Subsection 3.03.01 is for the exclusive benefit of POA and may be waived in writing by POA in whole or in part.

Section 3.05 Conditions Precedent to both His Majesty and POA

3.05.01 The obligations of both parties under this Agreement are subject to the satisfaction of or compliance with, at or before the Closing Date, all of the following conditions precedent:

(a) **Federal or Provincial Regulatory Control.** No governmental body or authority or regulatory agency, body or tribunal having jurisdiction has made under applicable federal or provincial legislation on or before the Closing Date any decision or order precluding POA or His Majesty from executing and delivering any of the Instruments or from consummating the transactions contemplated herein or therein;

(b) **Litigation.** No suit, action, litigation, arbitration proceeding, including appeals and applications for review, in progress, pending or threatened against or involving His Majesty or POA has been instituted and no judgment, decree, injunction or order of any court or arbitrator, involving His Majesty or POA, has been made which might adversely affect the capacity or power of His Majesty or POA to execute and deliver any of the Instruments or to consummate the transaction contemplated herein or therein or which might adversely affect POA's financial position to a significant degree;

(c) **Decision or Order.** No court having jurisdiction has made on or before the Closing Date any decision or order precluding any of the parties from executing and delivering any agreements made pursuant to this Agreement or from consummating the transactions contemplated herein or therein.

Section 3.06 Acknowledgment

3.06.01 The parties acknowledge that each of the conditions precedent set out in Subsection 3.05.01 is for the benefit of both parties and may be waived in writing by both the Minister and POA in whole or in part.

Section 3.07 No Liability

3.07.01 If any of the conditions precedent set out in Subsection 3.01.01, 3.03.01 or 3.05.01 has not been met and the party or parties for whose benefit it exists have not waived that condition precedent, this Agreement shall, notwithstanding any intermediate acts or negotiations, be of no further force and effect and neither party shall be liable to the other for any Damages whatsoever.

3.07.02 Neither of the parties can raise the non-fulfillment of any of the conditions precedent set out in Subsections 3.01.01, 3.03.01 or 3.05.01 after the Closing Date.

3.07.03 Notwithstanding any provision of this Agreement, including but not limited to the Reports, the Lands shall be transferred by His Majesty to POA on an as-is where-is basis without any warranty or representation as to their condition, whether environmental or otherwise, or their fitness for any purpose whatsoever. POA agrees to accept the Lands in their current condition without any liability of His Majesty whatsoever.

ARTICLE 4 – REPRESENTATIONS AND WARRANTIES

Section 4.01 POA's Representations and Warranties

4.01.01 POA represents and warrants to His Majesty that:

(a) it is a corporation whose head office is located at Argentia which has been duly incorporated and organized and is validly existing under the laws of the Province of Newfoundland and Labrador;

(b) it is duly qualified, licensed or registered to carry on business in the Province of Newfoundland and Labrador;

(c) it has all necessary corporate power, authority and capacity to:

(i) Manage the Lands;

(ii) Enter into this Agreement and the other agreements expressly contemplated in this Agreement and to perform its obligations herein and therein; and

(iii) Acquire and hold an interest in real property in the Province of Newfoundland and Labrador;

(d) the execution and delivery of this Agreement and each of the other agreements expressly contemplated in this Agreement and the consummation of any of the transactions provided for in any of them have been duly authorized by all necessary corporate action on the part of POA;

(e) the documents of incorporation and the by-laws of POA are consistent with the obligations of POA under this Agreement and any other agreement expressly contemplated in this Agreement;

(f) as of the Closing Date, there shall be no suit, action, litigation, arbitration proceeding or governmental proceeding, including appeals and applications for review, in progress, pending or threatened against or involving POA, or any judgment, decree, injunction or order of any court or arbitrator, involving POA, which might adversely affect the capacity or power of POA to execute and deliver this Agreement or any other agreement expressly contemplated in this Agreement or to consummate the transaction provided for in any of them or which might adversely affect to a significant degree POA, its assets, its financial condition or its future prospects;

(g) this Agreement and the other agreements expressly contemplated in this Agreement, upon execution and delivery, constitute legal, valid and binding obligations of POA enforceable against POA in accordance with their terms; and,

(h) each statement of fact contained in a certificate of a knowledgeable and authorized officer of POA referred to in Paragraph 3.01.01(a) is true and correct.

Section 4.02 His Majesty's Representations and Warranties

4.02.01 His Majesty represents and warrants to POA that

(a) this Agreement and any other agreement expressly contemplated in this Agreement, upon execution and delivery, constitute legally valid and binding obligations of His Majesty enforceable against His Majesty in accordance with their terms except as they may be limited by law;

(b) as of the Closing Date, there are no suits, actions, litigation, arbitration proceedings or governmental proceedings, including appeals and applications for review, in progress, pending or threatened against or involving His Majesty, or any judgment, decree, injunction or order of any court or arbitrator, involving His Majesty, which might adversely affect the capacity or power of His Majesty to execute and deliver this Agreement or any other agreement expressly contemplated in this Agreement or to consummate the transaction provided for in any of them or which might adversely affect to a significant degree the financial position of POA; and,

(c) each statement of fact contained in a certificate of a knowledgeable and authorized officer of His Majesty referred to in Paragraph 3.03.01 is true and correct.

Section 4.03 Acknowledgments

4.03.01 The parties acknowledge that neither party has made nor shall make any representations and warranties with respect to this Agreement or any other agreement expressly referred to in this Agreement and that none is implied or to be implied by statute or otherwise, except the representations and warranties expressly made in this Agreement or in any other agreement expressly referred to in this Agreement or in any certificate or statement of fact made or delivered under this Agreement or in any other agreement expressly referred to in this Agreement.

4.03.02 The parties further acknowledge that neither party has relied on nor shall rely on any information provided by the other party in connection with this Agreement or in any other agreement expressly referred to in this Agreement other than the Reports and the warranties and representations expressly made in this Agreement or in any other agreement expressly referred to in this Agreement or the certificates or other statements of fact provided under this Agreement or in any other agreement expressly referred to in this Agreement.

Section 4.04 Survival of Representations and Warranties

4.04.01 A representation or warranty contained in this Agreement or in any other agreement expressly referred to in this Agreement or in a certificate or other statement of fact provided hereunder or thereunder on the part of each of the parties shall survive the Closing and not merge with the Instruments.

Section 4.05 Independent Legal Advice

4.05.01 The parties each acknowledge having obtained their own independent legal advice with respect to this Agreement to the full extent deemed necessary by each party prior to its execution and delivery. The parties acknowledge that neither acted under duress in negotiating, drafting and executing this Agreement.

ARTICLE 5 – ENVIRONMENT

Section 5.01 Delivery of the Reports

5.01.01 POA acknowledges receipt of the Reports commissioned by His Majesty, at His cost, concerning the environmental condition of the Lands.

Section 5.02 Reports Constitute Proof

5.02.01 The Reports are proof between the parties, in the absence of proof to the contrary, as to the existence of any Contaminants affecting the soil of or the water (including sediment) in, on, over or under the Lands and the quantity thereof immediately prior to the Closing Date, notwithstanding the effective date of the Reports.

Section 5.03 Environmental Assessment

5.03.01 POA is responsible for ensuring compliance with the *Impact Assessment Act*, SC 2019, c 28, s 1, or any other Federal or Provincial legislation, as the case may be, if applicable, for any future activities it may undertake on the Lands.

Section 5.04 Dredging

5.04.01 POA hereby releases the Minister from any claim, and agrees to save harmless the Minister from any claims whatsoever including third party claims related to any dredging of the Lands.

Section 5.05 Military Munitions at Sea and Unexploded Ordnance (UXO)

5.05.01 The Parties acknowledge that there is an element of risk associated with the Lands that were used by the military due to the potential presence of UXO.

5.05.02 POA acknowledges that this Agreement is conditional upon the execution of a UXO Agreement by the Parties, an executed copy to be included with this Agreement as Schedule "F" attached hereto.

5.05.03 Due to the inherent inability to have complete knowledge of all subsurface items (munition and non-munition), it is impossible for the Minister to provide an absolute guarantee as to the absence of these items on the Lands. It is noted that munition items such as high explosives or military munitions are inherently hazardous. Should any suspected munition items such as high explosives or military munitions ever be encountered, caution should be exercised and the items should not be disturbed and local police authorities should be contacted.

ARTICLE 6 – NO PARTNERSHIP, JOINT VENTURE OR AGENCY

Section 6.01 No Partnership, Joint Venture or Agency

6.01.01 His Majesty and POA expressly disclaim any intention to create a partnership, joint venture or agency. It is understood, acknowledged and agreed that nothing contained in this Agreement nor any acts of His Majesty or POA shall constitute or be deemed to constitute His Majesty and POA as partners, joint venturers or principal and agent in any way or for any purpose. POA shall not represent or hold itself out to be an agent of His Majesty. No party shall have any authority to act for or to assume any obligations or responsibility on behalf of the other party.

6.01.02 POA agrees to be liable to His Majesty for any liability that His Majesty incurs by virtue of being found to be liable with POA as a partner of, joint venturer with, or principal of POA. For greater certainty, POA assumes no responsibility for any liability to His Majesty arising as a result of the act or omission of His Majesty or His agent which are the basis for the finding that His Majesty or His agent is a partner of, joint venturer with, or principal of POA.

6.01.03 For greater certainty, neither this Agreement nor any other agreement made pursuant to this Agreement nor any other document which may be necessary or desirable for purposes of completing the transaction contemplated by this Agreement, shall constitute or be construed or be deemed to constitute or be construed as a delegation by the Minister to POA of any of his powers, duties or functions.

ARTICLE 7 – INDEMNITY

Section 7.01 Indemnity

7.01.01 POA agrees, at all times, to indemnify and save harmless His Majesty or any of His officers, servants, employees or agents from and against all claims and demands, loss, costs, damages, actions, suits or other proceedings by whomsoever made, brought or prosecuted in any manner based upon, occasioned by or attributable to the execution of this Agreement or any action taken or things done or maintained by virtue hereof, or the exercise in any manner of rights arising hereunder, except claims for damage resulting from the negligence of any officers, servants, employees or agents of His Majesty while acting within the scope of their duties or employment.

ARTICLE 8 – ARBITRATION

Section 8.01 Arbitration

8.01.01 In the event that a dispute, conflict, claim or controversy ("Dispute") arises out of or in connection with this Agreement, and the parties are not able to resolve the Dispute through discussions, then with the written agreement of the parties ("Arbitration Agreement"), the Dispute will be referred to binding arbitration in accordance with the *Commercial Arbitration Act* (R.S. 1985, c. 17 2nd Supp.).

For the purposes of this Article, a Dispute includes, without limitation, a dispute, conflict, claim or controversy, not involving the interpretation or application of the public law of Canada, and concerning:

(a) the formation, validity, interpretation, application or enforceability of this Agreement;

(b) the performance, breach, termination or other discharge of the Agreement;

(c) the duties, rights, obligations or remedies of the parties pursuant to the Agreement.

8.01.02 For the purpose of each arbitration under this Agreement, POA shall constitute one party to the arbitration and His Majesty shall constitute the other party to the arbitration.

8.01.03 If a Dispute arises and the parties do not resolve some or all of the Dispute through discussions, then, either party may give written notice, in accordance with Section 9.15, to the other party of its intent to enter into an Arbitration Agreement ("Notice of Intent"). If the parties have not entered into an Arbitration Agreement within fifteen (15) Business Days of receipt of the Notice of Intent, the parties are not obligated to enter into such an Arbitration Agreement.

8.01.04 The parties shall, in the Arbitration Agreement, concisely describe the matter submitted for arbitration. The parties further agree that the arbitral proceedings will consist of oral hearings for the presentation of evidence (either oral, written or both) and for oral argument and that such hearings are to be held within sixty (60) Business Days of the date of the Arbitration Agreement.

8.01.05 (a) An arbitration under this Agreement shall be conducted by one arbitrator chosen by agreement of the parties.

(b) If the parties are unable to agree on the choice of an arbitrator within ten (10) Business Days from the date of execution of the Arbitration Agreement there shall be three (3) arbitrators (the "Arbitral Panel").

(c) Either party may nominate one arbitrator and upon doing so shall in writing notify the other party of that nomination. Within ten (10) Business Days after receiving such notice, the other party shall nominate a second arbitrator. The two arbitrators shall within ten (10) Business Days after selection of the second arbitrator select a third arbitrator to be chairperson of the Arbitral Panel and to act jointly with them. If the two arbitrators fail to agree on the selection of the third arbitrator, the third arbitrator shall be designated by the ADR Institute of Canada upon application by either party.

(d) A person eligible for appointment as an arbitrator:

(i) will be an experienced arbitrator or counsel having training in arbitration;

(ii) will be independent and impartial; and

(iii) preferably, will have knowledge of, or experience in the subject matter in dispute.

8.01.06 The sole arbitrator or Arbitral Panel, as the case may be, ("Arbitrator") shall have the right to grant legal and equitable relief and to award costs (including legal fees and the costs of the arbitration) and interest. The Arbitrator shall not be authorized to decide ex aequo et bono or as amiable compositeur. Nothing contained herein shall be construed to permit the Arbitrator to award punitive, exemplary or any similar damages.

8.01.07 Except to the extent that it may be inconsistent with the procedure set out in this Article, the *Commercial Arbitration Code* (*Commercial Arbitration Act* (R.S. 1985, c. 17 2nd Supp.)) shall govern the arbitration of a Dispute under this Agreement.

8.01.08 The arbitration shall take place in the City of St. John's at such place and time as the Arbitrator may fix for the purpose of hearing the evidence and representations that the parties may present. The arbitration proceedings shall be conducted in either French or English, with the agreement of the parties. No later than 20 Business Days after hearing the representations and evidence of the parties, the Arbitrator shall make its determination in writing and deliver one copy to each of the parties.

8.01.09 The parties agree to an exchange of all information upon which they intend to rely in any oral or written presentation during the arbitration. This exchange shall be completed no later than ten (10) Business Days prior to the date set for the arbitration hearing.

8.01.10 All information exchanged during this entire procedure shall be regarded as "without prejudice" communications. However, evidence that is independently admissible or discoverable shall not be rendered inadmissible or non-discoverable by virtue of its use during the arbitration.

8.01.11 Subject to the *Commercial Arbitration Code* (*Commercial Arbitration Act* (R.S. 1985, c. 17 2nd Supp.)), the decision of the Arbitrator, or a majority of its members, shall be final and binding upon the parties in respect of all matters relating to the arbitration, the conduct of the parties during the proceedings, and the final determination of the issues in the arbitration. The decision shall be in writing and include reasons for the decision. Judgment upon any award rendered by the Arbitrator may be entered in any court having jurisdiction thereof.

8.01.12 The costs of any arbitration hereunder shall be borne by the parties in the manner specified by the Arbitrator in its determination.

8.01.13 The Arbitrator shall resolve the Dispute in accordance with the laws of the Province of Newfoundland and Labrador.

8.01.14 It is agreed that the sole arbitrator or any member of the Arbitral Panel will neither represent nor testify on behalf of any of the parties in any subsequent proceeding between the parties or where they are opposed in interest. It is further agreed that the personal notes and written opinions of the sole arbitrator or any member of the Arbitral Panel made in relation to this arbitration are confidential and may not be used in any subsequent proceeding between the parties, or where they are opposed in interest.

ARTICLE 9 – GENERAL PROVISIONS

Section 9.01 Entire Agreement

9.01.01 This Agreement and the other agreements referred to in this Agreement, set forth the entire agreement between the parties concerning the subject matter hereof. No representation or warranty expressed, implied or otherwise is made by His Majesty to POA or by POA to His Majesty except as expressly set out in this Agreement or the other agreements referred to in this Agreement. This Agreement supersedes and revokes all negotiations, arrangements, letters of intent, brochures, representations and information conveyed, whether oral or in writing, between the parties or their representatives or any other Person purporting to represent the Minister or POA. POA agrees that:

(a) it has not been induced to enter into this Agreement or any other agreement referred to in this Agreement by any representations not set forth in this Agreement or any other agreement referred to in this Agreement;

(b) it has not relied on any such representations;

(c) it has conducted its own due diligence examinations in order to satisfy itself of the full, true and plain disclosure of the facts;

(d) no such representations shall be used in the interpretation or construction of this Agreement or any other agreement referred to in this Agreement; and

(e) no claims, including loss of profits and consequential damages arising as a result of, or from any such representations shall accrue to or be pursued by it, and His Majesty shall have no liability for any such claims.

Section 9.02 Cancellations

9.02.01 If any party fails, for any reason, to keep, perform or observe any of the covenants, agreements, provisions, conditions or provisos contained in Section 2.02 on the part of that party to be kept, performed or observed, then the other party may, at its option, terminate this Agreement by giving to the party in default a Notice. If Notice is so given, this Agreement shall terminate upon such Notice being given and neither party shall be liable to the other for any Damages whatsoever in respect of such termination.

Section 9.03 Assignment of this Agreement

9.03.01 Neither party shall assign this Agreement or any agreement made pursuant to this Agreement, nor any of the party's rights, duties or obligations hereunder or thereunder without the prior written consent of the other party. Any attempt by a party to assign this Agreement or any agreement made pursuant to this Agreement, or any of the party's rights, duties or obligations hereunder is void.

Section 9.04 Subdivisions

9.04.01 Unless otherwise stated, a reference in this Agreement, by numerical or alphabetical designation to an Article, Section, Subsection, Paragraph, Subparagraph, Appendix, Schedule or Annex, refers to the Article, Section, Subsection, Paragraph, Subparagraph, Appendix, Schedule, or Annex, bearing that designation in this Agreement.

Section 9.05 Headings

9.05.01 The division of this Agreement into Articles, Sections, Subsections, Paragraphs and Subparagraphs and the insertion of headings are for convenience of reference only and do not affect the construction or interpretation of this Agreement.

Section 9.06 Number and Gender

9.06.01 Words importing the singular number shall include the plural and words denoting the masculine gender shall include the feminine and neutral, if the context so requires.

Section 9.06 Appendices and Schedules

9.06.01 All capitalized words and phrases used in any of the attached Appendices or Schedules shall have the same meanings as defined in this Agreement, unless specifically defined in the Appendix or Schedule.

Section 9.07 Statutes, Regulations and Rules

9.07.01 Any reference in this Agreement to all or any part of any statute, regulation or rule, unless otherwise stated, is a reference to that statute, regulation or rule or the relevant part thereof, as amended, substituted, replaced or re-enacted from time to time.

Section 9.08 Governing Law

9.08.01 This Agreement is interpreted in accordance with the laws in force in the Province of Newfoundland and Labrador, subject always to any paramount or applicable federal laws. Nothing in this Agreement is intended to or is construed as limiting, waiving or derogating from any federal Crown prerogative.

Section 9.09 Construed Covenants

9.09.01 All of the provisions and each agreement or obligation of this Agreement, even though not expressed as a covenant, are construed as covenants and agreements as though the words importing such covenants and agreements were used.

Section 9.10 Rights or Remedies

9.10.01 Nothing expressed or implied in this Agreement, or any other agreement referred to in this Agreement, is intended to or is construed to confer on or give any Person, other than the parties hereto and their respective successors and permitted assigns, any rights or remedies under or by reason of this Agreement or any such other agreement.

Section 9.11 Time of Essence

9.11.01 Time is of the essence of this Agreement.

Section 9.12 Amendment

9.12.01 This Agreement may be amended only by a written agreement signed by the parties.

Section 9.13 Waiver

9.13.01 The failure by any party to insist in any one instance upon the strict performance by the other party of obligations hereunder shall not constitute a waiver or relinquishment of any such obligations as to any other instances, and the same shall continue in full force and effect.

9.13.02 No covenant or condition of this Agreement may be waived by any party except by the written consent of that party in whose favour the covenant or condition is expressed, and forbearance or indulgence by that party in any regard whatsoever and no matter how long shall not constitute a waiver of the covenant or condition, and until performed or waived in writing that party shall be entitled to invoke any remedy available to that party under this Agreement or by law, despite the forbearance or indulgence.

Section 9.14 Severability

9.14.01 If, for any reason, any provision of this Agreement, other than any provision which is of fundamental importance to the arrangement between the parties, is to any extent held or rendered invalid or unenforceable, then the particular provision shall be deemed to be independent of and severed from the remainder of this Agreement and all the other provisions of this Agreement shall nevertheless continue in full force and effect.

Section 9.15 Notice

9.15.01 All notices or other communications necessary for the purpose of this Agreement shall be in writing and delivered personally, or sent by email, or by courier, or sent by registered mail, or by prepaid post, or by facsimile, addressed,

(a) in the case of His Majesty, to:

PUBLIC SERVICES AND PROCUREMENT CANADA
John Cabot Building -
10 Barters Hill, St John's,
Newfoundland and Labrador
A1C 6M1

or to such other email, address or facsimile number or addressed to such other Person as His Majesty may, from time to time, designate in writing to POA; and

(b) in the case of POA, to:
PORT OF ARGENTIA INC., operating as **PORT OF ARGENTIA.**
P.O Box 95
Argentia,
Newfoundland and Labrador
A0B 1W0

or to such other address or facsimile number or addressed to such other Person as POA may, from time to time, designate in writing to the Minister.

9.16.02 Any notice or communication is considered to have been received:

(a) in the case of facsimile or e-mail, on actual receipt, and

(b) in all other cases, on the date of delivery.

If the postal service is interrupted or threatened to be interrupted, or is substantially delayed, any notice shall be delivered personally, or by facsimile, or by email, or by courier.

Section 9.17 Conflict of Interest

9.17.01 No current or former public servant or public office holder to whom any post-employment, ethics and conflict of interest legislation, guidelines, codes or policies of Canada applies will derive direct benefit from this Agreement unless the provision or receipt of such benefits is in compliance with such legislation, guidelines, policies or codes. POA will promptly inform Canada should it become aware of the existence any such situation.

Section 9.18 No Bribe

9.18.01 POA warrants that no bribe, gift, commission or other inducement has been paid, given, promised or offered to any Government official or employee for the obtaining of this Agreement, contrary to Section 121 of the *Criminal Code* (R.S. 1985, c. C-46).

Section 9.19 Approval

9.19.01 Neither this Agreement nor any other agreement made pursuant to this Agreement constitutes approval by His Majesty or any federal agency or the fulfillment of any requirement under the federal *Competition Act* (R.S. 1985, c. C-34), or successor legislation.

Section 9.20 Costs

9.20.01 All costs and expenses (including without limitation the fees and disbursements of legal counsel) incurred in connection with this Agreement, or any other agreement made pursuant to this Agreement and the transactions contemplated herein and therein, shall be paid by the party incurring such costs and expenses.

Section 9.21 Survival

9.21.01 Subject to Subsection 4.04.01, the representations, warranties, covenants and agreements of the parties contained in this Agreement and in particular in Article 10 shall survive and will not merge with the Instruments on Closing.

Section 9.22 Federal Recognition and Public Disclosure

9.22.01 The form and content of any public announcement respecting this Agreement shall be subject to the prior written approval of the Minister.

9.22.02 POA understands and agrees that POA's name, and the general nature of the transactions herein may be made publicly available by the Government of Canada by any means at any time.

[Remainder of page intentionally left blank]

IN WITNESS WHEREOF POA and His Majesty have executed this Agreement as evidenced by the signatures of their duly authorized directors, officers or representatives as of the day and year hereinabove first written.

	)	**HIS MAJESTY THE KING**
	)	**IN RIGHT OF CANADA**
	)	
	)	
______________________	)	Per: ______________________
Witness	)	Signature of duly authorized representative
	)	Jennifer Fowler RD APMS
	)	Print Name and Title of authorized
	)	representative
		PORT OF ARGENTIA INC.
______________________	)	Per: ______________________
Witness	)	Signature of duly authorized signing
	)	director or officer
	)	______________________
	)	Print name and title of authorized signing
	)	director or officer pursuant to the attached
	)	certified copy of the Resolution of the Board
	)	of Directors of POA
______________________	)	Per: ______________________
Witness	)	Signature of duly authorized signing
	)	director or officer
	)	______________________
	)	Print name and title of authorized signing
	)	director or officer pursuant to the attached
	)	certified copy of the Resolution of the Board
	)	of Directors of POA

IN WITNESS WHEREOF POA and His Majesty have executed this Agreement as evidenced by the signatures of their duly authorized directors, officers or representatives as of the day and year hereinabove first written.

HIS MAJESTY THE KING IN RIGHT OF CANADA

_______________________ Witness	Per: ______________________________ Signature of duly authorized representative
	______________________________ Print Name and Title of authorized representative

PORT OF ARGENTIA INC.

_______________________ Witness	Per: ______________________________ Signature of duly authorized signing director or officer
	Scott Penney, CEO Print name and title of authorized signing director or officer pursuant to the attached certified copy of the Resolution of the Board of Directors of POA
_______________________ Witness	Per: ______________________________ Signature of duly authorized signing director or officer
	______________________________ Print name and title of authorized signing director or officer pursuant to the attached certified copy of the Resolution of the Board of Directors of POA

SCHEDULE A – LANDS DESCRIPTION

PARCEL 2021-2
PLAN S-6675-W
PUBLIC SERVICES AND PROCUREMENT CANADA

All that piece or parcel of land covered by water situate and being southeast of Placentia Pike, at Argentia, Newfoundland and Labrador, shown as Parcel 2021-2 on Public Services and Procurement Canada Plan S-6675-W, dated August 20, 2021 as signed by Raymond C. Guy, Newfoundland Land Surveyor, said Parcel 2021-2 being more particularly described as follows, that is to say:

BEGINNING at a point southeast of Placentia Pike, said point having NAD-83 coordinates of North 5 239 080.719 metres and East 229 673.830 metres in the Modified Three Degree Transverse Mercator Projection for the province of Newfoundland and Labrador, Zone One;

THENCE running along the land of Argentia Management Authority Inc., Parcel 99-9 (Roll 2245 Frame 1792), North 60°30' 12" East, 32.263 metres;

THENCE North 48°58' 18" East, 80.489 metres;

THENCE North 10°37' 27" East, 257.490 metres;

THENCE turning and running along the land of His Majesty in Right of Canada, Parcel 99-7 (Marine Atlantic Terminal), North 44°51' 19" East, 89.419 metres;

THENCE North 63°40' 10" East, 139.868 metres;

THENCE North 26°19' 50" West, 102.533 metres;

THENCE turning and running along the land of Argentia Management Authority Inc., Parcel 99-17 (Roll 2245 Frame 1792), North 14°19' 12" East, 151.826 metres;

THENCE turning and running along the land of Argentia Management Authority Inc. Parcel 01-01 (Roll 2245 Frame 1792), North 87°05' 52" East, 272.937 metres;

THENCE North 27°57' 46" East, 718.715 metres;

THENCE North 62°02' 14" West, 184.242 metres;

THENCE South 72°27' 34" West, 54.538 metres;

PARCEL 2021-2 Continued
PLAN S-6675-W
PUBLIC SERVICES AND PROCUREMENT CANADA

THENCE turning and running along the land of Argentia Management Authority Inc., Parcel 01-01 (Roll 2245 Frame 1792) and along the land of Argentia Management Authority Inc., Parcel 01-02 (Roll 2277 Frame 686), North 17°04' 11" West, 143.447 metres;

THENCE turning and running along the land of Argentia Management Authority Inc. Parcel 01-02 (Roll 2277 Frame 686), North 14°21' 56" East, 167.426 metres;

THENCE North 29°00' 01" East, 151.027 metres;

THENCE North 68°16' 56" East, 226.810 metres;

THENCE South 21°28' 23" East, 37.162 metres;

THENCE North 68°31' 37" East, 245.805 metres;

THENCE North 21°28' 23" West, 25.165 metres;

THENCE North 58°04' 44" East, 362.276 metres;

THENCE North 45°34' 54" East, 112.239 metres;

THENCE North 44°25' 06" West, 44.070 metres;

THENCE, coincident with the Ordinary High Water Mark 2001, ± 929.6 metres on a chord bearing and distance of North 10°34' 35" East, 806.899 metres;

THENCE turning and running through the waters of Argentia Harbour, South 49°28' 49" East, 1734.079 metres;

THENCE coincident with the Ordinary High Water Mark 2021, ± 3193.8 metres on a chord bearing and distance of South 54°25' 54" West, 2928.754 metres;

THENCE ± 469.1 metres, on a chord bearing and distance of South 26°36' 02" East, 406.305 metres;

THENCE ± 365.4 metres, on a chord bearing and distance of North 49°05' 16" West, 342.519 metres;

PARCEL 2021-2 Continued
PLAN S-6675-W
PUBLIC SERVICES AND PROCUREMENT CANADA

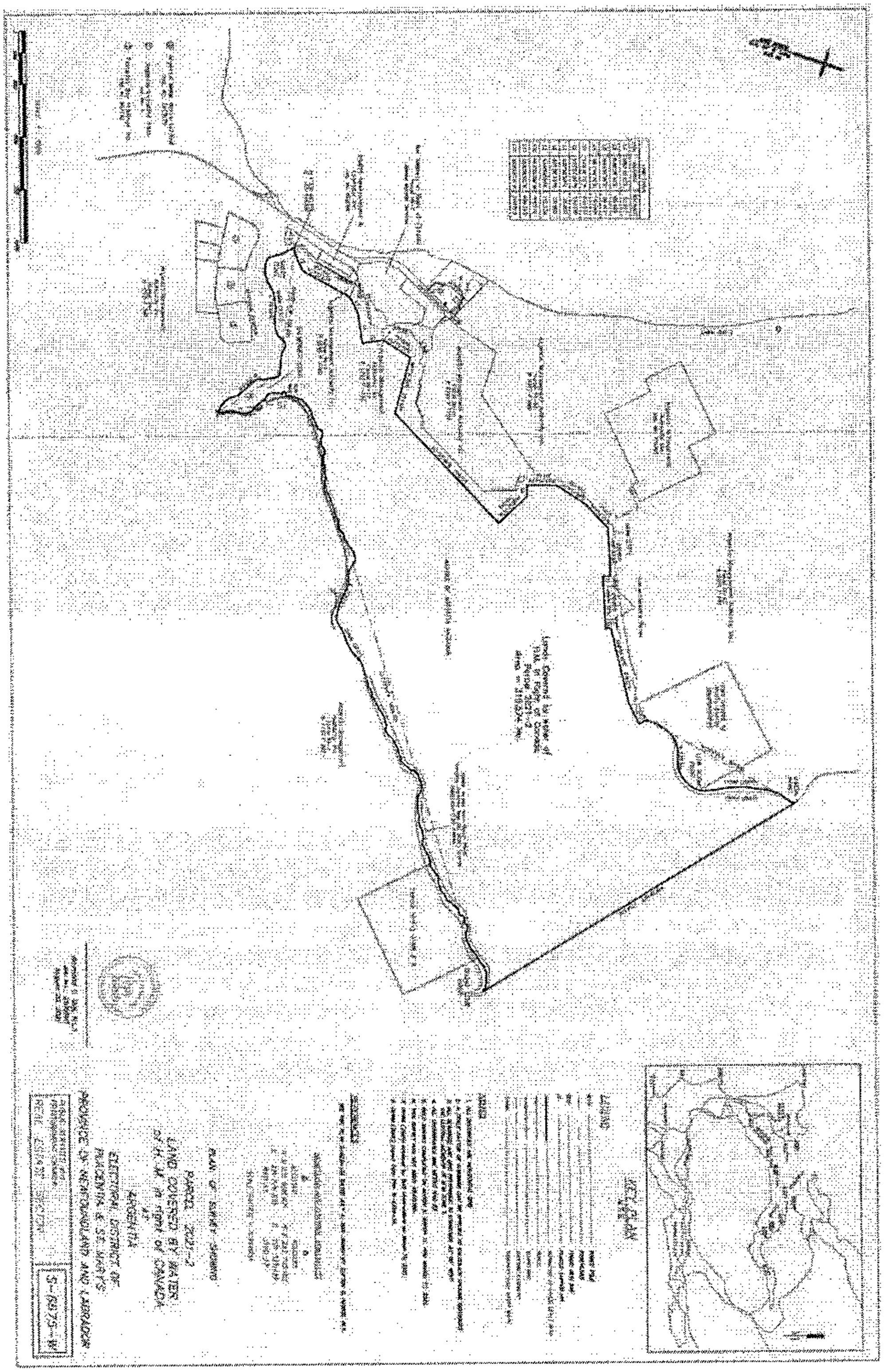
THENCE ± 723.8 metres, on a chord bearing and distance of South 78°07' 16" West, 604.985 metres, more or less, to the **PLACE OF BEGINNING**.

THE above described Parcel 2021-2 contains an area of 319.574 hectares.

All bearings are grid, referenced to Longitude 53 degrees West, of the Modified Three Degree Transverse Mercator Project for the Province of Newfoundland & Labrador. All distances are horizontal grid.

Raymond, C. Guy, NLS
Job Number: 2100595
Dated:
August 20, 2021

SCHEDULE B – PLAN OF SURVEY



SCHEDULE C – INSTRUMENT OF GRANT

CANADA

INSTRUMENT OF GRANT

THIS INSTRUMENT HAS THE SAME FORCE AND EFFECT
AS IF IT WERE LETTERS PATENT

(Subsection 5(7), *Federal Real Property and Federal Immovables Act*)

CHARLES THE THIRD, by the Grace of God of the United Kingdom, Canada and His other Realms and Territories, **KING**, Head of the Commonwealth, Defender of the Faith.

TO ALL TO WHOM these Presents shall come,

GREETING:

WHEREAS the lands hereinafter described are vested in US in right of Canada and are under the administration of Our Minister of Public Works and Government Services;

AND WHEREAS authority has been given for the grant of the said lands in fee simple to **PORT OF ARGENTIA INC.**, a body corporate under the laws of the Province of Newfoundland and Labrador, hereinafter called the Grantee, at or for the price or sum of One ($1.00) Dollar in Canadian currency;

NOW THEREFORE We do by these Presents grant, convey and assure unto the Grantee, its successors and assigns, ALL AND SINGULAR those lands described in Schedule "A" attached.

PROVIDED ALWAYS that this Instrument of Grant is made upon and subject to the condition that the **Grantee** continue to provide Marine Atlantic Inc. or a successor Crown corporation or entity, the right to unimpeded and uninterrupted passage of its ferry and auxiliary vessels through, into, across and out of the real property described in Schedule "A" attached hereto, at no cost to Marine Atlantic Inc., the condition herein also attaching to, and for the benefit of His Majesty's lands being Parcel 99-7 on PWGSC Plan S-4224-4, and shall enure to the benefit of and be binding on the heirs, successors, assigns and lessees of the **Grantee** and His Majesty respectively.

TO HAVE AND TO HOLD the said lands unto the Grantee, and its successors and assigns, forever.

IN WITNESS WHEREOF These Presents have been signed and countersigned under the ***Federal Real Property and Federal Immovables Act*** of Canada.

DATED this 1st day of December, 2022.

SIGNED on behalf of the Minister of the Minister of Public Works and Government Services, by: Name: Jennifer Fowler Title: Regional Director, Real Property - Accommodation and Portfolio Management	)	(Signature)
COUNTERSIGNED on behalf of the Minister of Justice by: Name: Alan R. Farquhar Title: Counsel	)	(Signature)

THE GRANTEE covenants and agrees that it will observe and be fully bound by the covenant set forth in this Instrument of Grant regarding Marine Atlantic Inc. hereto and forming an integral part hereof.

THE GRANTEE covenants that it will insert in any subsequent conveyance of the lands or any portion of the lands or any portion of the lands described in Schedule "A" the same covenant as set forth in this Instrument of Grant respecting Marine Atlantic Inc., including this clause, with the intent that all subsequent purchasers of the lands or any part thereof should be bound by the covenant

SIGNED, SEALED AND DELIVERED In the presence of	**PORT OF ARGENTIA INC.**
(Barrister - NL)	Per: Name: Scott Penney Title: CEO
	Per: Name: Title:

CANADA

NOVA SCOTIA

HALIFAX

AFFIDAVIT OF CONFIRMATION

I, Alan R. Farquhar, of the Halifax Regional Municipality, in the Province of Nova Scotia, hereby make oath and say:

1. **THAT** I am Counsel with the Department of Justice, Atlantic Regional Office;

2. **THAT** the document attached hereto is an Instrument of Grant duly prepared for execution;

3. **THAT,** to my understanding, this Instrument of Grant has been properly executed by the duly authorized officer of the Crown.

SWORN TO before me at Halifax Regional Municipality, Province of Nova Scotia, this 7th day of December, A.D. 2022.

A Notary Public in and for the Province of Nova Scotia

Alan R. Farquhar

Affidavit of Execution (Grantee)

CANADA
PROVINCE OF NEWFOUNDLAND
AND LABRADOR

ON THIS ________ day of November, 2022, before me, the subscriber, personally came and appeared ___________________________, a subscribing witness to the foregoing Indenture, who having been by me duly sworn, made oath and said that the , one of the Parties thereto, caused the same to be executed in its name and on its behalf, and at the same time caused its corporate seal to be thereunto affixed by its proper officer duly authorized in that behalf, in their presence.

A Commissioner of Oaths of the Supreme Court of Newfoundland and Labrador

OR

CANADA
PROVINCE OF NEWFOUNDLAND
AND LABRADOR

I CERTIFY THAT ON THIS ________ day of November, 2022, that and, , the duly authorized officers for the , one of the Parties thereto, signed and executed the within Indenture on behalf of the and I have signed as a witness to such execution.

A Commissioner of Oaths of the Supreme Court of Newfoundland and Labrador

SCHEDULE "A"

PARCEL 2021-2
PLAN S-6675-W
PUBLIC SERVICES AND PROCUREMENT CANADA

All that piece or parcel of land covered by water situate and being southeast of Placentia Pike, at Argentia, Newfoundland and Labrador, shown as Parcel 2021-2 on Public Services and Procurement Canada Plan S-6675-W, dated August 20, 2021 as signed by Raymond C. Guy, Newfoundland Land Surveyor, said Parcel 2021-2 being more particularly described as follows, that is to say:

BEGINNING at a point southeast of Placentia Pike, said point having NAD-83 coordinates of North 5 239 080.719 metres and East 229 673.830 metres in the Modified Three Degree Transverse Mercator Projection for the province of Newfoundland and Labrador, Zone One;

THENCE running along the land of Argentia Management Authority Inc., Parcel 99-9 (Roll 2245 Frame 1792), North 60°30' 12" East, 32.263 metres;

THENCE North 48°58' 18" East, 80.489 metres;

THENCE North 10°37' 27" East, 257.490 metres;

THENCE turning and running along the land of His Majesty in Right of Canada, Parcel 99-7 (Marine Atlantic Terminal), North 44°51' 19" East, 89.419 metres;

THENCE North 63°40' 10" East, 139.868 metres;

THENCE North 26°19' 50" West, 102.533 metres;

THENCE turning and running along the land of Argentia Management Authority Inc., Parcel 99-17 (Roll 2245 Frame 1792), North 14°19' 12" East, 151.826 metres;

THENCE turning and running along the land of Argentia Management Authority Inc. Parcel 01-01 (Roll 2245 Frame 1792), North 87°05' 52" East, 272.937 metres;

THENCE North 27°57' 46" East, 718.715 metres;

THENCE North 62°02' 14" West, 184.242 metres;

THENCE South 72°27' 34" West, 54.538 metres;

THENCE turning and running along the land of Argentia Management Authority Inc., Parcel 01-01 (Roll 2245 Frame 1792) and along the land of Argentia Management Authority Inc., Parcel 01-02 (Roll 2277 Frame 686), North 17°04' 11" West, 143.447 metres;

THENCE turning and running along the land of Argentia Management Authority Inc. Parcel 01-02 (Roll 2277 Frame 686), North 14°21' 56" East, 167.426 metres;

THENCE North 29°00' 01" East, 151.027 metres;

THENCE North 68°16' 56" East, 226.810 metres;

THENCE South 21°28' 23" East, 37.162 metres;

THENCE North 68°31' 37" East, 245.805 metres;

THENCE North 21°28' 23" West, 25.165 metres;

THENCE North 58°04' 44" East, 362.276 metres;

THENCE North 45°34' 54" East, 112.239 metres;

THENCE North 44°25' 06" West, 44.070 metres;

THENCE, coincident with the Ordinary High Water Mark 2001, ± 929.6 metres on a chord bearing and distance of North 10°34' 35" East, 806.899 metres;

PARCEL 2021-2 Continued
PLAN S-6675-W
PUBLIC SERVICES AND PROCUREMENT CANADA

THENCE turning and running through the waters of Argentia Harbour, South 49°28' 49" East, 1734.079 metres;

THENCE coincident with the Ordinary High Water Mark 2021, ± 3193.8 metres on a chord bearing and distance of South 54°25' 54" West, 2928.754 metres;

THENCE ± 469.1 metres, on a chord bearing and distance of South 26°36' 02" East, 406.305 metres;

THENCE ± 365.4 metres, on a chord bearing and distance of North 49°05' 16" West, 342.519 metres;

THENCE ± 723.8 metres, on a chord bearing and distance of South 78°07' 16" West, 604.985 metres, more or less, to the **PLACE OF BEGINNING**.

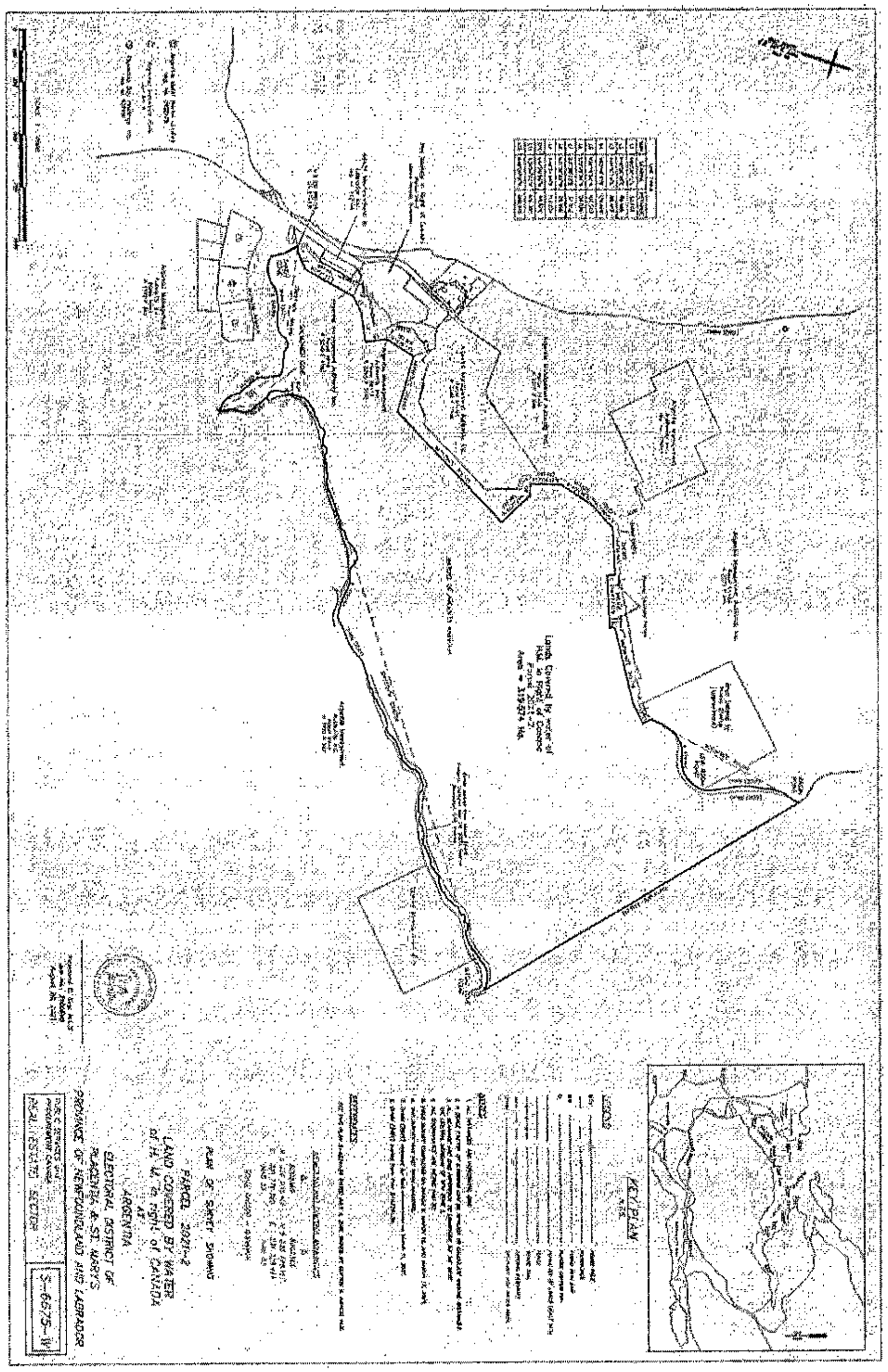
THE above described Parcel 2021-2 contains an area of 319.574 hectares.

All bearings are grid, referenced to Longitude 53 degrees West, of the Modified Three Degree Transverse Mercator Project for the Province of Newfoundland & Labrador. All distances are horizontal grid.

Raymond, C. Guy, NLS

Job Number: 2100595
Dated: August 20, 2021

SCHEDULE "B"



DATED: the 15th day of December, 2022.

HIS MAJESTY THE KING IN RIGHT OF CANADA

- and -

PORT OF ARGENTIA INC.

CANADA

INSTRUMENT OF GRANT

THIS INSTRUMENT HAS THE SAME FORCE AND EFFECT AS IF IT WERE LETTERS PATENT

(Fee Simple)

Justice File: LEX-500055526

Department of Justice Canada
Atlantic Regional Office
Duke Tower
Suite 1400 - 5251 Duke Street
Halifax NS
B3J 1P3

Alan R. Farquhar, Counsel

SCHEDULE D – THE REPORTS

1. **Englobe. (March 2021). Baseline Marine Sediment Sampling Program And Multi Beam Survey. PSPC. Argentia Harbour, Argentia, NL**

2. **Englobe. (March 2021). Phase I Environmental Site Assessment. PSPC. Argentia Harbour, Argentia, NL**

3. **PWGSC. (1996). Underwater Investigations of Gull Pond, Shag Pond, and Harbour Targets. Argentia Harbour, Argentia, NL.**

4. **Argentia Remediation Group. (1995). Phase III & IV Environmental Site Assessment, U.S. Naval Facility, Argentia Newfoundland (Report 2 – Vol 1 Introductory Chapters and Northside Sites). PWGSC. Argentia Harbour, Argentia, NL.**

5. **Argentia Remediation Group. (1995). Phase III & IV Environmental Site Assessment, U.S. Naval Facility, Argentia Newfoundland (Report 2 – Vol 3 Ponds and Outlying Sites). PWGSC. Argentia Harbour, Argentia, NL.**

6. **Atlantic Geoscience Center. (1994). A Survey of Argentia Harbour, Newfoundland. PWGSC. Argentia Harbour, Argentia, NL.**

7. **Pelagos Atlantic Ltd & McGregor Geoscience Ltd (1995). Sidescan Sonar and Seismic Operations, Argentia, NL.**

CERTIFICATE OF AN OFFICER OF PORT OF AGRENTIA INC.

TO: **HIS MAJESTY THE KING IN RIGHT OF CANADA ("His Majesty"), as represented by the Minister of Public Works and Government Services ("Minister"),**

AND TO: **Stewart McKelvey**

RE: **Agreement to Transfer Lands and Lands Covered by Water at Argentia, Newfoundland and Labrador (the "Lands") to Port of Argentia Inc. (the "Port")**

I, Scott Penney, do solemnly declare as follows:

1. I am the Chief Executive Officer of the Port and as such have personal knowledge of the following facts.

2. I have examined the Agreement to Transfer among His Majesty, as represented by the Minister, and the Port, dated December 1, 2022, (the "Transfer Agreement") and certain other documents and instruments in connection with same.

3. The Port is a corporation whose head office is located at Third Street Extension, Freshwater, Newfoundland and Labrador, and which has been duly incorporated and organized and is validly existing under the laws of the Province of Newfoundland and Labrador.

4. The Port is duly registered to carry on business in the Province of Newfoundland and Labrador.

5. The Port has all necessary corporate power, authority and capacity to:

   (i) Manage the Lands;

   (ii) Enter into the Transfer Agreement and the other agreements expressly contemplated in the Transfer Agreement and to perform its obligations therein; and

   (iii) Acquire and hold an interest in real property in the Province of Newfoundland and Labrador.

6. The execution and delivery of the Transfer Agreement and each of the other agreements expressly contemplated in the Transfer Agreement and the consummation of any of the transactions provided for in any of them have been duly authorized by all necessary corporate action on the part of the Port. Attached hereto as Schedule "A" is a true and complete copy of a resolution of the directors of the Port (the "**Authorizing Resolution**") which has been duly and validly passed in accordance with applicable law authorizing the Transfer Agreement and the transactions and other documents contemplated thereby. The Authorizing Resolution is the only resolution of the directors of the Port

CERTIFICATE OF AN OFFICER OF PORT OF AGRENTIA INC.

TO: **HIS MAJESTY THE KING IN RIGHT OF CANADA ("His Majesty"), as represented by the Minister of Public Works and Government Services ("Minister"),**

AND TO: **Stewart McKelvey**

RE: **Agreement to Transfer Lands and Lands Covered by Water at Argentia, Newfoundland and Labrador (the "Lands") to Port of Argentia Inc. (the "Port")**

I, Scott Penney, do solemnly declare as follows:

1. I am the Chief Executive Officer of the Port and as such have personal knowledge of the following facts.

2. I have examined the Agreement to Transfer among His Majesty, as represented by the Minister, and the Port, dated December 1, 2022, (the "Transfer Agreement") and certain other documents and instruments in connection with same.

3. The Port is a corporation whose head office is located at Third Street Extension, Freshwater, Newfoundland and Labrador, and which has been duly incorporated and organized and is validly existing under the laws of the Province of Newfoundland and Labrador.

4. The Port is duly registered to carry on business in the Province of Newfoundland and Labrador.

5. The Port has all necessary corporate power, authority and capacity to:

   (i) Manage the Lands;

   (ii) Enter into the Transfer Agreement and the other agreements expressly contemplated in the Transfer Agreement and to perform its obligations therein; and

   (iii) Acquire and hold an interest in real property in the Province of Newfoundland and Labrador.

6. The execution and delivery of the Transfer Agreement and each of the other agreements expressly contemplated in the Transfer Agreement and the consummation of any of the transactions provided for in any of them have been duly authorized by all necessary corporate action on the part of the Port. Attached hereto as Schedule "A" is a true and complete copy of a resolution of the directors of the Port (the "**Authorizing Resolution**") which has been duly and validly passed in accordance with applicable law authorizing the Transfer Agreement and the transactions and other documents contemplated thereby. The Authorizing Resolution is the only resolution of the directors of the Port

specifically pertaining to the subject matter therein and is in full force and effect, unamended, as at this date.

7. The documents of incorporation and the by-laws of the Port are consistent with the obligations of the Port under the Transfer Agreement and any other agreement expressly contemplated in the Transfer Agreement.

8. As of the date hereof, there is no suit, action, litigation, arbitration proceeding or governmental proceeding, including appeals and applications for review, in progress, pending or threatened against or involving the Port, or any judgment, decree, injunction or order of any court or arbitrator, involving the Port, which might adversely affect the capacity or power of the Port to execute and deliver the Transfer Agreement or any other agreement expressly contemplated in the Transfer Agreement or to consummate the transaction provided for in any of them or which might adversely affect to a significant degree the Port, its assets, its financial condition or its future prospects.

9. The Transfer Agreement and the other agreements expressly contemplated in the Transfer Agreement, upon execution and delivery, constitute legal, valid and binding obligations of the Port enforceable against the Port in accordance with their terms.

AND I MAKE THIS SOLEMN DECLARATION conscientiously believing it to be true and knowing that it is of the same force and effect as if made under oath and by and in virtue of the Canada Evidence Act.

DECLARED before me at St. John's,
in the Province of Newfoundland and
Labrador, this 2nd day of December,
2022

A Barrister (NL)	SCOTT PENNEY

SCHEDULE "A"

PORT OF ARGENTIA INC.
(the "Corporation")

RESOLUTION OF THE DIRECTORS

The undersigned, being all the directors of the Corporation, by signature hereby pass the following resolution:

WHEREAS Public Services & Procurement Canada and the Corporation have negotiated the terms of the transfer of the Argentia Harbour lot to the Corporation (the "Harbour Transfer");

AND WHEREAS pursuant to the Harbour Transfer, the Corporation will be required to enter into, execute and deliver certain documents, deeds, and instruments, including a Transfer Agreement (the "Documents").

NOW THEREFORE BE IT RESOLVED THAT:

1. The Corporation be and it is hereby authorized to enter into and accept the Harbour Transfer from the Minister responsible for Public Services & Procurement Canada and to enter into, execute and perform its obligations under the Transfer Agreement.

2. The Chief Executive Officer of the Corporation is hereby authorized and directed for and on behalf of the Corporation to execute and deliver, whether under the corporate seal of the Corporation or otherwise, the Documents, and such other documents, instruments, agreements, certificates and writings and to perform and do all such acts and things as he or she in his or her discretion may consider necessary, desirable, or useful in furtherance of or for giving effect to the foregoing provision of this resolution.

3. This resolution may be executed in counterparts with the same effect as if all the parties had signed the same document. All such counterparts shall be construed together and shall constitute one resolution.

4. Executed fax and email copies of this resolution shall have the same binding effect as the original executed resolution.

[Remainder of this page intentionally left blank. Signature page to follow.]

DATED at Placentia, in the Province of Newfoundland and Labrador, with effect the 30th day of November, 2022.

Hedley Burge	Francis Collins
Glen Fitzgerald	Jane Hynes
Keith Pearson	Genny Picco
Claudette Pittman	Wayne D. Power Wayne Power
	Vivian Smith

DATED at Placentia, in the Province of Newfoundland and Labrador, with effect the 30th day of November, 2022.

Hedley Burge	Francis Collins
Glen Fitzgerald	Jane Hynes
Keith Pearson	Genny Picco
Claudette Pittman	Wayne Power
	Vivian Smith

DATED at Placentia, in the Province of Newfoundland and Labrador, with effect the 30th day of November, 2022.

Hedley Burge	Francis Collins
Glen Fitzgerald	Jane Hynes
Keith Pearson	Genny Picco
Claudette Pittman	Wayne Power
	Vivian Smith

DATED at Placentia, in the Province of Newfoundland and Labrador, with effect the 30th day of November, 2022.

Hedley Burge

Francis Collins

Glen Fitzgerald

Jane Hynes

Keith Pearson

Genny Picco

Claudette Pittman

Wayne Power

Vivian Smith

DATED at Placentia, in the Province of Newfoundland and Labrador, with effect the 30th day of November, 2022.

Hedley Burge	Francis Collins
Glen Fitzgerald	Jane Hynes
Keith Pearson	Genny Picco
Claudette Pittman	Wayne Power
	Vivian Smith

DATED at Placentia, in the Province of Newfoundland and Labrador, with effect the 30th day of November, 2022.

Hedley Burge	Francis Collins
Glen Fitzgerald	Jane Hynes
Keith Pearson	Genny Picco
Claudette Pittman	Wayne Power
	Vivian Smith

DATED at Placentia, in the Province of Newfoundland and Labrador, with effect the 30th day of November, 2022.

Hedley Burge

Francis Collins

Glen Fitzgerald

Jane Hynes

Keith Pearson

Genny Picco

Claudette Pittman

Wayne Power

Vivian Smith

DATED at Placentia, in the Province of Newfoundland and Labrador, with effect the 30th day of November, 2022.

Hedley Burge	Francis Collins
Glen Fitzgerald	Jane Hynes
Keith Pearson	Genny Picco
Claudette Pittman	Wayne Power
	Vivian Smith

SCHEDULE "F" – UXO AGREEMENT (SIGNED)

UXO AGREEMENT

THIS AGREEMENT made in duplicate as of the 1st day of DECEMBER, 2022.

BETWEEN: **HIS MAJESTY THE KING IN RIGHT OF CANADA ("His Majesty")**, represented by the Minister of Public Works and Government Services (**"PSPC"**),

OF THE FIRST PART

AND: **PORT OF ARGENTIA INC.,** a body corporate under the laws of the Province of Newfoundland and Labrador, operating as **PORT OF ARGENTIA ("POA")**

OF THE SECOND PART

WHEREAS PSPC is the owner in fee simple of the lands and lands covered by water located in Argentia, Electoral District of Placentia, Province of Newfoundland and Labrador, more particularly identified as Parcel 2021-2, on PSPC Plan S-6675-W, described in Schedule A, and shown in Schedule "B", both attached hereto, and also referred to herein as "Parcel 2021-2", or for the purposes of this Agreement, the "Lands".

AND WHEREAS POA is the owner and operator of the Port of Argentia, in the Province of Newfoundland and Labrador, saving and excepting certain lands, including the aforementioned Parcel 2021-2.

AND WHEREAS POA has requested a conveyance of Parcel 2021-2 from PSPC, governed by Transfer Agreement dated the 1st day of December, 2022 (the "Transfer Agreement");

NOW THEREFORE THIS AGREEMENT WITNESSES that, in consideration of the mutual covenants and agreements herein and subject to the terms and conditions hereinafter set out, the parties agree as follows:

1. In this Agreement:

   "Agreement" means this UXO Agreement, and includes the documents attached Schedules "A", "B" and "C", inclusive, which form an integral part of this Agreement;

   "Unexploded Ordnance" (UXO) shall mean a munition containing explosive material which has not been armed and/or fired, or failed to function, explode or detonate as intended after being armed and/or fired. UXO is commonly associated with munitions which failed to function as designed when used/fired in designated range training areas or in combat zones. UXO may also be associated with outdated, malfunctioning or surplus munitions which were buried as a means of disposal.

2. POA acknowledges receipt of various reports related to Argentia harbour and the condition of the harbour bed, as more particularly provided in Schedule "D" of the Transfer Agreement.

3. POA acknowledges and agrees to follow the guidance provided in the UXO Protocol datasheet attached in Schedule "C".

4. In the event that UXO is located on the Lands or is suspected to have been located, POA shall follow the guidance provided in the UXO Protocol datasheet. If His Majesty is engaged following any potential discovery of UXO, POA shall permit His Majesty to have unrestricted and unimpeded access to the Lands at all reasonable times to the extent required to perform any investigation or remedial work necessary to determine whether UXO is present on the Lands and if so, to remove it. However, when UXO is underwater, the most prudent measure is usually simple avoidance. His Majesty will very rarely remove UXO at His own expense when they are encountered as the result of an underwater survey.

5. Whenever the Lands are to be disturbed, POA or a project proponent with POA's permission, shall provide the Department of National Defence's UXO Legacy Sites Management Program with sufficient notice of any proposed dredging or disturbance of the bed of the Lands, as more particularly provided in Schedule "C", and shall ensure that all applicable environmental reports are appended in tender specifications for contractor awareness regarding military munitions at sea and UXO risk. POA shall provide His Majesty with prior access to the Lands, or any part of the Lands, as His Majesty deems necessary for that purpose. His Majesty recommends that POA should retain the services of a UXO consultant or company with specific expertise in UXO during dredging activities to advise POA, and potentially identify any found UXO, as the case may be.

6. POA shall not have any claim against His Majesty, or His Majesty's agents, assignees, invitees, or employees for any loss, damage or injury to the Lands, or to any person or property brought, placed or made on the Lands except where the loss, damage or injury is directly attributable to negligence on the part of any official, employee, or agent of His Majesty acting within the scope of their employment.

7. POA will indemnify and save harmless His Majesty, and those whom His Majesty is responsible in law, from any and all actions, suits, damages, losses, charges, expenses, claims and demands whatsoever, including but not limited to those based on personal injury, death, economic loss, and/or necessary legal costs on a solicitor and own client basis, caused by or arising out of any failure or omission to provide PSPC with an executed UXO Agreement in favour of His Majesty, from a future purchaser of the Lands or any part of it.

8. Concurrently with the execution of the transfer documents required for any purchase and sale of the Lands, or any part of them, to a future purchaser, POA shall provide PSPC with a UXO Agreement, substantially in the form of this Agreement and including this paragraph 6, executed by the future purchaser, such that:

(a) In the event that UXO is located on the Lands or is suspected to have been located, the future purchaser shall follow the guidance provided in the UXO Protocol datasheet. If His Majesty is engaged following any potential discovery of UXO, the future purchaser shall permit His Majesty to have unrestricted and unimpeded access to the Lands at all reasonable times to the extent required to perform any investigation or remedial work necessary to determine whether UXO is present on the Lands and if so, to remove it. However, when UXO is underwater, the most prudent measure is usually simple avoidance. His Majesty will very rarely remove UXO at His own expense when they are encountered as the result of an underwater survey.

(b) Whenever the Lands are to be disturbed, the future purchaser shall provide the Department of National Defence's UXO Legacy Sites Management Program with sufficient notice of any proposed dredging or disturbance of the bed of the Lands, as more particularly provided in Schedule "C", and shall ensure that all applicable environmental reports are appended in tender specifications for contractor awareness regarding UXO risk. The future purchaser shall provide His Majesty with prior access to the Lands, or any part of the Lands, if His Majesty considers such access to be necessary for the briefing. His Majesty recommends that the future purchaser should retain the services of a UXO consultant or company with specific expertise in UXO during dredging activities to advise the future purchaser, and potentially identify any found UXO, as the case may be.

(c) The future purchaser shall not have any claim against His Majesty, or His Majesty's agents, assignees, invitees, or employees for any loss, damage or injury to the Lands, or to any person or property brought, placed or made on the Lands except where the loss, damage or injury is directly attributable to negligence on the part of any official, employee, or agent or PSPC acting within the scope of their employment.

(d) The future purchaser will indemnify and save harmless His Majesty, and those for whom His Majesty is responsible in law, from any and all actions, suits, damages, losses, charges, expenses, claims and demands whatsoever, including but not limited to those based on personal injury, death, economic loss, and/or necessary legal costs on a solicitor and own client basis, caused by or arising out of any failure or omission to provide PSPC with an executed UXO Agreement in favour of His Majesty from a future purchaser of the Lands or any part of it.

(e) Concurrently with the execution of the transfer documents required for any future purchase and sale of the Lands, or any part of it to a future purchaser, the future purchaser shall provide His Majesty with a UXO Agreement (the Agreement) executed by the next future purchaser. The Agreement shall be substantially in the form of this Agreement, including this paragraph, such that all future purchasers in succession will be obliged to enter into a similar UXO Agreement with His Majesty in respect of the Lands or part of it, as the case may be.

9. Time shall be of the essence of this Agreement.

10. This Agreement is interpreted in accordance with the laws in force in the Province of Newfoundland and Labrador, subject always to any paramount or applicable federal laws. Nothing in this Agreement is intended to or is construed as limiting, waiving or derogating from any federal Crown prerogative.

11. This Agreement may be amended only by a written agreement signed by the parties.

12. Notwithstanding any urgent requirement created through the discovery or suspected presence of UXO as contemplated in clause 4, all notices or other communications necessary for the purpose of this Agreement shall be in writing and delivered personally, or sent by email, or by courier, or sent by registered mail, or by prepaid post, or by facsimile, addressed,

(a) in the case of PSPC, to:

PUBLIC SERVICES AND PROCUREMENT CANADA
John Cabot Building -
10 Barters Hill, St John's,
Newfoundland and Labrador
A1C 6M1

or to such other email, address or facsimile number or addressed to such other Person as PSPC or His Majesty may, from time to time, designate in writing to POA; and

(b) in the case of the Department of National Defence (DND), to:

UXO LEGACY SITES MANAGEMENT PROGRAM
Department of National Defence
Email: uxocanada@forces.gc.ca

or to such other email, address or facsimile number or addressed to such other Person as DND may, from time to time, designate in writing to POA; and

(c) in the case of POA, to:
PORT OF ARGENTIA INC., operating as **PORT OF ARGENTIA.**
P.O Box 95
Argentia,
Newfoundland and Labrador
A0B 1W0

or to such other address or facsimile number or addressed to such other Person as POA may, from time to time, designate in writing to His Majesty.

13. Any notice or communication is considered to have been received:

(a) in the case of facsimile or e-mail, on actual receipt, and

(b) in all other cases, on the date of delivery.

If the postal service is interrupted or threatened to be interrupted, or is substantially delayed, any notice shall be delivered personally, or by facsimile, or by email, or by courier.

IN WITNESS WHEREOF POA and His Majesty have executed this Agreement as evidenced by the signatures of their duly authorized directors, officers or representatives as of the day and year hereinabove first written.

	)	**HIS MAJESTY THE KING**
	)	**IN RIGHT OF CANADA**
	)	
	)	
	)	Per: ______________________
Witness	)	Signature of duly authorized representative
	)	Jennifer Fowler KD APUS
	)	Print Name and Title of authorized
	)	representative

PORT OF ARGENTIA INC.

Witness	)))	Per: __________ Signature of duly authorized signing director or officer
	)))))	Scott Penney , CEO Print name and title of authorized signing director or officer pursuant to the attached certified copy of the Resolution of the Board of Directors of POA
Witness	)))	Per: __________ Signature of duly authorized signing director or officer
	)))))	__________ Print name and title of authorized signing director or officer pursuant to the attached certified copy of the Resolution of the Board of Directors of POA

SCHEDULE A – LANDS DESCRIPTION

PARCEL 2021-2
PLAN S-6675-W
PUBLIC SERVICES AND PROCUREMENT CANADA

All that piece or parcel of land covered by water situate and being southeast of Placentia Pike, at Argentia, Newfoundland and Labrador, shown as Parcel 2021-2 on Public Services and Procurement Canada Plan S-6675-W, dated August 20, 2021 as signed by Raymond C. Guy, Newfoundland Land Surveyor, said Parcel 2021-2 being more particularly described as follows, that is to say:

BEGINNING at a point southeast of Placentia Pike, said point having NAD-83 coordinates of North 5 239 080.719 metres and East 229 673.830 metres in the Modified Three Degree Transverse Mercator Projection for the province of Newfoundland and Labrador, Zone One;

THENCE running along the land of Argentia Management Authority Inc., Parcel 99-9 (Roll 2245 Frame 1792), North 60°30' 12" East, 32.263 metres;

THENCE North 48°58' 18" East, 80.489 metres;

THENCE North 10°37' 27" East, 257.490 metres;

THENCE turning and running along the land of Her Majesty in Right of Canada, Parcel 99-7 (Marine Atlantic Terminal), North 44°51' 19" East, 89.419 metres;

THENCE North 63°40' 10" East, 139.868 metres;

THENCE North 26°19' 50" West, 102.533 metres;

THENCE turning and running along the land of Argentia Management Authority Inc., Parcel 99-17 (Roll 2245 Frame 1792), North 14°19' 12" East, 151.826 metres;

THENCE turning and running along the land of Argentia Management Authority Inc. Parcel 01-01 (Roll 2245 Frame 1792), North 87°05' 52" East, 272.937 metres;

THENCE North 27°57' 46" East, 718.715 metres;

THENCE North 62°02' 14" West, 184.242 metres;

THENCE South 72°27' 34" West, 54.538 metres;

PARCEL 2021-2 Continued
PLAN S-6675-W
PUBLIC SERVICES AND PROCUREMENT CANADA

THENCE turning and running along the land of Argentia Management Authority Inc., Parcel 01-01 (Roll 2245 Frame 1792) and along the land of Argentia Management Authority Inc., Parcel 01-02 (Roll 2277 Frame 686), North 17°04' 11" West, 143.447 metres;

THENCE turning and running along the land of Argentia Management Authority Inc. Parcel 01-02 (Roll 2277 Frame 686), North 14°21' 56" East, 167.426 metres;

THENCE North 29°00' 01" East, 151.027 metres;

THENCE North 68°16' 56" East, 226.810 metres;

THENCE South 21°28' 23" East, 37.162 metres;

THENCE North 68°31' 37" East, 245.805 metres;

THENCE North 21°28' 23" West, 25.165 metres;

THENCE North 58°04' 44" East, 362.276 metres;

THENCE North 45°34' 54" East, 112.239 metres;

THENCE North 44°25' 06" West, 44.070 metres;

THENCE, coincident with the Ordinary High Water Mark 2001, ± 929.6 metres on a chord bearing and distance of North 10°34' 35" East, 806.899 metres;

THENCE turning and running through the waters of Argentia Harbour, South 49°28' 49" East, 1734.079 metres;

THENCE coincident with the Ordinary High Water Mark 2021, ± 3193.8 metres on a chord bearing and distance of South 54°25' 54" West, 2928.754 metres;

THENCE ± 469.1 metres, on a chord bearing and distance of South 26°36' 02" East, 406.305 metres;

THENCE ± 365.4 metres, on a chord bearing and distance of North 49°05' 16" West, 342.519 metres;

PARCEL 2021-2 Continued
PLAN S-6675-W
PUBLIC SERVICES AND PROCUREMENT CANADA

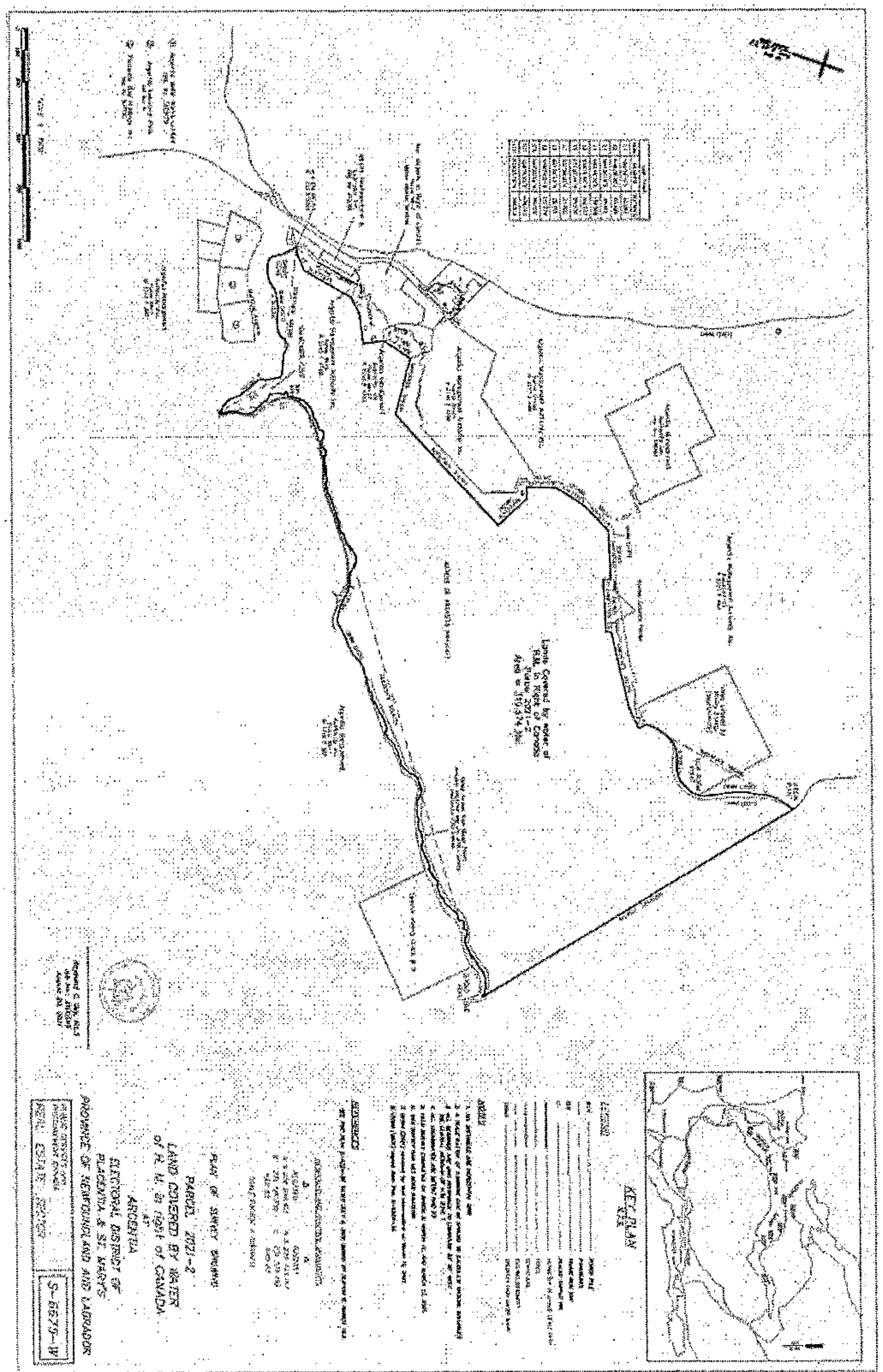
THENCE ± 723.8 metres, on a chord bearing and distance of South 78°07' 16" West, 604.985 metres, more or less, to the **PLACE OF BEGINNING.**

THE above described Parcel 2021-2 contains an area of 319.574 hectares.

All bearings are grid, referenced to Longitude 53 degrees West, of the Modified Three Degree Transverse Mercator Project for the Province of Newfoundland & Labrador. All distances are horizontal grid.

Raymond, C. Guy, NLS
Job Number: 2100595
Dated:
August 20, 2021

SCHEDULE B – PLAN OF SURVEY



SCHEDULE "C"
UXO Protocol Datasheet

The Government of Canada recognizes that there is an element of risk associated with former military lands that were used by the military due to the potential presence of Unexploded Explosive Ordnance (UXO). The risk can range from very low, for sites where munitions were never fired, such as on a domestic site or a small arms rifle range, to high for a former impact area that has never been comprehensively cleared of UXO.

"Unexploded Ordnance" (UXO) is defined as munition containing explosive material which has not been armed and/or fired, or failed to function, explode or detonate as intended after being armed and/or fired. UXO is commonly associated with munitions which failed to function as designed when used/fired in designated range training areas or in combat zones. UXO may also be associated with outdated, malfunctioning or surplus munitions which were buried as a means of disposal.

The purpose of this protocol is to protect Canadians from harm.

Current owners of former military lands and those undertaking work on those lands should be advised of the process to follow should a suspicious item be found. The following protocol has been developed as a standard response to the discovery of suspicious items on former Department of National Defence (DND) lands which remains applicable to the Port of Argentia waterlot, Parcel 2021-2, Plan S-6675-W.

Upon discovery of a suspected UXO item:

- Do not touch it. It's been there for many years, it won't hurt you if you don't disturb it.
- Note the time, exact location and details of the discovery.
- Mark the location of the area so that the authorities can relocate it.
- Leave the area of the finding and prevent others from accessing it.
- Contact the POLICE and they will arrange for military experts to attend and dispose of it.

Port of Argentia Waterlot Parcel 2021-2, Plan S-6675-W

The above protocol is provided in keeping with the Government of Canada's standard realty practice.

It is DND's considered opinion, based upon historical research conducted as part of the disposal process, that Parcel 2021-2 is a medium risk property. As such, it is recommended that any landowner of Parcel 2021-2 take prudent measures when considering any dredging or disturbance of the bed of the waterlot in question. Accordingly, it is advised that landowners procure the services of a qualified UXO Firm and have them develop a UXO Risk Mitigation Plan to ensure the health and safety of their workers. A qualified UXO Firm will advise a landowner on all facets of UXO Risk Mitigation.

It is advised that landowners consult the Notice to Mariners website: https://www.notmar.gc.ca/index-en.php to ensure that they avail themselves of the most up to date information regarding any proposed work site(s) in Argentia Harbour.

Landowners may also visit DND's UXO website: https://www.canada.ca/en/department-national-defence/services/uxo/unexploded-explosive-ordnance.html

The UXO Legacy Sites Management Program of DND provides briefing packages for contractors working on sites where there is the potential for UXO to be found. In the event that intrusive work is planned for the property additional information will be provided by the DND UXO & Legacy Sites Program. The Program can be contacted by emailing: uxocanada@forces.gc.ca

Appendix B

Port of Argentia Record of Engagement

Record of Engagement
Port of Argentia

Contact List

Qalipu Mi'kmaq First Nation Band	Charles Pender, Band Manager Ian Sullivan, Manager of Environment and Natural Resources Brendan Mitchell, Chief	cpender@qalipu.ca 709-634-8059 isullivan@qalipu.ca 709-634-0998 bmitchell@qalipu.ca
Miawpukek First Nation	Ross Hinks, Director, Department of Natural Resources Mise'l Joe, Chief Vanessa King, Chief's Assistant	rhinks@mfngov.ca 709-882-3002 saqamaw@mfngov.ca ca@mfngov.ca

Engagement Log: Indigenous Communities – Qalipu Mi'kmaq

Date	From	To	Method	Content	Response/Concerns
February 1, 2023	Port of Argentia	Qalipu Mi'kmaq - Chief Brendan Mitchell - Jonathan Strickland - Andrew Simms - Paulette Brinston	Letter	Notice of Project Expansion	N/A
August 18, 2023	Dillon Consulting, on behalf of Port of Argentia	Qalipu Mi'kmaq -Chief Brendan Mitchell -Ian Sullivan	Letter	Notice of Project Expansion Opportunity to meet/discuss issues	*letter is dated Aug 17
August 28, 2023	Dillon Consulting Ltd.	Ian Sullivan, Manager of Environment and Natural Resources	Email	Forwarded original message and if there were any questions, coordinate a time to meet	

September 6, 2023	Dillon Consulting Ltd.	Charles Pender, Band Manager cc. Ian Sullivan	Email	Forwarded original message and if there were any questions, to contact. Noted that the Agency indicated Charles and Ian as the contacts for engagement protocols.	
September 13, 2023	Diedre Halbot, Director of Environment and Natural Resources	Michelle Roche, Dillon Consulting cc. Charles Pender, Brendan Mitchell, Alana Vigna	Email	Question regarding whether there are any other documents associated with the Project.	
September 14, 2023	Michelle Roche, Dillon Consulting	Diedre Halbot, Director of Environment and Natural Resources cc. Charles Pender, Brendan Mitchell, Alana Vigna	Email	Provided an update regarding the Initial Project Description (IPD) and that the Project Team will share the IPD once submitted. Offered the option to discuss the project by email or phone call.	
Note:					

Engagement Log: Indigenous Communities – Miawpukek First Nation

Date	From	To	Method	Content	Response/Concerns
February 1, 2023	Port of Argentia	Miawpukek First Nation	Letter	Notice of Project Expansion	N/A

		-Chief Mise'l Joe -Ross Hicks -Vanessa King			
August 18, 2023	Dillon Consulting, on behalf of Port of Argentia	Miawpukek First Nation -Chief Mise'l Joe	Letter	Notice of Project Expansion Opportunity to meet/discuss issues	*letter is dated Aug 17
August 28, 2023	Dillon Consulting Ltd.	Vanessa King, Chief's Assistant	Voicemail	Called to confirm Aug 18 letter was received, any questions or concerns. Follow up in an email	
August 28, 2023	Dillon Consulting Ltd.	Vanessa King, Chief's Assistant	Email	Forwarded original message and if there were any questions, coordinate a time to meet	
September 6, 2023	Dillon Consulting Ltd.	Ross Hinks, Director, Department of Natural Resources	Email	Forwarded original message and if there were any questions, to contact. Noted that the Agency indicated Ross as the contact for engagement protocols.	
Note:					

Record of Engagement
Port of Argentia

Engagement Log: Government Departments and Agencies; Local Municipalities; Business and Industry organizations; Individuals

Date	From	To	Method	Content	Response/Concerns
March 14, 2022	Port of Argentia	Town of Placentia CRH Cement Subsea 7 TMSI Containers Argentia Freezers and Terminals	Email	Request for support for Marine Terminal Expansion	N/A
March 15, 2022	Port of Argentia	Newco Metals Pattern Energy TechnipFMC Econnext Integrated Logistics	Email	Request for support for Marine Terminal Expansion	N/A
March 18, 2022	Port of Argentia	Mammoet Search Minerals Boskalis	Email	Request for support for Marine Terminal Expansion	N/A
March 30, 2022	Town of Placentia	Port of Argentia	Letter	Support for Marine Terminal Expansion	No additional issues raised
March 30, 2022	CRH Cement	Port of Argentia	Letter	Support for Marine Terminal Expansion	No additional issues raised
March 30, 2022	Subsea 7	Port of Argentia	Letter	Support for Marine Terminal Expansion	No additional issues raised
March 30, 2022	TMSI Containers	Port of Argentia	Letter	Support for Marine Terminal Expansion	No additional issues raised
March 31, 2022	Argentia Freezers and Terminals	Port of Argentia	Letter	Support for Marine Terminal Expansion	No additional issues raised
March 31, 2022	Newco metals	Port of Argentia	Letter	Support for Marine Terminal Expansion	No additional issues raised
March 31, 2022	Pattern Energy	Port of Argentia	Letter	Support for Marine Terminal Expansion	No additional issues raised
March 31, 2022	TechnipFMC	Port of Argentia	Letter	Support for Marine Terminal Expansion	No additional issues raised
April 1, 2022	Econnext	Port of Argentia	Letter	Support for Marine Terminal Expansion	No additional issues raised

Record of Engagement
Port of Argentia

Date	From	To	Method	Content	Response/Concerns
April 1, 2022	Integrated Logistics	Port of Argentia	Letter	Support for Marine Terminal Expansion	No additional issues raised
April 1, 2022	Energy NL	Port of Argentia	Letter	Support for Marine Terminal Expansion	No additional issues raised
April 11, 2022	Mammoet	Port of Argentia	Letter	Support for Marine Terminal Expansion	No additional issues raised
April 14, 2022	Search Minerals	Port of Argentia	Letter	Support for Marine Terminal Expansion	No additional issues raised
May 24, 2022	Boskalis	Port of Argentia	Letter	Support for Marine Terminal Expansion	No additional issues raised
September 16, 2022	Port of Argentia	The Honourable Seamus O'Regan	Presentation	Project overview with the Minster and senior staff	No additional issues raised
September 20, 2022	Port of Argentia	Equinor/BP	Presentation	Project overview with senior staff	No additional issues raised
September 26, 2022	Port of Argentia	Energy NL	Presentation	Project overview	No additional issues raised
October 29, 2022	Port of Argentia	Newfoundland and Labrador Construction Association	Presentation	CEO speaking engagement on Port's future plans	No additional issues raised
January 11, 2023	Port of Argentia	Department of Industry, Energy, and Technology	Presentation	Project overview with Minister Andrew Parsons and senior staff	No additional issues raised
January 18, 2023	Port of Argentia	Transport Canada, National Trade Corridors Fund	Email		N/A
January 19, 2023	Port of Argentia	Maclean's Magazine	Interview	Interview regarding Port growth	N/A
January 25, 2023	Town of Placentia	Port of Argentia, Boskalis	Meeting	Interface meeting	No additional issues raised
January 25, 2023	Port of Argentia	Transport Canada, National Trade Corridors Fund	Email		N/A

Record of Engagement
Port of Argentia

Date	From	To	Method	Content	Response/Concerns
January 30, 2023	Port of Argentia	Transport Canada, National Trade Corridors Fund	Email		N/A
February 10, 2023	Port of Argentia	Transport Canada, National Trade Corridors Fund	Email		
February 13, 2023	Port of Argentia	Transport Canada, National Trade Corridors Fund	Email		
February 14, 2023	Port of Argentia	Transport Canada, National Trade Corridors Fund	Email		
February 20, 2023	Port of Argentia	Transport Canada, National Trade Corridors Fund	Email		
February 22, 2023	Port of Argentia	Memorial University	Speaking Engagement	A new paradigm to operations in the 21st century	N/A
February 23, 2023	Port of Argentia	Transport Canada, National Trade Corridors Fund	Virtual Meeting	Discussion regarding Project	N/A
February 27, 2023	Globe and Mail	N/A	News Article	Newfoundland's dreams of a wind-powered hydrogen future are starting to take shape	N/A
March 2, 2023	Maclean's Magazine	N/A	News Article	Bay du Nord: The $16-billion oil project that could make or break Newfoundland	N/A
March 2, 2023	Port of Argentia	Transport Canada, National Trade Corridors Fund	Email		N/A
March 6, 2023	ACI	Port of Argentia Board of Directors	Presentation	Presentation from project partner regarding…	
March 8, 2023	Port of Argentia	Transport Canada, National Trade Corridors Fund	Email		
March 13, 2023	Port of Argentia	Transport Canada, National Trade Corridors Fund	Email		

Record of Engagement
Port of Argentia

Date	From	To	Method	Content	Response/Concerns
March 27, 2023	Allnewfoundland Labrador	N/A	News Article	…	
March 27, 2023	Port of Argentia	Avalon West CBDC	?	'provision of information'	
March 27, 2023	Port of Argentia	Placentia Bay Traffic Committee	Letter	Notice of Project Expansion	N/A
March 27, 2023	Port of Argentia	Town of Placentia	Letter	Notice of Project Expansion	N/A
March 27, 2023	Port of Argentia	Town of Long Harbour and Mount Arlington Heights	Letter	Notice of Project Expansion	N/A
March 27, 2023	Port of Argentia	Town of Fox Harbour	Letter	Notice of Project Expansion	N/A
March 27, 2023	Port of Argentia	Town of St. Brides	Letter	Notice of Project Expansion	N/A
August 18, 2023	Dillon Consulting, on behalf of Port of Argentia	World Wildlife Fund	Letter	Notice of Project Expansion Opportunity to meet/discuss issues	*letter is dated Aug 17
August 18, 2023	Dillon Consulting, on behalf of Port of Argentia	Whale and Release Strandings	Letter	Notice of Project Expansion Opportunity to meet/discuss issues	*letter is dated Aug 17
August 18, 2023	Dillon Consulting, on behalf of Port of Argentia	Sierra Club Canada Foundation	Letter	Notice of Project Expansion Opportunity to meet/discuss issues	*letter is dated Aug 17
August 18, 2023	Dillon Consulting, on behalf of Port of Argentia	Salmonid Association of Eastern Newfoundland	Letter	Notice of Project Expansion Opportunity to meet/discuss issues	*letter is dated Aug 17
August 18, 2023	Dillon Consulting, on behalf of Port of Argentia	Montevecchi Lab	Letter	Notice of Project Expansion	*letter is dated Aug 17

Record of Engagement
Port of Argentia

Date	From	To	Method	Content	Response/Concerns
				Opportunity to meet/discuss issues	
August 18, 2023	Dillon Consulting, on behalf of Port of Argentia	Island Rooms	Letter	Notice of Project Expansion Opportunity to meet/discuss issues	*letter is dated Aug 17
August 18, 2023	Dillon Consulting, on behalf of Port of Argentia	Fish, Food & Allied Workers Union	Letter	Notice of Project Expansion Opportunity to meet/discuss issues	*letter is dated Aug 17
August 18, 2023	Dillon Consulting, on behalf of Port of Argentia	Environmental Resources Management Association	Letter	Notice of Project Expansion Opportunity to meet/discuss issues	*letter is dated Aug 17
August 18, 2023	Dillon Consulting, on behalf of Port of Argentia	Ecology Action Centre	Letter	Notice of Project Expansion Opportunity to meet/discuss issues	*letter is dated Aug 17
August 18, 2023	Dillon Consulting, on behalf of Port of Argentia	Canadian Parks and Wilderness Society	Letter	Notice of Project Expansion Opportunity to meet/discuss issues	*letter is dated Aug 17
August 18, 2023	Dillon Consulting, on behalf of Port of Argentia	The Council of Canadians	Letter	Notice of Project Expansion Opportunity to meet/discuss issues	*letter is dated Aug 17
August 18, 2023	Dillon Consulting, on behalf of Port of Argentia	Bay St. George Climate Action Network	Letter	Notice of Project Expansion Opportunity to meet/discuss issues	*letter is dated Aug 17
August 18, 2023	Dillon Consulting, on behalf of Port of Argentia	Balaena Institute for Cetacean Conservation Studies	Letter	Notice of Project Expansion	*letter is dated Aug 17

Record of Engagement
Port of Argentia

Date	From	To	Method	Content	Response/Concerns
				Opportunity to meet/discuss issues	
August 18, 2023	Dillon Consulting, on behalf of Port of Argentia	ACAP Humber Arm	Letter	Notice of Project Expansion Opportunity to meet/discuss issues	*letter is dated Aug 17
October 11, 2023	Michelle Roche, Dillon Consulting	Vicki Ficzere, Government of NL Leslie Kieley, IAAC Jason Flanagan, Transport Canada Melissa Ginn, Transport Canada	Email	Project update that the team is examining the geotechnical report and that preliminary insights have raised considerations that might influence the proposed dimensions of the dredging area	
October 11, 2023	Vicki Ficzere, Government of NL	Michelle Roche, Dillon Consulting	Email	Thanking Michelle for Project update	
October 17, 2023	Michelle Roche, Dillon Consulting	Vicki Ficzere, Government of NL Christa Skinner, Government of NL Leslie Kieley, IAAC Jason Flanagan, Transport Canada Carl Sheppard, Port of Argentia Chris Newhook, Port of Argentia	Email	Project update that the Initial Project Description is expected to be submitted the week of October 30, 2023.	
October 18, 2023	Jason Flanagan, Transport Canada	Michelle Roche, Dillon Consulting	Email	Thanking Michelle for Project update	
October 31, 2023	Alana Vigna, Dillon Consulting Ltd (on behalf of Michelle Roche, Dillon Consulting)	Murray Hupman, Marine Atantic cc. Tara Laing, Marine Atlantic	Email	Notice of Project Expansion Opportunity to meet/discuss issues	

Record of Engagement
Port of Argentia

Date	From	To	Method	Content	Response/Concerns
October 31, 2023	Alana Vigna, Dillon Consulting Ltd (on behalf of Michelle Roche, Dillon Consulting)	Officer-in-Charge: MCTS Operations	Email	Notice of Project Expansion Opportunity to meet/discuss issues	

Issues Tracking Sheet

Issue	Community, Organization	Origin of Issue (letter, meeting, etc.)	Management of Issues (commitments, mitigations, etc.)	Resolved? Y/N Action Items

Note: No issues raised as of November 2, 2023

Appendix C

Letters of Support

A. HARVEY
& COMPANY LTD

60 Water Street, P.O. Box 5128, St. Johns, NL, Canada A1C 5W6
Office +1 (709) 726-8000 Fax +1 (709) [illegible]

March 31, 2022

Mr. Scott Penney
CEO
Port of Argentia
1 Augusta Ave.,
P.O. Box 95, Argentia,
NL A0B 1W0

Re: Letter of Support – Cooper Cove Multi-Purpose Dock Development

Dear Scott;

It is with pleasure that on behalf of A.Harvey and our Argentia Freezers and Terminals Division (AFT) to write in support of the Cooper Cove Project.

While AFT has been active in the fishery and general stevedoring business in Argentia since 1979 the growth opportunities it sees in the offshore oil and gas, aquaculture and the green economy (to name a few) all require an expanded wharf infrastructure. Currently only 1 of the 3 berths in Argentia are capable of sustaining crane operations making berth availability a major concern. Cooper Cove would solve that problem.

Investments like Copper Cove are regional economic development tools and require government support. No one project could justify the investment but the opportunities for the port and the community with this investement will be many.

We wish the Port of Argentia well in this project and look forward to doing whatever we can to support it.

Sincerely,
A.Harvey & Co. Ltd.

Geoff Cunningham
Vice President Operations

From: Deschenes, Paul (Ash Grove) <Paul.Deschenes@ashgrove.com>
Sent: Wednesday, March 30, 2022 5:21 PM
To: Ray Greene <r.greene@portofargentia.ca>
Cc: Chris Newhook <c.newhook@portofargentia.ca>
Subject: Cooper Cove Multi-Purpose Dock Development

Port of Argentia

Ash Grove Cement supports Port of Argentia in seeking funding from various government programs to advance development of key dock infrastructure in the Cooper Cove area at Argentia.
Ports are known gateways of economic development and new investment at Argentia is essential for the Port to reach its development goals. The new multipurpose dock infrastructure development planned will support the growth of existing industries and attract new ones to Argentia.

Marine transportation, supply chain services, offshore and renewable energy sectors, to name a few, require access to dock infrastructure supported by adjacent processing facilities and laydown areas. The proposed heavy lift dock facility with 12m draft and vast available acreage at Argentia make it ideally suited for shoreline support to these industries. Coupling this space with new docking infrastructure will enable these companies to gain competitive efficiencies which is key to the continuity and growth of these business activities as they evolve and grow.

We encourage government to partner with the Port as it advances these important infrastructure objectives. If you have any questions in relation to this letter of support, please contact the undersigned at your convenience.

Best regards

Paul Deschênes

Directeur des ventes et logistique — Québec et Atlantique

Sales and Logistics Manager

Ciment Ash Grove
966, chemin des Prairies
Joliette (Québec) J6E 0L4

C 450 758-5816

T 450 756-1076 x 48815

www.ashgrove.com

Newco Metal and Auto Recycling Ltd
50 Robin Hood Bay Road, St John's, NL, A1A 5V3
(709) 753-3070 office or (709) 753-4892 fax
ddrew@newcometal.com

Mar 31, 2022
Mr. Scott Penney
Port of Argentia,
Argentia, NL, Canada

Mr. Penney,

As a Locally Owned and Operated Business with operations in the Port of Argentia Newco Metal & Auto Recycling Ltd. would like to offer our support to the Port of Argentia in obtaining funding from various government programs to advance development of key dock infrastructure in the Cooper Cove area at Argentia.

The Port of Argentia is a key gateway into the province, a centre of economic development, and new investment. This new development is essential for the Port to reach its development goals. The new multipurpose dock infrastructure development planned will support the growth of existing industries like Newco and attract new businesses to Argentia.

The offshore and renewable energy sectors require access to dock infrastructure supported by adjacent processing facilities and laydown areas. The proposed heavy lift dock facility with 12m draft and vast available acreage at Argentia make it ideally suited for shoreline support to these industries. Coupling this space with new docking infrastructure will enable these companies to gain competitive efficiencies which is key to the continuity and growth of these business activities as they evolve and grow.

Newco holds a Certificate of Approval from the provincial government for the processing of recycled metal within the province, along with the required insurance, bonding, and registration required by law. We are also proud to be a COR certified company with the Newfoundland and Labrador Construction Safety Association.

We are pleased to work with you on the environmentally safe handling and processing of the scrap metal in question.

All the best.

Sincerely,

Don Drew
Operations Manager

Pattern
Canada

Pattern Energy Group Services Canada ULC
119 Spadina Ave, Suite 502
Toronto, ON M5V 2L1

T +1 416 263 8025
F +1 416 979 8428
www.patterncanada.ca

March 31, 2022

CEO Scott Penney
Port of Argentia
1 Augusta Ave.
P.O. Box 95
Argentia, NL A0B 1W0

Dear Mr. Penney,

Pattern Energy Group LP is one of Canada's leading renewable energy development and operations companies. We operate the largest installed fleet of wind energy projects in the country, as well as a large portfolio of assets in the United States, Puerto Rico, Mexico and Japan. We firmly support the efforts of the Port of Argentia in seeking funding from various government agencies to advance development of key dock infrastructure in the Cooper Cove area at Argentia.

Ports provide critical infrastructure to support the efficient transportation of large electrical generation equipment, transportation equipment and vehicles and personnel, all of which are essential to the successful construction of renewable energy projects globally. Supporting the development and enhancement of Port infrastructure will be one of the necessary investments as Canada works toward our collective 2050 energy transition goals. As an ice-free, deepwater port strategically located in eastern Canada, the Port of Argentia stands to serve a critical role in major renewable energy project development in the region for decades to come. The new multipurpose dock infrastructure development at Argentia, as proposed, will support the growth of existing industries and attract new ones to Argentia.

The renewable energy sector requires access to a network of modern, reliable dock infrastructure supported by adjacent processing facilities and laydown areas. The proposed heavy lift dock facility with 12m draft and vast available acreage at Argentia make it ideally suited for shoreline support to these industries in the province of Newfoundland & Labrador and the Atlantic Canada region.

We encourage government to partner with the Port as it advances these important infrastructure objectives.

If you have any questions in relation to this letter of support, please contact the undersigned at your convenience.

Sincerely,

Frank Davis
AVP, Canadian Markets and Asset Management

subsea 7

Subsea 7 Canada Inc.
351 Water St, 6th Floor
PO Box 7070, Stn. C
St John's, NL
A1E 3Y3

Tel: +1 709 753 0500
Fax: +1 709 753 0501

www.subsea7.com

Mr. Scott Penney
1 Augusta Ave
PO Box 95
Argentia, NL
A0B 1W0

June 9, 2022

Dear Mr. Penney,

Please accept this letter in support of the Port of Argentia proposal for the Cooper Cove Multi-Purpose Dock Development. Subsea 7 Canada Inc. fully supports initiatives from local companies such as the Port of Argentia that provide for increased capacity and capability within the local Newfoundland & Labrador supplier community.

Development of the Cooper Cove Multi-Purpose Dock, including provision of expanded berthing, deep draft loading/offloading capability, and new onshore facilities will provide opportunities for growth and expansion of the Port of Argentia. Subject to further evaluation and assessment, if successful in our pursuit of the Bay du Nord Project, Subsea 7 Canada Inc. will be engaging with the Port of Argentia to develop and finalise plans to establish and operate a local pipeline spool base at this site.

Subsea 7 Canada Inc. look forward to continuing to work with the Port of Argentia as the Cooper Cove Multi-Purpose Dock Development evolves.

Yours sincerely,

Brian Rogers P.Eng
Country Manager – Canada

seabed-to-surface

Registered Office:
351 Water St, 6th Floor,
P.O. Box 7070, Stn. C
St.John's, N.L., A1E 3Y3,
Canada
Registered no: 55666

TechnipFMC

March 31, 2022
TFMC Ref: TFMC07/07-02/L0001

Port of Argentia
1 Augusta Avenue
Argentia, NL A0B 1W0

For the Attention of: Mr. Scott Penney

Subject: Cooper Cove Multi-Purpose Dock Development

Dear Mr. Penney,

TechnipFMC is pleased to provide this letter of support for the Cooper Cove Multi-Purpose Dock Development.

TechnipFMC understands that the Port of Argentia envisages a deep draft (12 m), heavy lift capacity dock for Cooper Cove. As a stakeholder in potential future oil and gas and renewable energy developments, TechnipFMC recognizes the advantages of deep draft, high deck capacity berth space to accommodate the current generation of large offshore construction vessels. It is noted that there are currently limited quayside facilities in province to support these vessels and the associated shoreside activities. The proposed development at Cooper Cove aligns well with TechnipFMC specific development interests in the Argentia area. Having the proposed development in place by 2026 meets TechnipFMC requirements for proposed project activities. The proposed development also provides required infrastructure for related project activities, increases potential project execution flexibility and robustness, and therefore unlocks additional development opportunities for Argentia and the Province.

Please do not hesitate to contact the undersigned should additional information be required regarding the TechnipFMC position on the proposed development.

Yours truly,
For and on Behalf of TechnipFMC Canada Ltd.

Richard J. R. Mandeville
VP, Subsea Canada

Cc: PPE, GVI, LTU

P +1 709 724 1851
F +1 709 724 1855
TechnipFMC.com

TechnipFMC
131 Kelsey Drive
St. John's, NL
A1B 0L2

TechnipFMC plc is registered in England and Wales (Company No. 09909709), with registered office address at Hadrian House, Wincomblee Road, Newcastle Upon Tyne, NE6 3PL, United Kingdom

TMSI Ltd

2022.03.31

Mr. Scott Penney
Port of Argentia
1 Augusta Avenue, P.O. Box 95
Argentia NL, A0B 1W0

Re: Letter of Support – Cooper Cove Multi-Purpose Dock Development

Dear Scott;

Please accept this letter as support for the development of a multi-purpose dock facility at Cooper Cove in Argentia.

Since its inception, TMSI Ltd. has invested heavily in equipment and infrastructure at the Port of Argentia and we continue to promote the Port to the benefit of the region and its population. While our throughput continues to grow, it is somewhat stifled by the relatively small landing area near the dock face, the lack of roro capability, and the inability to accommodate more than one large ship at a time. Our hope for the future is to increase our sailings and replace our ship with a larger, greener containership with roro capacity to service the trucking industry.

We are very exited about the opportunities that such a development would create for us and we are hopeful that you will succeed with this endeavor. We remain at your service should you require further assistance.

Best Regards,

Girardin

Damien Girardin
President
TMSI Limited

Cc: Max Girardin
Cc: Yvon Dufour

107 BURBRIDGE AVENUE, DARTMOUTH, N.S. B3B 0G6
WWW.TMSI.CA.COM

Energy NL

April 1, 2022

Energy NL is pleased to support the Port of Argentia plan to develop a multi-purpose dock facility at Cooper Cove, within Argentia Harbour.

Energy NL understands that Port of Argentia has consulted with relevant stakeholders who support this proposal, and also undertaken studies which highlight the need for such a facility and the potential for it to drive economic activity in the Placentia area.

Energy NL is supportive of this plan to help create new opportunities in the renewable energy sector such as wind energy and hydrogen. Port of Argentia has been examining opportunities in renewable energies for some time and should the development of this dock lead to new opportunities, the entire energy sector of Newfoundland and Labrador will benefit. This proposed development will also support current offshore activities and allow the Port of Argentia to continue its important role in this sector.

Energy NL represents approximately 460 member organizations worldwide which are involved in the Newfoundland and Labrador energy sector. Members are active in all areas of the supply and service sector and include a diverse representation of businesses that range from offshore supply vessels and helicopters, carbon reduction and sustainable technologies, health and safety equipment and training, engineering solutions and fabricators to law firms and human resource agencies.

On behalf of Energy NL, I offer support to the Port of Argentia for this important project.

Thank you,

Charlene Johnson

Charlene Johnson
Energy NL CEO

Energy NL
100 New Gower Street, Cabot Place, Suite 902, St. John's, NL, Canada A1C 6K3
T: 709-758-6610   F: 709-758-6611 www.energynl.ca @WeAreEnergyNL

INTEGRATED
LOGISTICS

April 01 2022

Mr. Scott Penney
CEO Port of Argentia

Subject: Letter of Support – Cooper Cove Multi -Purpose Dock Development

Dear Mr. (Scott) Penney:

We are very pleased to confirm our support for a new dock development in Cooper's Cove. We chose Argentia to be our first marine terminal in 2009 based on the unique capabilities of the Argentia area. Since our arrival in the port, it is clear that many other industrial projects have made the same evaluation of this port, and with this growth the need of additional port infrastructure is easy to support.

These advantages include the features of Placentia Bay, the industrial hub of the Placentia area and the physical attributes of the Argentia land holdings.

Placentia Bay offers an ice-free deep-water port with Smart Atlantic technology to make it one of the safer ports for year round navigation for our shared marine clients. This bay is also home to the Come by Chance refinery, Marystown Fabrication, Vale's Hydromet plant, and Argentia is a significant industrial port for the capital region of our province.

Argentia's land features, combined with the strength of this marine access, continue to place the port on the table for major industry developments. In recent years we have seen new container lines, regular shipment of resupply materials, opportunities for aquaculture, plus the development of the Cenovus Gravity Base structure, with future developments for energy projects passing through the decision gates daily.

We fully support the development of the Cooper's Cove waterfront at this time. You have an opportunity to further develop the port and unlock the potential of Argentia as a major industrial player and additional vessel service abilities will be key to the success of this plan.

If you require anything further from IL during the stages of this development, please contact me directly.

Regards,

Andrew Short

Chief Operating Officer

Integrated Logistics

INTEGRATED LOGISTICS 2 Clift's-Baird's Cove, St. John's NL A1C 6M9 | T +1 709 739-4036 F +1 709 739-4317 | info@integratednl.com

Boskalis

Boskalis Offshore Contracting B.V.
Rosmolenweg 20
3356 LK Papendrecht
PO Box 43
3350 AA Papendrecht
The Netherlands

T +31 78 6969000
F +31 78 6969555
offshore@boskalis.com
www.boskalis.com/offshore

Minister Andrew Parsons
7th Floor, Industry, Energy and
Technology Building
50 Elizabeth Ave.
P.O. Box 8700
St. John's, NL A1B 4J6
CANADA

Date
24 May 2022

Our reference
JVL/JS/vcB

Page
1 | 2

Enclosure(s)

Dear Minister Andrew Parsons,

Boskalis Offshore Contracting is a leading global offshore contractor and maritime services provider. We create new opportunities for our stakeholders in the ports, offshore energy, and maritime inland infrastructure markets

Port of Argentia is a critical partner that can enable Boskalis to meet the demands of significant growth of the US offshore wind market. The Port and Boskalis have entered into a contractual agreement that will see Argentia serve as a Boskalis feeder port for up to 140 offshore wind turbine monopiles during 2023 and 2024, with further potential for additional projects to support this market in future years.

Given the limited port infrastructure, laydown, and marshalling yards along the eastern seaboard of Canada, Boskalis views the 60+ hectares of runways and other uplands property at Argentia as a distinct competitive advantage in our combined efforts to collaborate and secure multiple large scale feeder port projects. Boskalis is committed to support the Port of Argentia development through a possible combination of financial investment, in-kind contribution and project financing as required. This strategy has a long precedent and Boskalis has a proven track record of around the globe of successful collaboration with partners like Port of Argentia.

With the significant economic benefits to be derived from these activities, we encourage the Governments of Canada and Newfoundland and Labrador to partner alongside Boskalis and Port of Argentia in these significant business development opportunities.

Yours faithfully,

Hans Dieteren
Director

cc. Mr Ken McDonald

Boskalis Offshore
Contracting B.V.
BNP Paribas S.A.
IBAN NL03BNPA0227671880
BIC BNPANL2A

Chamber of Commerce
63348805

VAT no.
NL8551.96.749.B01

MAMMOET LETTER OF SUPPORT

From: Mammoet Canada Eastern Ltd.
7504 McLean Road East
Puslinch, ON, Canada
N0B 2J0

To: Port of Argentia
Mr. Scott Penney
1 Augusta Ave., P.O. Box 95,
Argentia, NL A0B 1W0

Date: 11 April 2022
Subject: **Cooper Cove Multi-Purpose Dock Development**

Dear Mr. Penney,

Mammoet provides solutions to lifting, transportation projects. With a unique global network and an unparalleled fleet of equipment, our mission is to help clients improve construction efficiency. Our engineering expertise and high quality and safety standards, deliver value to a wide breadth of industry sectors and projects.

Mammoet has a long history of working in Newfoundland, namely, Hibernia, White Rose, Vale - Long Harbour. Most recently we provided the largest ring crane in the world, our 5,000t capacity SK350 for the assembly of the West White Rose concrete gravity structure (CGS) in the Argentia Graving Dock.

We have recently concluded an agreement for the marshalling activities of the Orsted US North East Program that will be received and stored at the Port of Argentia, and have received additional marshalling requests relating to Offshore Wind.

We fully support your initiative to develop a multipurpose dock facility at Cooper Cove and firmly believe that the investment will provides benefits to the region for generations to come.

Sincerely yours,

Mammoet Canada Eastern Ltd.

Gilles Emond
Director of Sales

PFC PFCollins
International Trade Solutions

April 1, 2022

CEO Scott Penney
Port of Argentia
1 Augusta Ave., P.O. Box 95
Argentia, NL A0B 1W0

Mr. Penney:

PF Collins International Trade Solutions expresses our full support to the Port of Argentia in your request for government funding to support the development of key dock infrastructure in the Cooper Cove area.

The Port of Argentia is a significant gateway for economic development within the Province of Newfoundland and Labrador and investment is essential for the continued support of the Province's major industries. Development of the multipurpose dock infrastructure will not only support the growth of existing industries, it will also attract new ones to Argentia and Newfoundland and Labrador as a whole.

As a logistics provider, the Port of Argentia is a significant contributor to PF Collins' core services lines, including our Freight Forwarding, Customs Brokerage, Marine Agency, and Warehousing operations. Development and expansion of the Port will ensure continued success in these areas as well as increased opportunities within our main industries.

- In the transportation sector, the planned heavy lift dock will support current activities and new opportunities for the supply chain. Specifically, the roll-on/roll-off ramp will create efficiencies for cargo loading and offloading.

- Within the offshore and renewable energy sectors, access to dock infrastructure is required to support processing facilities and marshalling yards. The sizeable land available in Argentia makes it well suited for shore-based support for these industries. Combining this space with new dock infrastructure will allow these companies to gain a competitive advantage that will support growth of these business activities.

We encourage the Governments of Newfoundland and Labrador and Canada to partner with the Port of Argentia in these important infrastructure objectives.

Regards,

Raymond Collins
President

Registered to ISO 9001

ST. JOHN'S
P.O. Box 5514
251 East White Hills Road
St. John's, NL A1C 5W4
Tel: (709) 726-7596
Fax: (709) 739-5939
stjohns@pfcollins.com

ST. JOHN'S WAREHOUSE
275 East White Hills Road
St. John's, NL A1A 5X7
Tel: (709) 726-2121
Fax: (709) 739-4787
warehouse@pfcollins.com

HALIFAX
10 Morris Drive, Unit 22
Dartmouth, NS B3B 1K8
Tel: (902) 496-1500
Fax: (902) 496-1506
halifax@pfcollins.com

CALGARY
#250 7326 10 Street NE
Calgary, AB T2E 8X1
Tel: (403) 275-6550
Fax: (403) 275-6520
calgary@pfcollins.com

April 4, 2022

Mr. Scott Penney
CEO, Port of Argentia
1 Augusta Ave., PO Box 95
Argentia, NL, A0B 1W0

Dear Scott,

This is to confirm Search Minerals Inc. is actively seeking a brownfield industrial site on the island of NL for the chemical processing of approximately 200,000 MT/year of rare earth concentrate from our proposed mine operation in south east Labrador.

Search Minerals anticipates first production of concentrate in 2025 and is seeking to secure confirmation of a brownfield site on the island of NL by the end of 2022 which could be available by 2025-26 for the processing of concentrate and further downstream processing.

Search Minerals has identified the Port of Argentia as a potential location for its concentrate processing requirements and therefore Search is writing in support of an application from the Port of Argentia to federal and provincial government departments and agencies to assist with the capital requirements to develop a multi-purpose dock facility at Cooper Cove within Argentia Harbour by 2026.

Thank you,

Leo P. Power

Leo Power

Chairman, Search Minerals Inc.

Appendix D

Sediment Memo

DILLON CONSULTING

Memo

To: Chris Newhook, VP Strategy & Growth, Port of Argentia

From: Shawn Forster, M.Eng., P.Eng., Dillon Consulting Limited

cc: Michelle Roche, EP, RPF., Dillon Consulting Limited

Date: October 3, 2023

Subject: Sediment Characterization, Cooper Cove Marine Terminal Extension Project, Port of Argentia, NL

Our File: 21-3088

1.0 Introduction

Dillon Consulting Limited (Dillon) was commissioned by the Port of Argentia to summarize the laboratory analytical data associated with the marine sediment sampling program (MSSP) conducted within the proposed dredge area associated with the Cooper Cove Marine Terminal Extension Project at the Port of Argentia in Newfoundland and Labrador (NL). The purpose of this program was to establish baseline physical and chemical conditions of the sediment within the proposed dredge area associated with the Cooper Cove Marine Terminal Extension Project.

2.0 Sediment Assessment

2.1 Methodology

2.1.1 Drilling Program

Between May 1 and 11, 2023, Stantec Consulting Limited (Stantec) conducted a geotechnical field program that included the drilling five boreholes within the proposed dredge area for the Cooper Cove Marine Terminal Extension Project. In conjunction with the geotechnical field program Stantec personnel also collected sediment samples for the purpose of establishing baseline physical and chemical conditions of the sediment. The sediment samples were collected from boreholes drilled using a geotechnical drill as indicated in Figure 1 (Appendix A).

A Stantec technician was onsite to oversee the geotechnical drilling program, as well as to collect samples from the applicable boreholes in laboratory supplied containers, to be sent to the laboratory for analysis. The sample collection, preparation, and analyses were conducted in accordance with the Environment and Climate Change Canada (ECCC) publication *Guidance Document on Collection and Preparation of Sediments for Physicochemical Characterization and Biological Testing,* December 1994.

2.1.2 Laboratory Program

The collected sediment samples were composited (as warranted) and stored in the laboratory supplied jars and containers, placed in a cooler on ice and brought to the Bureau Veritas (BV) Laboratory in St. John's, NL for analysis. Samples were analyzed for the following contaminants of potential concern (COPCs) and other parameters:

- Petroleum hydrocarbons, including benzene, toluene, ethylbenzene, xylenes (BTEX) and modified total petroleum hydrocarbons (mTPH);
- Polycyclic aromatic hydrocarbons (PAHs);
- Total polychlorinated biphenyls (total PCBs);
- Metals including mercury;
- Grain size (Sieve and Pipette);
- Total Organic Carbon (TOC) and Fraction of Organic Carbon (FOC); and
- Hexavalent Chromium.

BV is accredited by the Standards Council of Canada (SCC) 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

The laboratory analytical results of the six sediment samples collected from the proposed dredge area associated with the Cooper Cove Marine Terminal Extension Project are summarized in Table 1 (Appendix B), and further discussed below. The complete set of laboratory analytical results, including laboratory QA/QC and Certificates of Analyses for all the analyzed parameters, are included in Appendix C.

The identification of COPCs in sediment were made on the basis of comparison of the sediment chemistry data to the applicable Atlantic Partnership in RBCA [Risk-Based Corrective Action] Implementation (PIRI) Ecological (Eco) Tier I Quality Standards (EQS) for sediment.

2.2.1 Grain Size Analysis

The available laboratory analytical results for the grain size of the analyzed sediment samples are summarized in Table 1 (Attachment 2).

The laboratory-determined grain size distribution of the sediment samples collected from the proposed dredging area can be classified as follows:

- BH23 CC-1A: Coarse-grained;
- BH-23 CC-1B: Coarse-grained;
- BH-14 CC-1A: Fine-grained;

- BH-14 CC-1B: Coarse-grained;
- BH-17 CC-1A: Fine-grained;
- BH-17 CC-1B: Coarse-grained;
- BH-12 CC-1A: Coarse-grained;
- BH12 CC-1B: Coarse-grained;
- BH-9 CC-1A: Coarse-grained; and
- BH-9 CC-1B: Coarse-grained.

2.2.2 Petroleum Hydrocarbons

The available laboratory analytical results for BTEX and mTPH in sediment are summarized in Table 1 (Appendix B).

The reported BTEX concentrations in each of the laboratory analyzed sediment samples were less than the laboratory reported detection limits (RDLs) that were also less than the Atlantic PIRI Eco Tier I EQS.

Reported mTPH concentrations (resembling lube oil) in the laboratory analyzed sediment samples ranged from <15 to 90 mg/kg, which is less than the Atlantic PIRI Eco Tier I EQS (Other Sediment Type: 190 mg/kg).

2.2.3 **Polycyclic Aromatic Hydrocarbons**

The available laboratory analytical results for PAHs in sediment are summarized in Table 1 (Appendix B).

The reported PAH concentration in the laboratory analyzed sediment samples were either less than the applicable Atlantic PIRI Eco Tier I EQS or less than the laboratory RDLs that were also less than the Atlantic PIRI Eco Tier I EQS in each of the analyzed samples with the exception of sediment sample BH-23 CC-1A. The reported benzo(a)pyrene concentration (0.82 mg/kg) in sediment sample BH-23 CC-1A marginally exceeds the Atlantic PIRI Eco Tier I EQS (0.763 mg/kg).

2.2.4 Total Polychlorinated Biphenyls

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

The reported PCB congener concentrations in the laboratory analyzed sediment samples were less than less than the laboratory RDLs that were also less than the Atlantic PIRI Eco Tier I EQS. On this basis, the reported total PCB concentrations in the laboratory analyzed sediment samples were less than less than the laboratory RDLs that were also less than the Atlantic PIRI Eco Tier I EQS.

2.2.5 Metals

The available laboratory analytical results for metals in sediment are summarized in Table 1 (Appendix B).

The reported metal concentrations in the laboratory analyzed sediment samples were either less than the applicable Atlantic PIRI Eco Tier I EQS or less than the laboratory RDLs that were also less than the Atlantic PIRI Eco Tier I EQS in each of the laboratory analyzed samples with the exception of sediment sample BH-12 CC-1B. The reported silver concentration (5.7 mg/kg) in sediment sample BH-12 CC-1B exceeds the Atlantic PIRI Eco Tier I EQS (2.2 mg/kg).

2.2.6 Carbon Content

The available laboratory analytical results for TOC in sediment are summarized in Table 1 (Appendix B).

Each of the analyzed sediment samples collected from the proposed dredging area were analyzed for TOC and results ranged from a low of <0.05% to a high of 4.4%.

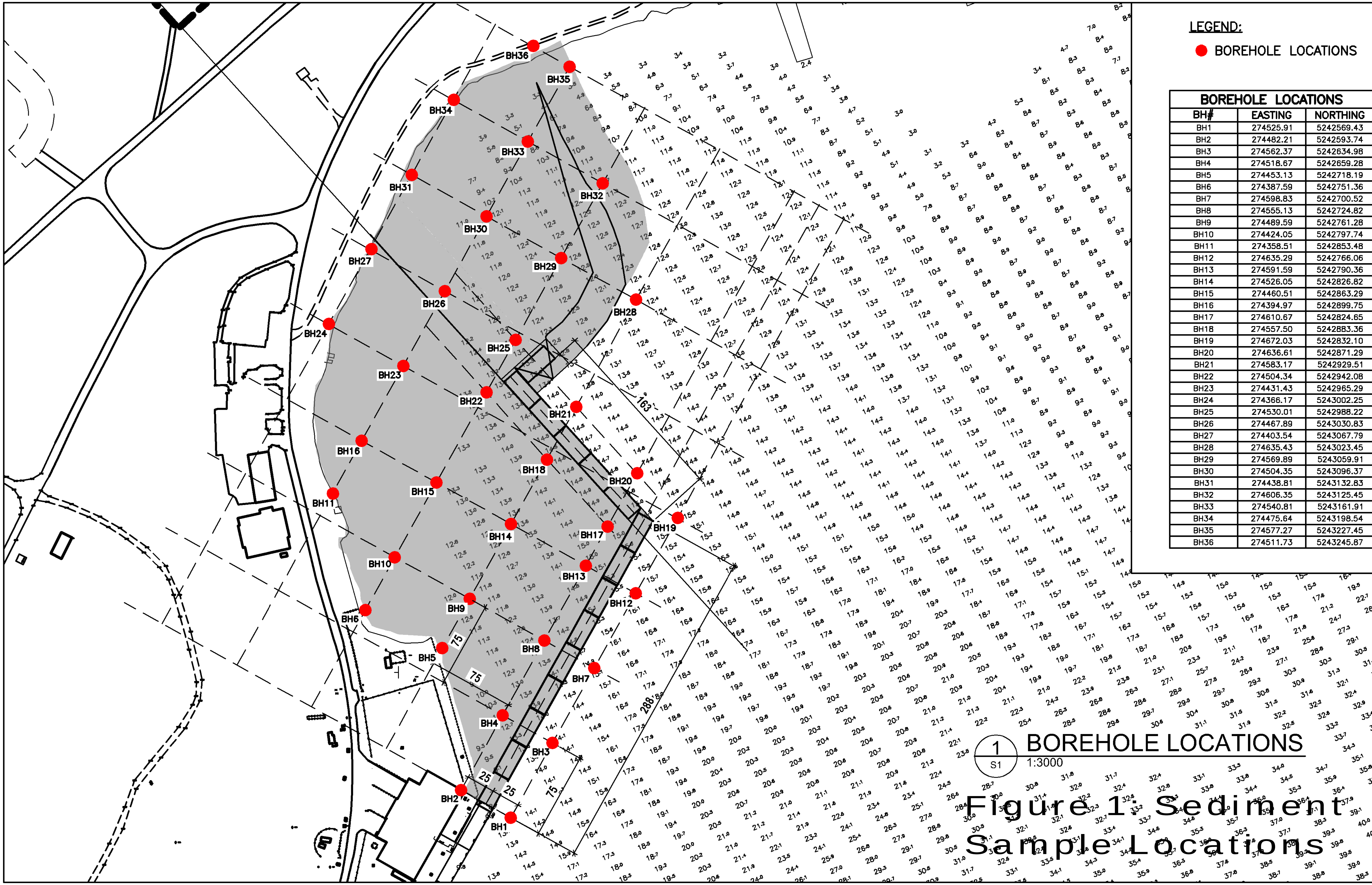
3.0 Summary

Two of the analyzed sediment samples collected from the proposed dredge area associated with the Cooper Cove Marine Terminal Extension Project had reported benzo(a)pyrene (BH-23 CC-1A) and silver (BH-12 CC-1B) concentrations that exceed the Atlantic PIRI Eco Tier I EQS.

The remaining parameters in the analyzed sediment samples were reported at concentrations either less than the applicable Atlantic PIRI Eco Tier I EQS or less than the laboratory RDLs that were also less than the Atlantic PIRI Eco Tier I EQS.

Appendix A

Figures



BOREHOLE LOCATIONS		
BH#	EASTING	NORTHING
BH1	274525.91	5242569.43
BH2	274482.21	5242593.74
BH3	274562.37	5242634.98
BH4	274518.67	5242659.28
BH5	274453.13	5242718.19
BH6	274387.59	5242751.36
BH7	274598.83	5242700.52
BH8	274555.13	5242724.82
BH9	274489.59	5242761.28
BH10	274424.05	5242797.74
BH11	274358.51	5242853.48
BH12	274635.29	5242766.06
BH13	274591.59	5242790.36
BH14	274526.05	5242826.82
BH15	274460.51	5242863.29
BH16	274394.97	5242899.75
BH17	274610.67	5242824.65
BH18	274557.50	5242883.36
BH19	274672.03	5242832.10
BH20	274636.61	5242871.29
BH21	274583.17	5242929.51
BH22	274504.34	5242942.08
BH23	274431.43	5242965.29
BH24	274366.17	5243002.25
BH25	274530.01	5242988.22
BH26	274467.89	5243030.83
BH27	274403.54	5243067.79
BH28	274635.43	5243023.45
BH29	274569.89	5243059.91
BH30	274504.35	5243096.37
BH31	274438.81	5243132.83
BH32	274606.35	5243125.45
BH33	274540.81	5243161.91
BH34	274475.64	5243198.54
BH35	274577.27	5243227.45
BH36	274511.73	5243245.87

Figure 1: Sediment Sample Locations

Appendix B

Laboratory Analytical Summary Tables

Table 1: Sediment - Analytical Results Cooper Cove, Port of Argentia, Newfoundland and Labrador		Field ID Depth (m) Date	BH-9 CC-1A 0 - 1.0 11 May 2023	BH-9 CC-1B 3.0 - 4.0 11 May 2023	BH-12 CC-1A 0 - 1.0 08 May 2023	BH-12 CC-1B 1.0 - 3.0 08 May 2023	BH-14 CC-1A 0 - 1.0 02 May 2023	BH-14 CC-1B 2.0 - 3.0 02 May 2023	BH-17 CC-1A 0 - 1.0 03 May 2023	BH-17 CC-1B 1.0 - 3.0 03 May 2023	BH-23 CC-1A 0 - 1.0 01 May 2023	BH-23 CC-1B 1.0 - 3.0 01 May 2023
	Unit	Atlantic PIRI Eco Tier I EQS for Sediment - Marine										
Metals												
Aluminium	mg/kg	-	13,000	11,000	12,000	9,100	11,000	14,000	11,000	12,000	12,000	11,000
Antimony	mg/kg	25	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Arsenic	mg/kg	41.6	13	4.2	10	2.4	5.0	16	8.6	4.7	12	5.8
Barium	mg/kg	130	44	10	33	8.6	16	63	23	24	54	8.7
Beryllium	mg/kg	-	<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
Boron	mg/kg	-	<50	<50	<50	<50	<50	92	<50	<50	<50	<50
Cadmium	mg/kg	4.2	0.32	<0.30	<0.30	<0.30	2.0	0.82	<0.30	<0.30	<0.30	<0.30
Chromium (Total, III+VI)	mg/kg	160	28	27	27	23	24	36	28	32	28	26
Chromium (Hexavalent)	mg/kg	-	<0.54[#1]	<0.18	<0.18	<0.18	<0.54[#1]	<0.18	<0.36[#1]	<0.18	<0.54[#1]	<0.18
Cobalt	mg/kg	-	11	11	11	8.6	11	10	10	10	11	11
Copper	mg/kg	108	20	26	38	41	13	28	15	24	32	14
Iron	mg/kg	-	29,000	24,000	26,000	22,000	28,000	37,000	28,000	30,000	27,000	24,000
Lead	mg/kg	112	13	19	13	6.5	14	13	7.0	18	33	9.6
Manganese	mg/kg	-	620	630	570	510	580	620	590	570	600	600
Mercury	mg/kg	0.7	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.17	<0.10
Molybdenum	mg/kg	-	11	3.5	12	2.1	<2.0	9.1	7.5	6.0	4.5	3.0
Nickel	mg/kg	50	25	20	22	18	19	29	21	23	23	20
Selenium	mg/kg	2	0.81	<0.50	0.52	<0.50	<0.50	1.8	0.52	<0.50	0.62	<0.50
Lithium	mg/kg	-	3.9	<2.0	2.6	<2.0	18	23	19	23	20	18
Rubidium	mg/kg	-	22	17	20	15	<2.0	5.7	2.4	6.4	3.2	<2.0
Silver	mg/kg	2.2	<0.50	0.63	<0.50	5.7	1.2	<0.50	<0.50	0.54	<0.50	<0.50
Strontium	mg/kg	-	55	16	26	15	14	71	26	25	39	12
Thallium	mg/kg	-	0.16	<0.10	0.23	<0.10	0.13	0.16	0.24	0.13	0.12	<0.10
Tin	mg/kg	48	<1.0	<1.0	2.1	<1.0	<1.0	<1.0	<1.0	<1.0	3.0	<1.0
Uranium	mg/kg	-	4.0	0.68	3.2	0.38	0.39	2.5	2.9	1.0	1.6	1.0
Vanadium	mg/kg	-	50	34	42	27	36	61	35	46	51	36
Zinc	mg/kg	271	75	69	71	63	70	80	71	70	81	65
Physical Properties												
Particle Size Distribution (Gravel)	%	-	-	-	-	-	0.26	34	9.6	63	30	54
% sand by hydrometer	%	-	-	-	-	-	8.9	44	32	34	54	39
% silt by hydrometer	%	-	-	-	-	-	41	15	36	2.0	6.6	3.8
Clay in soils	%	-	-	-	-	-	50	6.9	23	1.5	8.9	2.8
Gravel in soils	%	-	-	-	-	-	0.26	34	9.6	63	30	54
Silt in soils	%	-	-	-	-	-	41	15	36	2.0	6.6	3.8
Sand in soils	%	-	-	-	-	-	44	32	34	0.10	30	54
Sieve - #200 (>0.075mm)	%	-	66	92	79	100	-	-	-	-	-	-
Moisture Content	%	-	59	9.5	22	23	64	9.0	39	16	64	8.6
General Chemistry												
Fraction Organic Carbon (FOC)	g/g	-	0.022	<0.00050	0.0096	0.0011	<0.00050	0.044	0.0073	0.0068	0.020	0.0010
Total Organic Carbon (TOC)	g/kg	-	22,000,000	<500,000	9,600,000	1,100,000	<500,000	44,000	7,300	6,800	20,000	1,000
Particle Size												
< -1 Phi (2 mm)	%	-	-	-	-	-	100	66#4	90	37#4	70#4	46#4
< 0 Phi (1 mm)	%	-	-	-	-	-	99	57	85	24	56	35
< +1 Phi (0.5 mm)	%	-	-	-	-	-	99	49	79	15	46	25
< +2 Phi (0.25 mm)	%	-	-	-	-	-	98	39	73	8.9	33	16
< +3 Phi (0.12 mm)	%	-	-	-	-	-	97	29	69	5.4	22	9.6
< +4 Phi (0.062 mm)	%	-	-	-	-	-	91	22	59	3.5	16	6.6
< +5 Phi (0.031 mm)	%	-	-	-	-	-	78	17	42	2.8	13	5.4
< +6 Phi (0.016 mm)	%	-	-	-	-	-	67	13	32	2.2	11	4.3
< +7 Phi (0.0078 mm)	%	-	-	-	-	-	55	8.2	25	1.6	9.5	3.2
< +8 Phi (0.0039 mm)	%	-	-	-	-	-	50	6.9	23	1.5	8.9	2.8
< +9 Phi (0.0020 mm)	%	-	-	-	-	-	40	4.5	19	1.1	7.7	2.0

Table 1: Sediment - Analytical Results
Cooper Cove, Port of Argentia, Newfoundland and Labrador

Field ID			BH-9 CC-1A	BH-9 CC-1B	BH-12 CC-1A	BH-12 CC-1B	BH-14 CC-1A	BH-14 CC-1B	BH-17 CC-1A	BH-17 CC-1B	BH-23 CC-1A	BH-23 CC-1B
Depth (m)			0 - 1.0	3.0 - 4.0	0 - 1.0	1.0 - 3.0	0 - 1.0	2.0 - 3.0	0 - 1.0	1.0 - 3.0	0 - 1.0	1.0 - 3.0
Date			11 May 2023	11 May 2023	08 May 2023	08 May 2023	02 May 2023	02 May 2023	03 May 2023	03 May 2023	01 May 2023	01 May 2023
	Unit	Atlantic PIRI Eco Tier I EQS for Sediment - Marine										
BTEX												
Benzene	mg/kg	1.2	<0.0050	<0.0050	<0.0050	<0.0050	<0.010	<0.0050	<0.0050	<0.010	<0.0050	<0.0050
Toluene	mg/kg	1.4	<0.050	<0.050	<0.050	<0.050	<0.10	<0.050	<0.050	<0.10	<0.050	<0.050
Ethylbenzene	mg/kg	1.2	<0.010	<0.010	<0.010	<0.010	<0.020	<0.010	<0.010	<0.020	<0.010	<0.010
Xylene Total	mg/kg	1.3	<0.050	<0.050	<0.050	<0.050	<0.10	<0.050	<0.050	<0.10	<0.050	<0.050
Petroleum Hydrocarbons (PHCs)												
EPH >C10-C16	mg/kg	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
EPH >C16-C21	mg/kg	-	<10	<10	<10	<10	<10	<10	19	<10	<10	<10
EPH >C21-C32	mg/kg	-	44	<15	20	28	72	<15	90	30	60	<15
PHC F1-BTEX (C6-C10-BTEX)	mg/kg	-	<2.5	<2.5	<2.5	<2.5	<5.0	<2.5	<2.5	<5.0	<2.5	<2.5
mTPH (Tier I)	mg/kg	-	44	<15	20	28	72	<15	110	30	60	<15
Reached Baseline at C32	-	-	Yes	-	Yes	Yes	Yes	-	Yes	Yes	Yes	-
Hydrocarbon Resemblance	-	-	PL		PL	PL	PL		PL		PL	
Polycyclic Aromatic Hydrocarbons (PAHs)												
1-Methylnaphthalene	mg/kg	0.201	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
2-Methylnaphthalene	mg/kg	0.201	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Acenaphthene	mg/kg	0.0889	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Acenaphthylene	mg/kg	0.128	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.016	<0.0050
Anthracene	mg/kg	0.245	<0.0050	<0.0050	<0.0050	0.013	0.027	<0.0050	0.0085	<0.0050	0.098	<0.0050
Benz(a)anthracene	mg/kg	0.693	<0.0050	<0.0050	<0.0050	0.014	0.080	<0.0050	0.013	<0.0050	0.58	<0.0050
Benzo(a)pyrene	mg/kg	0.763	<0.0050	<0.0050	0.0064	0.014	0.070	<0.0050	0.020	<0.0050	0.82	<0.0050
Benzo(b)fluoranthene	mg/kg	4.5	<0.0050	<0.0050	0.0068	0.012	0.096	<0.0050	0.023	<0.0050	0.97	<0.0050
Benzo(b+j)fluoranthene	mg/kg	4.5	<0.010	<0.010	<0.010	0.019	0.14	<0.010	0.032	<0.010	1.3	<0.010
Benzo(g,h,i)perylene	mg/kg	0.78	<0.0050	<0.0050	<0.0050	<0.0050	0.025	<0.0050	0.013	<0.0050	0.37	<0.0050
Benzo(j)fluoranthene	mg/kg	4.5	<0.0050	<0.0050	<0.0050	0.0070	0.043	<0.0050	0.0091	<0.0050	0.37	<0.0050
Benzo(k)fluoranthene	mg/kg	4.5	<0.0050	<0.0050	<0.0050	0.0074	0.048	<0.0050	0.011	<0.0050	0.42	<0.0050
Chrysene	mg/kg	0.846	<0.0050	<0.0050	0.0079	0.015	0.099	<0.0050	0.017	<0.0050	0.69	<0.0050
Dibenz(a,h)anthracene	mg/kg	0.135	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.11	<0.0050
Fluorene	mg/kg	0.144	<0.0050	<0.0050	<0.0050	0.0081	<0.0050	<0.0050	<0.0050	<0.0050	0.024	<0.0050
Fluoranthene	mg/kg	1.494	<0.0050	<0.0050	0.0071	0.062	0.019	<0.0050	0.036	<0.0050	0.89	<0.0050
Indeno(1,2,3-c,d)pyrene	mg/kg	0.88	<0.0050	<0.0050	<0.0050	<0.0050	0.024	<0.0050	0.011	<0.0050	0.32	<0.0050
Naphthalene	mg/kg	0.391	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Perylene	mg/kg	-	0.066	<0.0050	<0.0050	<0.0050	0.038	<0.0050	0.011	<0.0050	0.18	<0.0050
Phenanthrene	mg/kg	0.544	<0.0050	<0.0050	0.0068	0.068	0.029	<0.0050	0.036	<0.0050	0.27	<0.0050
Pyrene	mg/kg	1.398	<0.0050	<0.0050	0.017	0.043	0.028	<0.0050	0.031	<0.0050	0.80	<0.0050
Polychlorinated Biphenyls (PCBs)												
Arochlor 1016	mg/kg	-	<0.050	<0.050	<0.050	<0.050	<0.030	<0.010	<0.020	<0.010	<0.030	<0.010
Arochlor 1221	mg/kg	-	<0.050	<0.050	<0.050	<0.050	<0.030	<0.010	<0.020	<0.010	<0.030	<0.010
Arochlor 1232	mg/kg	-	<0.050	<0.050	<0.050	<0.050	<0.030	<0.010	<0.020	<0.010	<0.030	<0.010
Arochlor 1242	mg/kg	-	<0.050	<0.050	<0.050	<0.050	<0.030	<0.010	<0.020	<0.010	<0.030	<0.010
Arochlor 1248	mg/kg	-	<0.050	<0.050	<0.050	<0.050	<0.030	<0.010	<0.020	<0.010	<0.030	<0.010
Arochlor 1254	mg/kg	-	<0.050	<0.050	<0.050	<0.050	<0.030	<0.010	<0.020	<0.010	<0.030	<0.010
Arochlor 1260	mg/kg	-	<0.050	<0.050	<0.050	<0.050	<0.030	<0.010	<0.020	<0.010	<0.030	<0.010
PCBs (Sum of total)	mg/kg	0.189	<0.050	<0.050	<0.050	<0.050	<0.030	<0.010	<0.020	<0.010	<0.030	<0.010

Comments
'G' denotes concentration resembles gasoline — 'W' denotes weathered resemblance
'F' denotes concentration resembles fuel oil — 'F/D' denotes Field Duplicate
'L' denotes concentration resembles lube oil — 'L/D" denotes Laboratory Duplicate
PL' denotes concentration resembles possible lube oil fraction.
'OP' denotes one product — '---' denotes parameter not analyzed
Environmental Standards
Atlantic RBCA, July 2021 (updated July 2022), Atlantic PIRI Eco Tier I EQS for Sediment - Marine
#1 Detection Limit were adjusted due to high moisture content
#4 PSA sample observation comment: Fraction contained rocks.

Appendix C

Laboratory Certificates of Analysis

Your C.O.C. #: N/A

Attention: Michelle Roche

Dillon Consulting Limited
45 Hebron Way
Suite 202
St John's, NL
CANADA A1A 0P9

Report Date: 2023/05/19
Report #: R7635729
Version: 2 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3C7715
Received: 2023/05/05, 09:28

Sample Matrix: Sand
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Benzo(b/j)fluoranthene Sum (LL soil)	6	N/A	2023/05/15	N/A	Auto Calc.
Hexavalent Chromium in Soil by IC (1, 2)	6	2023/05/11	2023/05/12	CAM SOP-00436	EPA 3060A/7199 m
TEH in Soil (PIRI) (2)	2	2023/05/10	2023/05/10	ATL SOP 00111	Atl. RBCA v3.1 m
TEH in Soil (PIRI) (2)	3	2023/05/10	2023/05/11	ATL SOP 00111	Atl. RBCA v3.1 m
TEH in Soil (PIRI) (2)	1	2023/05/10	2023/05/12	ATL SOP 00111	Atl. RBCA v3.1 m
Fraction Organic Carbon in Soil	6	N/A	2023/05/11	ATL SOP 00044	LECO203601224 1991m
Metals Solids Acid Extr. ICPMS	6	2023/05/11	2023/05/11	ATL SOP 00058	EPA 6020B R2 m
Moisture	6	N/A	2023/05/10	ATL SOP 00001	OMOE Handbook 1983 m
PAH in sediment by GC/MS (Low Level) (2)	6	2023/05/11	2023/05/12	ATL SOP 00102	EPA 8270E R6 m
Polychlorinated Biphenyl in Soil (1)	6	2023/05/11	2023/05/12	CAM SOP-00309	EPA 8082A m
Particle size in solids (pipette&sieve) (3)	6	N/A	2023/05/16	ATL SOP 00012	MSAMS'78/WREP-125R3m
Total Organic Carbon in Soil	6	2023/05/10	2023/05/11	ATL SOP 00044	LECO203601224 1991 m
ModTPH (T1) Calc. for Soil	6	N/A	2023/05/12	N/A	Atl. RBCA v3.1 m
VPH in Soil (PIRI) - Field Preserved (4)	6	N/A	2023/05/11	ATL SOP 00119	Atl. RBCA v3.1 m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope

Bureau Veritas 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.bvna.com

Your C.O.C. #: N/A

Attention: Michelle Roche

Dillon Consulting Limited
45 Hebron Way
Suite 202
St John's, NL
CANADA A1A 0P9

Report Date: 2023/05/19
Report #: R7635729
Version: 2 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3C7715
Received: 2023/05/05, 09:28

dilution methods.

Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Bureau Veritas Mississauga, 6740 Campobello Rd , Mississauga, ON, L5N 2L8
(2) Soils are reported on a dry weight basis unless otherwise specified.
(3) Note: Graphical representation of larger fractions (PHI-4, PHI -3 and PHI -2) not applicable unless these optional parameters are specifically requested.
(4) No lab extraction date is given for C6-C10/BTEX and VOC samples that are field preserved with methanol. Extraction date is date sampled unless otherwise stated.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:
Preeti Kapadia, Project Manager
Email: Preeti.Kapadia@bureauveritas.com
Phone# (902)420-0203 Ext:252

==

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Suzanne Rogers, General Manager responsible for Nova Scotia Environmental laboratory operations.

RBCA HYDROCARBONS IN SOIL (FIELD PRES.)

Bureau Veritas ID		VSR628	VSR629			VSR629		
Sampling Date		2023/05/01 13:00	2023/05/01 13:00			2023/05/01 13:00		
COC Number		N/A	N/A			N/A		
	UNITS	**BH-23 CC-1A (0-1.0M)**	**BH-23 CC-1B (1-3.0M)**	**RDL**	**QC Batch**	**BH-23 CC-1B (1-3.0M) Lab-Dup**	**RDL**	**QC Batch**
Petroleum Hydrocarbons								
Benzene	mg/kg	<0.0050	<0.0050	0.0050	8655893	<0.0050	0.0050	8655893
Toluene	mg/kg	<0.050	<0.050	0.050	8655893	<0.050	0.050	8655893
Ethylbenzene	mg/kg	<0.010	<0.010	0.010	8655893	<0.010	0.010	8655893
Total Xylenes	mg/kg	<0.050	<0.050	0.050	8655893	<0.050	0.050	8655893
C6 - C10 (less BTEX)	mg/kg	<2.5	<2.5	2.5	8655893	<2.5	2.5	8655893
>C10-C16 Hydrocarbons	mg/kg	<10	<10	10	8656292			
>C16-C21 Hydrocarbons	mg/kg	<10	<10	10	8656292			
>C21-<C32 Hydrocarbons	mg/kg	60	<15	15	8656292			
Modified TPH (Tier1)	mg/kg	60	<15	15	8653539			
Reached Baseline at C32	mg/kg	Yes	NA	N/A	8656292			
Hydrocarbon Resemblance	mg/kg	COMMENT (1)	NA	N/A	8656292			
Surrogate Recovery (%)								
Isobutylbenzene - Extractable	%	113	91		8656292			
n-Dotriacontane - Extractable	%	106	80		8656292			
Isobutylbenzene - Volatile	%	118	124		8655893	122		8655893

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Possible lube oil fraction.

RBCA HYDROCARBONS IN SOIL (FIELD PRES.)

Bureau Veritas ID		VSR630		VSR631	VSR632		
Sampling Date		2023/05/01 10:00		2023/05/01 10:00	2023/05/01 10:10		
COC Number		N/A		N/A	N/A		
	UNITS	**BH-14 CC-1A (0-1.0M)**	**RDL**	**BH-14 CC-1B (2.0-3.0M)**	**BH-17 CC-1A (0-1.0M)**	**RDL**	**QC Batch**
Petroleum Hydrocarbons							
Benzene	mg/kg	<0.010	0.010	<0.0050	<0.0050	0.0050	8655893
Toluene	mg/kg	<0.10	0.10	<0.050	<0.050	0.050	8655893
Ethylbenzene	mg/kg	<0.020	0.020	<0.010	<0.010	0.010	8655893
Total Xylenes	mg/kg	<0.10	0.10	<0.050	<0.050	0.050	8655893
C6 - C10 (less BTEX)	mg/kg	<5.0	5.0	<2.5	<2.5	2.5	8655893
>C10-C16 Hydrocarbons	mg/kg	<10	10	<10	<10	10	8656292
>C16-C21 Hydrocarbons	mg/kg	<10	10	<10	19	10	8656292
>C21-<C32 Hydrocarbons	mg/kg	72	15	<15	90	15	8656292
Modified TPH (Tier1)	mg/kg	72	15	<15	110	15	8653539
Reached Baseline at C32	mg/kg	Yes	N/A	NA	Yes	N/A	8656292
Hydrocarbon Resemblance	mg/kg	COMMENT (1)	N/A	NA	COMMENT (1)	N/A	8656292
Surrogate Recovery (%)							
Isobutylbenzene - Extractable	%	103		92	102		8656292
n-Dotriacontane - Extractable	%	98		86	110		8656292
Isobutylbenzene - Volatile	%	112 (2)		106	115		8655893

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Possible lube oil fraction.
(2) Elevated VPH RDL(s) due to limited sample.

Bureau Veritas 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.bvna.com

RBCA HYDROCARBONS IN SOIL (FIELD PRES.)

Bureau Veritas ID		VSR633		
Sampling Date		2023/05/01 10:10		
COC Number		N/A		
	UNITS	**BH-17 CC-1B (1-3.0M)**	**RDL**	**QC Batch**
Petroleum Hydrocarbons				
Benzene	mg/kg	<0.010	0.010	8655893
Toluene	mg/kg	<0.10	0.10	8655893
Ethylbenzene	mg/kg	<0.020	0.020	8655893
Total Xylenes	mg/kg	<0.10	0.10	8655893
C6 - C10 (less BTEX)	mg/kg	<5.0	5.0	8655893
>C10-C16 Hydrocarbons	mg/kg	<10	10	8656292
>C16-C21 Hydrocarbons	mg/kg	<10	10	8656292
>C21-<C32 Hydrocarbons	mg/kg	30	15	8656292
Modified TPH (Tier1)	mg/kg	30	15	8653539
Reached Baseline at C32	mg/kg	Yes	N/A	8656292
Hydrocarbon Resemblance	mg/kg	COMMENT (1)	N/A	8656292
Surrogate Recovery (%)				
Isobutylbenzene - Extractable	%	106		8656292
n-Dotriacontane - Extractable	%	119		8656292
Isobutylbenzene - Volatile	%	119 (2)		8655893

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Possible lube oil fraction.
(2) Elevated VPH RDL(s) due to limited sample.

LOW LEVEL PCBS IN SEDIMENT (SAND)

Bureau Veritas ID		VSR628		VSR629		VSR630		
Sampling Date		2023/05/01 13:00		2023/05/01 13:00		2023/05/01 10:00		
COC Number		N/A		N/A		N/A		
	UNITS	**BH-23 CC-1A (0-1.0M)**	**RDL**	**BH-23 CC-1B (1-3.0M)**	**RDL**	**BH-14 CC-1A (0-1.0M)**	**RDL**	**QC Batch**
PCBs								
Aroclor 1016	ug/g	<0.030	0.030	<0.010	0.010	<0.030	0.030	8660682
Aroclor 1221	ug/g	<0.030	0.030	<0.010	0.010	<0.030	0.030	8660682
Aroclor 1232	ug/g	<0.030	0.030	<0.010	0.010	<0.030	0.030	8660682
Aroclor 1242	ug/g	<0.030	0.030	<0.010	0.010	<0.030	0.030	8660682
Aroclor 1248	ug/g	<0.030	0.030	<0.010	0.010	<0.030	0.030	8660682
Aroclor 1254	ug/g	<0.030	0.030	<0.010	0.010	<0.030	0.030	8660682
Aroclor 1260	ug/g	<0.030	0.030	<0.010	0.010	<0.030	0.030	8660682
Total PCB	ug/g	<0.030	0.030	<0.010	0.010	<0.030	0.030	8660682
Surrogate Recovery (%)								
Decachlorobiphenyl	%	88		88		96		8660682

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Bureau Veritas ID		VSR631		VSR632		VSR633		
Sampling Date		2023/05/01 10:00		2023/05/01 10:10		2023/05/01 10:10		
COC Number		N/A		N/A		N/A		
	UNITS	**BH-14 CC-1B (2.0-3.0M)**	**RDL**	**BH-17 CC-1A (0-1.0M)**	**RDL**	**BH-17 CC-1B (1-3.0M)**	**RDL**	**QC Batch**
PCBs								
Aroclor 1016	ug/g	<0.010	0.010	<0.020	0.020	<0.010	0.010	8660682
Aroclor 1221	ug/g	<0.010	0.010	<0.020	0.020	<0.010	0.010	8660682
Aroclor 1232	ug/g	<0.010	0.010	<0.020	0.020	<0.010	0.010	8660682
Aroclor 1242	ug/g	<0.010	0.010	<0.020	0.020	<0.010	0.010	8660682
Aroclor 1248	ug/g	<0.010	0.010	<0.020	0.020	<0.010	0.010	8660682
Aroclor 1254	ug/g	<0.010	0.010	<0.020	0.020	<0.010	0.010	8660682
Aroclor 1260	ug/g	<0.010	0.010	<0.020	0.020	<0.010	0.010	8660682
Total PCB	ug/g	<0.010	0.010	<0.020	0.020	<0.010	0.010	8660682
Surrogate Recovery (%)								
Decachlorobiphenyl	%	76		87		82		8660682

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Bureau Veritas 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.bvna.com

LOW LEVEL PCBS IN SEDIMENT (SAND)

Bureau Veritas ID		VSR633		
Sampling Date		2023/05/01 10:10		
COC Number		N/A		
	UNITS	BH-17 CC-1B (1-3.0M) Lab-Dup	RDL	QC Batch
PCBs				
Aroclor 1016	ug/g	<0.010	0.010	8660682
Aroclor 1221	ug/g	<0.010	0.010	8660682
Aroclor 1232	ug/g	<0.010	0.010	8660682
Aroclor 1242	ug/g	<0.010	0.010	8660682
Aroclor 1248	ug/g	<0.010	0.010	8660682
Aroclor 1254	ug/g	<0.010	0.010	8660682
Aroclor 1260	ug/g	<0.010	0.010	8660682
Total PCB	ug/g	<0.010	0.010	8660682
Surrogate Recovery (%)				
Decachlorobiphenyl	%	82		8660682

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Bureau Veritas 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.bvna.com

RESULTS OF ANALYSES OF SAND

Bureau Veritas ID		VSR628			VSR628		
Sampling Date		2023/05/01 13:00			2023/05/01 13:00		
COC Number		N/A			N/A		
	UNITS	**BH-23 CC-1A (0-1.0M)**	**RDL**	**QC Batch**	**BH-23 CC-1A (0-1.0M) Lab-Dup**	**RDL**	**QC Batch**
Inorganics							
Fraction of Organic Carbon	g/g	0.020	0.00050	8653851			
Moisture	%	64	1.0	8653899			
Organic Carbon (TOC)	g/kg	20	0.50	8656733	21	0.50	8656733
< -1 Phi (2 mm)	%	70 (1)	0.10	8655998	55 (2)	0.10	8655998
< 0 Phi (1 mm)	%	56	0.10	8655998	46	0.10	8655998
< +1 Phi (0.5 mm)	%	46	0.10	8655998	38	0.10	8655998
< +2 Phi (0.25 mm)	%	33	0.10	8655998	29	0.10	8655998
< +3 Phi (0.12 mm)	%	22	0.10	8655998	19	0.10	8655998
< +4 Phi (0.062 mm)	%	16	0.10	8655998	14	0.10	8655998
< +5 Phi (0.031 mm)	%	13	0.10	8655998	11	0.10	8655998
< +6 Phi (0.016 mm)	%	11	0.10	8655998	9.5	0.10	8655998
< +7 Phi (0.0078 mm)	%	9.5	0.10	8655998	8.0	0.10	8655998
< +8 Phi (0.0039 mm)	%	8.9	0.10	8655998	7.4	0.10	8655998
< +9 Phi (0.0020 mm)	%	7.7	0.10	8655998	6.3	0.10	8655998
Gravel	%	30	0.10	8655998	45 (3)	0.10	8655998
Sand	%	54	0.10	8655998	41	0.10	8655998
Silt	%	6.6	0.10	8655998	6.6	0.10	8655998
Clay	%	8.9	0.10	8655998	7.4	0.10	8655998

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
(1) PSA sample observation comment: Fraction contained rocks.
(2) PSA sample observation comment: Fraction contained rocks & one large rock.
(3) Poor RPD due to sample inhomogeneity.

Bureau Veritas 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.bvna.com

RESULTS OF ANALYSES OF SAND

Bureau Veritas ID		VSR629	VSR630	VSR631		
Sampling Date		2023/05/01 13:00	2023/05/01 10:00	2023/05/01 10:00		
COC Number		N/A	N/A	N/A		
	UNITS	**BH-23 CC-1B (1-3.0M)**	**BH-14 CC-1A (0-1.0M)**	**BH-14 CC-1B (2.0-3.0M)**	**RDL**	**QC Batch**
Inorganics						
Fraction of Organic Carbon	g/g	0.0010	<0.00050	0.044	0.00050	8653851
Moisture	%	8.6	64	9.0	1.0	8653899
Organic Carbon (TOC)	g/kg	1.0	<0.50	44	0.50	8656733
< -1 Phi (2 mm)	%	46 (1)	100	66 (1)	0.10	8655998
< 0 Phi (1 mm)	%	35	99	57	0.10	8655998
< +1 Phi (0.5 mm)	%	25	99	49	0.10	8655998
< +2 Phi (0.25 mm)	%	16	98	39	0.10	8655998
< +3 Phi (0.12 mm)	%	9.6	97	29	0.10	8655998
< +4 Phi (0.062 mm)	%	6.6	91	22	0.10	8655998
< +5 Phi (0.031 mm)	%	5.4	78	17	0.10	8655998
< +6 Phi (0.016 mm)	%	4.3	67	13	0.10	8655998
< +7 Phi (0.0078 mm)	%	3.2	55	8.2	0.10	8655998
< +8 Phi (0.0039 mm)	%	2.8	50	6.9	0.10	8655998
< +9 Phi (0.0020 mm)	%	2.0	40	4.5	0.10	8655998
Gravel	%	54	0.26	34	0.10	8655998
Sand	%	39	8.9	44	0.10	8655998
Silt	%	3.8	41	15	0.10	8655998
Clay	%	2.8	50	6.9	0.10	8655998

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) PSA sample observation comment: Fraction contained rocks.

Bureau Veritas 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.bvna.com

RESULTS OF ANALYSES OF SAND

Bureau Veritas ID		VSR632	VSR633		
Sampling Date		2023/05/01 10:10	2023/05/01 10:10		
COC Number		N/A	N/A		
	UNITS	**BH-17 CC-1A (0-1.0M)**	**BH-17 CC-1B (1-3.0M)**	**RDL**	**QC Batch**
Inorganics					
Fraction of Organic Carbon	g/g	0.0073	0.0068	0.00050	8653851
Moisture	%	39	16	1.0	8653899
Organic Carbon (TOC)	g/kg	7.3	6.8	0.50	8656733
< -1 Phi (2 mm)	%	90	37 (1)	0.10	8655998
< 0 Phi (1 mm)	%	85	24	0.10	8655998
< +1 Phi (0.5 mm)	%	79	15	0.10	8655998
< +2 Phi (0.25 mm)	%	73	8.9	0.10	8655998
< +3 Phi (0.12 mm)	%	69	5.4	0.10	8655998
< +4 Phi (0.062 mm)	%	59	3.5	0.10	8655998
< +5 Phi (0.031 mm)	%	42	2.8	0.10	8655998
< +6 Phi (0.016 mm)	%	32	2.2	0.10	8655998
< +7 Phi (0.0078 mm)	%	25	1.6	0.10	8655998
< +8 Phi (0.0039 mm)	%	23	1.5	0.10	8655998
< +9 Phi (0.0020 mm)	%	19	1.1	0.10	8655998
Gravel	%	9.6	63	0.10	8655998
Sand	%	32	34	0.10	8655998
Silt	%	36	2.0	0.10	8655998
Clay	%	23	1.5	0.10	8655998

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) PSA sample observation comment: Fraction contained rocks.

Bureau Veritas 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.bvna.com

ELEMENTS BY ATOMIC SPECTROSCOPY (SAND)

Bureau Veritas ID		VSR628		VSR629		VSR630		
Sampling Date		2023/05/01 13:00		2023/05/01 13:00		2023/05/01 10:00		
COC Number		N/A		N/A		N/A		
	UNITS	**BH-23 CC-1A (0-1.0M)**	**RDL**	**BH-23 CC-1B (1-3.0M)**	**RDL**	**BH-14 CC-1A (0-1.0M)**	**RDL**	**QC Batch**
Inorganics								
Chromium (VI)	ug/g	<0.54 (1)	0.54	<0.18	0.18	<0.54 (1)	0.54	8659819
Metals								
Acid Extractable Aluminum (Al)	mg/kg	12000	10	11000	10	11000	10	8658314
Acid Extractable Antimony (Sb)	mg/kg	<2.0	2.0	<2.0	2.0	<2.0	2.0	8658314
Acid Extractable Arsenic (As)	mg/kg	12	2.0	5.8	2.0	5.0	2.0	8658314
Acid Extractable Barium (Ba)	mg/kg	54	5.0	8.7	5.0	16	5.0	8658314
Acid Extractable Beryllium (Be)	mg/kg	<1.0	1.0	<1.0	1.0	<1.0	1.0	8658314
Acid Extractable Bismuth (Bi)	mg/kg	<2.0	2.0	<2.0	2.0	<2.0	2.0	8658314
Acid Extractable Boron (B)	mg/kg	<50	50	<50	50	<50	50	8658314
Acid Extractable Cadmium (Cd)	mg/kg	<0.30	0.30	<0.30	0.30	2.0	0.30	8658314
Acid Extractable Chromium (Cr)	mg/kg	28	2.0	26	2.0	24	2.0	8658314
Acid Extractable Cobalt (Co)	mg/kg	11	1.0	11	1.0	11	1.0	8658314
Acid Extractable Copper (Cu)	mg/kg	32	2.0	14	2.0	13	2.0	8658314
Acid Extractable Iron (Fe)	mg/kg	27000	50	24000	50	28000	50	8658314
Acid Extractable Lead (Pb)	mg/kg	33	0.50	9.6	0.50	14	0.50	8658314
Acid Extractable Lithium (Li)	mg/kg	20	2.0	18	2.0	18	2.0	8658314
Acid Extractable Manganese (Mn)	mg/kg	600	2.0	600	2.0	580	2.0	8658314
Acid Extractable Mercury (Hg)	mg/kg	0.17	0.10	<0.10	0.10	<0.10	0.10	8658314
Acid Extractable Molybdenum (Mo)	mg/kg	4.5	2.0	3.0	2.0	<2.0	2.0	8658314
Acid Extractable Nickel (Ni)	mg/kg	23	2.0	20	2.0	19	2.0	8658314
Acid Extractable Rubidium (Rb)	mg/kg	3.2	2.0	<2.0	2.0	<2.0	2.0	8658314
Acid Extractable Selenium (Se)	mg/kg	0.62	0.50	<0.50	0.50	<0.50	0.50	8658314
Acid Extractable Silver (Ag)	mg/kg	<0.50	0.50	<0.50	0.50	1.2	0.50	8658314
Acid Extractable Strontium (Sr)	mg/kg	39	5.0	12	5.0	14	5.0	8658314
Acid Extractable Thallium (Tl)	mg/kg	0.12	0.10	<0.10	0.10	0.13	0.10	8658314
Acid Extractable Tin (Sn)	mg/kg	3.0	1.0	<1.0	1.0	<1.0	1.0	8658314
Acid Extractable Uranium (U)	mg/kg	1.6	0.10	1.0	0.10	0.39	0.10	8658314
Acid Extractable Vanadium (V)	mg/kg	51	2.0	36	2.0	36	2.0	8658314
Acid Extractable Zinc (Zn)	mg/kg	81	5.0	65	5.0	70	5.0	8658314

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

(1) Detection Limit were adjusted due to high moisture content

Bureau Veritas 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.bvna.com

ELEMENTS BY ATOMIC SPECTROSCOPY (SAND)

Bureau Veritas ID		VSR630			VSR631		
Sampling Date		2023/05/01 10:00			2023/05/01 10:00		
COC Number		N/A			N/A		
	UNITS	**BH-14 CC-1A (0-1.0M) Lab-Dup**	**RDL**	**QC Batch**	**BH-14 CC-1B (2.0-3.0M)**	**RDL**	**QC Batch**
Inorganics							
Chromium (VI)	ug/g	<0.54 (1)	0.54	8659819	<0.18	0.18	8659819
Metals							
Acid Extractable Aluminum (Al)	mg/kg				14000	10	8658314
Acid Extractable Antimony (Sb)	mg/kg				<2.0	2.0	8658314
Acid Extractable Arsenic (As)	mg/kg				16	2.0	8658314
Acid Extractable Barium (Ba)	mg/kg				63	5.0	8658314
Acid Extractable Beryllium (Be)	mg/kg				<1.0	1.0	8658314
Acid Extractable Bismuth (Bi)	mg/kg				<2.0	2.0	8658314
Acid Extractable Boron (B)	mg/kg				92	50	8658314
Acid Extractable Cadmium (Cd)	mg/kg				0.82	0.30	8658314
Acid Extractable Chromium (Cr)	mg/kg				36	2.0	8658314
Acid Extractable Cobalt (Co)	mg/kg				10	1.0	8658314
Acid Extractable Copper (Cu)	mg/kg				28	2.0	8658314
Acid Extractable Iron (Fe)	mg/kg				37000	50	8658314
Acid Extractable Lead (Pb)	mg/kg				13	0.50	8658314
Acid Extractable Lithium (Li)	mg/kg				23	2.0	8658314
Acid Extractable Manganese (Mn)	mg/kg				620	2.0	8658314
Acid Extractable Mercury (Hg)	mg/kg				<0.10	0.10	8658314
Acid Extractable Molybdenum (Mo)	mg/kg				9.1	2.0	8658314
Acid Extractable Nickel (Ni)	mg/kg				29	2.0	8658314
Acid Extractable Rubidium (Rb)	mg/kg				5.7	2.0	8658314
Acid Extractable Selenium (Se)	mg/kg				1.8	0.50	8658314
Acid Extractable Silver (Ag)	mg/kg				<0.50	0.50	8658314
Acid Extractable Strontium (Sr)	mg/kg				71	5.0	8658314
Acid Extractable Thallium (Tl)	mg/kg				0.16	0.10	8658314
Acid Extractable Tin (Sn)	mg/kg				<1.0	1.0	8658314
Acid Extractable Uranium (U)	mg/kg				2.5	0.10	8658314
Acid Extractable Vanadium (V)	mg/kg				61	2.0	8658314
Acid Extractable Zinc (Zn)	mg/kg				80	5.0	8658314

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
(1) Detection Limit were adjusted due to high moisture content

Bureau Veritas 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.bvna.com

ELEMENTS BY ATOMIC SPECTROSCOPY (SAND)

Bureau Veritas ID		VSR632		VSR633		
Sampling Date		2023/05/01 10:10		2023/05/01 10:10		
COC Number		N/A		N/A		
	UNITS	**BH-17 CC-1A (0-1.0M)**	RDL	**BH-17 CC-1B (1-3.0M)**	RDL	QC Batch
Inorganics						
Chromium (VI)	ug/g	<0.36 (1)	0.36	<0.18	0.18	8659819
Metals						
Acid Extractable Aluminum (Al)	mg/kg	11000	10	12000	10	8658314
Acid Extractable Antimony (Sb)	mg/kg	<2.0	2.0	<2.0	2.0	8658314
Acid Extractable Arsenic (As)	mg/kg	8.6	2.0	4.7	2.0	8658314
Acid Extractable Barium (Ba)	mg/kg	23	5.0	24	5.0	8658314
Acid Extractable Beryllium (Be)	mg/kg	<1.0	1.0	<1.0	1.0	8658314
Acid Extractable Bismuth (Bi)	mg/kg	<2.0	2.0	<2.0	2.0	8658314
Acid Extractable Boron (B)	mg/kg	<50	50	<50	50	8658314
Acid Extractable Cadmium (Cd)	mg/kg	<0.30	0.30	<0.30	0.30	8658314
Acid Extractable Chromium (Cr)	mg/kg	28	2.0	32	2.0	8658314
Acid Extractable Cobalt (Co)	mg/kg	10	1.0	10	1.0	8658314
Acid Extractable Copper (Cu)	mg/kg	15	2.0	24	2.0	8658314
Acid Extractable Iron (Fe)	mg/kg	28000	50	30000	50	8658314
Acid Extractable Lead (Pb)	mg/kg	7.0	0.50	18	0.50	8658314
Acid Extractable Lithium (Li)	mg/kg	19	2.0	23	2.0	8658314
Acid Extractable Manganese (Mn)	mg/kg	590	2.0	570	2.0	8658314
Acid Extractable Mercury (Hg)	mg/kg	<0.10	0.10	<0.10	0.10	8658314
Acid Extractable Molybdenum (Mo)	mg/kg	7.5	2.0	6.0	2.0	8658314
Acid Extractable Nickel (Ni)	mg/kg	21	2.0	23	2.0	8658314
Acid Extractable Rubidium (Rb)	mg/kg	2.4	2.0	6.4	2.0	8658314
Acid Extractable Selenium (Se)	mg/kg	0.52	0.50	<0.50	0.50	8658314
Acid Extractable Silver (Ag)	mg/kg	<0.50	0.50	0.54	0.50	8658314
Acid Extractable Strontium (Sr)	mg/kg	26	5.0	25	5.0	8658314
Acid Extractable Thallium (Tl)	mg/kg	0.24	0.10	0.13	0.10	8658314
Acid Extractable Tin (Sn)	mg/kg	<1.0	1.0	<1.0	1.0	8658314
Acid Extractable Uranium (U)	mg/kg	2.9	0.10	1.0	0.10	8658314
Acid Extractable Vanadium (V)	mg/kg	35	2.0	46	2.0	8658314
Acid Extractable Zinc (Zn)	mg/kg	71	5.0	70	5.0	8658314

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) Detection Limit were adjusted due to high moisture content

SEMI-VOLATILE ORGANICS BY GC-MS (SAND)

Bureau Veritas ID		VSR628	VSR629	VSR630	VSR631		
Sampling Date		2023/05/01 13:00	2023/05/01 13:00	2023/05/01 10:00	2023/05/01 10:00		
COC Number		N/A	N/A	N/A	N/A		
	UNITS	**BH-23 CC-1A (0-1.0M)**	**BH-23 CC-1B (1-3.0M)**	**BH-14 CC-1A (0-1.0M)**	**BH-14 CC-1B (2.0-3.0M)**	**RDL**	**QC Batch**
Polyaromatic Hydrocarbons							
1-Methylnaphthalene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	8658528
2-Methylnaphthalene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	8658528
Acenaphthene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	8658528
Acenaphthylene	mg/kg	0.016	<0.0050	<0.0050	<0.0050	0.0050	8658528
Anthracene	mg/kg	0.098	<0.0050	0.027	<0.0050	0.0050	8658528
Benzo(a)anthracene	mg/kg	0.58	<0.0050	0.080	<0.0050	0.0050	8658528
Benzo(a)pyrene	mg/kg	0.82	<0.0050	0.070	<0.0050	0.0050	8658528
Benzo(b)fluoranthene	mg/kg	0.97	<0.0050	0.096	<0.0050	0.0050	8658528
Benzo(b/j)fluoranthene	mg/kg	1.3	<0.010	0.14	<0.010	0.010	8653850
Benzo(g,h,i)perylene	mg/kg	0.37	<0.0050	0.025	<0.0050	0.0050	8658528
Benzo(j)fluoranthene	mg/kg	0.37	<0.0050	0.043	<0.0050	0.0050	8658528
Benzo(k)fluoranthene	mg/kg	0.42	<0.0050	0.048	<0.0050	0.0050	8658528
Chrysene	mg/kg	0.69	<0.0050	0.099	<0.0050	0.0050	8658528
Dibenzo(a,h)anthracene	mg/kg	0.11	<0.0050	<0.0050	<0.0050	0.0050	8658528
Fluoranthene	mg/kg	0.89	<0.0050	0.019	<0.0050	0.0050	8658528
Fluorene	mg/kg	0.024	<0.0050	<0.0050	<0.0050	0.0050	8658528
Indeno(1,2,3-cd)pyrene	mg/kg	0.32	<0.0050	0.024	<0.0050	0.0050	8658528
Naphthalene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	8658528
Perylene	mg/kg	0.18	<0.0050	0.038	<0.0050	0.0050	8658528
Phenanthrene	mg/kg	0.27	<0.0050	0.029	<0.0050	0.0050	8658528
Pyrene	mg/kg	0.80	<0.0050	0.028	<0.0050	0.0050	8658528
Surrogate Recovery (%)							
D10-Anthracene	%	92	91	90	90		8658528
D14-Terphenyl	%	99	92	93	94		8658528
D8-Acenaphthylene	%	85	93	84	93		8658528

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Bureau Veritas 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.bvna.com

SEMI-VOLATILE ORGANICS BY GC-MS (SAND)

Bureau Veritas ID		VSR632			VSR632		
Sampling Date		2023/05/01 10:10			2023/05/01 10:10		
COC Number		N/A			N/A		
	UNITS	BH-17 CC-1A (0-1.0M)	RDL	QC Batch	BH-17 CC-1A (0-1.0M) Lab-Dup	RDL	QC Batch
Polyaromatic Hydrocarbons							
1-Methylnaphthalene	mg/kg	<0.0050	0.0050	8658528	<0.0050	0.0050	8658528
2-Methylnaphthalene	mg/kg	<0.0050	0.0050	8658528	<0.0050	0.0050	8658528
Acenaphthene	mg/kg	<0.0050	0.0050	8658528	<0.0050	0.0050	8658528
Acenaphthylene	mg/kg	<0.0050	0.0050	8658528	<0.0050	0.0050	8658528
Anthracene	mg/kg	0.0085	0.0050	8658528	<0.0050	0.0050	8658528
Benzo(a)anthracene	mg/kg	0.013	0.0050	8658528	<0.0050	0.0050	8658528
Benzo(a)pyrene	mg/kg	0.020	0.0050	8658528	<0.0050 (1)	0.0050	8658528
Benzo(b)fluoranthene	mg/kg	0.023	0.0050	8658528	0.0096 (1)	0.0050	8658528
Benzo(b/j)fluoranthene	mg/kg	0.032	0.010	8653850			
Benzo(g,h,i)perylene	mg/kg	0.013	0.0050	8658528	<0.0050	0.0050	8658528
Benzo(j)fluoranthene	mg/kg	0.0091	0.0050	8658528	<0.0050	0.0050	8658528
Benzo(k)fluoranthene	mg/kg	0.011	0.0050	8658528	<0.0050	0.0050	8658528
Chrysene	mg/kg	0.017	0.0050	8658528	0.010	0.0050	8658528
Dibenzo(a,h)anthracene	mg/kg	<0.0050	0.0050	8658528	<0.0050	0.0050	8658528
Fluoranthene	mg/kg	0.036	0.0050	8658528	<0.0050 (1)	0.0050	8658528
Fluorene	mg/kg	<0.0050	0.0050	8658528	<0.0050	0.0050	8658528
Indeno(1,2,3-cd)pyrene	mg/kg	0.011	0.0050	8658528	<0.0050	0.0050	8658528
Naphthalene	mg/kg	<0.0050	0.0050	8658528	<0.0050	0.0050	8658528
Perylene	mg/kg	0.011	0.0050	8658528	<0.0050	0.0050	8658528
Phenanthrene	mg/kg	0.036	0.0050	8658528	<0.0050 (1)	0.0050	8658528
Pyrene	mg/kg	0.031	0.0050	8658528	0.010 (1)	0.0050	8658528
Surrogate Recovery (%)							
D10-Anthracene	%	87		8658528	89		8658528
D14-Terphenyl	%	92		8658528	91		8658528
D8-Acenaphthylene	%	84		8658528	88		8658528

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
(1) Duplicate: results are outside acceptance limit. Analysis was repeated with similar results.

SEMI-VOLATILE ORGANICS BY GC-MS (SAND)

Bureau Veritas ID		VSR633		
Sampling Date		2023/05/01 10:10		
COC Number		N/A		
	UNITS	BH-17 CC-1B (1-3.0M)	RDL	QC Batch
Polyaromatic Hydrocarbons				
1-Methylnaphthalene	mg/kg	<0.0050	0.0050	8658528
2-Methylnaphthalene	mg/kg	<0.0050	0.0050	8658528
Acenaphthene	mg/kg	<0.0050	0.0050	8658528
Acenaphthylene	mg/kg	<0.0050	0.0050	8658528
Anthracene	mg/kg	<0.0050	0.0050	8658528
Benzo(a)anthracene	mg/kg	<0.0050	0.0050	8658528
Benzo(a)pyrene	mg/kg	<0.0050	0.0050	8658528
Benzo(b)fluoranthene	mg/kg	<0.0050	0.0050	8658528
Benzo(b/j)fluoranthene	mg/kg	<0.010	0.010	8653850
Benzo(g,h,i)perylene	mg/kg	<0.0050	0.0050	8658528
Benzo(j)fluoranthene	mg/kg	<0.0050	0.0050	8658528
Benzo(k)fluoranthene	mg/kg	<0.0050	0.0050	8658528
Chrysene	mg/kg	<0.0050	0.0050	8658528
Dibenzo(a,h)anthracene	mg/kg	<0.0050	0.0050	8658528
Fluoranthene	mg/kg	<0.0050	0.0050	8658528
Fluorene	mg/kg	<0.0050	0.0050	8658528
Indeno(1,2,3-cd)pyrene	mg/kg	<0.0050	0.0050	8658528
Naphthalene	mg/kg	<0.0050	0.0050	8658528
Perylene	mg/kg	<0.0050	0.0050	8658528
Phenanthrene	mg/kg	<0.0050	0.0050	8658528
Pyrene	mg/kg	<0.0050	0.0050	8658528
Surrogate Recovery (%)				
D10-Anthracene	%	93		8658528
D14-Terphenyl	%	95		8658528
D8-Acenaphthylene	%	94		8658528

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	3.0°C

PCB Analysis: Detection limits were adjusted for high moisture content.

Results relate only to the items tested.

Bureau Veritas 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.bvna.com

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8653899	KCS	RPD	Moisture	2023/05/10	9.0		%	25
8655893	SHL	Matrix Spike [VSR629-07]	Isobutylbenzene - Volatile	2023/05/11		121	%	60 - 130
			Benzene	2023/05/11		94	%	60 - 130
			Toluene	2023/05/11		93	%	60 - 130
			Ethylbenzene	2023/05/11		101	%	60 - 130
			Total Xylenes	2023/05/11		98	%	60 - 130
8655893	SHL	Spiked Blank	Isobutylbenzene - Volatile	2023/05/11		97	%	60 - 130
			Benzene	2023/05/11		89	%	60 - 140
			Toluene	2023/05/11		93	%	60 - 140
			Ethylbenzene	2023/05/11		92	%	60 - 140
			Total Xylenes	2023/05/11		94	%	60 - 140
8655893	SHL	Method Blank	Isobutylbenzene - Volatile	2023/05/11		99	%	60 - 130
			Benzene	2023/05/11	<0.0050		mg/kg	
			Toluene	2023/05/11	<0.050		mg/kg	
			Ethylbenzene	2023/05/11	<0.010		mg/kg	
			Total Xylenes	2023/05/11	<0.050		mg/kg	
			C6 - C10 (less BTEX)	2023/05/11	<2.5		mg/kg	
8655893	SHL	RPD [VSR629-07]	Benzene	2023/05/11	NC		%	50
			Toluene	2023/05/11	NC		%	50
			Ethylbenzene	2023/05/11	NC		%	50
			Total Xylenes	2023/05/11	NC		%	50
			C6 - C10 (less BTEX)	2023/05/11	NC		%	50
8655998	TPE	RPD [VSR628-03]	Gravel	2023/05/16	39 (1)		%	35
			Sand	2023/05/16	28		%	35
			Silt	2023/05/16	0.030		%	35
			Clay	2023/05/16	19		%	35
8656292	MGN	Matrix Spike	Isobutylbenzene - Extractable	2023/05/11		89	%	60 - 130
			n-Dotriacontane - Extractable	2023/05/11		76	%	60 - 130
			>C10-C16 Hydrocarbons	2023/05/11		79	%	30 - 130
			>C16-C21 Hydrocarbons	2023/05/11		83	%	30 - 130
			>C21-<C32 Hydrocarbons	2023/05/11		91	%	30 - 130
8656292	MGN	Spiked Blank	Isobutylbenzene - Extractable	2023/05/10		98	%	60 - 130
			n-Dotriacontane - Extractable	2023/05/10		84	%	60 - 130
			>C10-C16 Hydrocarbons	2023/05/10		95	%	60 - 130
			>C16-C21 Hydrocarbons	2023/05/10		101	%	60 - 130
			>C21-<C32 Hydrocarbons	2023/05/10		110	%	60 - 130
8656292	MGN	Method Blank	Isobutylbenzene - Extractable	2023/05/10		97	%	60 - 130
			n-Dotriacontane - Extractable	2023/05/10		89	%	60 - 130
			>C10-C16 Hydrocarbons	2023/05/10	<10		mg/kg	
			>C16-C21 Hydrocarbons	2023/05/10	<10		mg/kg	
			>C21-<C32 Hydrocarbons	2023/05/10	<15		mg/kg	
8656292	MGN	RPD	>C10-C16 Hydrocarbons	2023/05/11	NC		%	50
			>C16-C21 Hydrocarbons	2023/05/11	NC		%	50
			>C21-<C32 Hydrocarbons	2023/05/11	8.7		%	50
8656733	BBD	QC Standard	Organic Carbon (TOC)	2023/05/11		113	%	75 - 125
8656733	BBD	Method Blank	Organic Carbon (TOC)	2023/05/11	<0.50		g/kg	
8656733	BBD	RPD [VSR628-01]	Organic Carbon (TOC)	2023/05/11	5.5		%	35
8658314	JHY	Matrix Spike	Acid Extractable Antimony (Sb)	2023/05/11		99	%	75 - 125
			Acid Extractable Arsenic (As)	2023/05/11		102	%	75 - 125
			Acid Extractable Barium (Ba)	2023/05/11		NC	%	75 - 125
			Acid Extractable Beryllium (Be)	2023/05/11		97	%	75 - 125
			Acid Extractable Bismuth (Bi)	2023/05/11		97	%	75 - 125
			Acid Extractable Boron (B)	2023/05/11		93	%	75 - 125
			Acid Extractable Cadmium (Cd)	2023/05/11		95	%	75 - 125
			Acid Extractable Chromium (Cr)	2023/05/11		100	%	75 - 125

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Cobalt (Co)	2023/05/11		98	%	75 - 125
			Acid Extractable Copper (Cu)	2023/05/11		102	%	75 - 125
			Acid Extractable Lead (Pb)	2023/05/11		97	%	75 - 125
			Acid Extractable Lithium (Li)	2023/05/11		98	%	75 - 125
			Acid Extractable Manganese (Mn)	2023/05/11		NC	%	75 - 125
			Acid Extractable Mercury (Hg)	2023/05/11		96	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2023/05/11		101	%	75 - 125
			Acid Extractable Nickel (Ni)	2023/05/11		100	%	75 - 125
			Acid Extractable Rubidium (Rb)	2023/05/11		99	%	75 - 125
			Acid Extractable Selenium (Se)	2023/05/11		98	%	75 - 125
			Acid Extractable Silver (Ag)	2023/05/11		98	%	75 - 125
			Acid Extractable Strontium (Sr)	2023/05/11		107	%	75 - 125
			Acid Extractable Thallium (Tl)	2023/05/11		98	%	75 - 125
			Acid Extractable Tin (Sn)	2023/05/11		93	%	75 - 125
			Acid Extractable Uranium (U)	2023/05/11		96	%	75 - 125
			Acid Extractable Vanadium (V)	2023/05/11		105	%	75 - 125
			Acid Extractable Zinc (Zn)	2023/05/11		NC	%	75 - 125
8658314	JHY	Spiked Blank	Acid Extractable Antimony (Sb)	2023/05/11		99	%	75 - 125
			Acid Extractable Arsenic (As)	2023/05/11		98	%	75 - 125
			Acid Extractable Barium (Ba)	2023/05/11		93	%	75 - 125
			Acid Extractable Beryllium (Be)	2023/05/11		93	%	75 - 125
			Acid Extractable Bismuth (Bi)	2023/05/11		93	%	75 - 125
			Acid Extractable Boron (B)	2023/05/11		96	%	75 - 125
			Acid Extractable Cadmium (Cd)	2023/05/11		94	%	75 - 125
			Acid Extractable Chromium (Cr)	2023/05/11		98	%	75 - 125
			Acid Extractable Cobalt (Co)	2023/05/11		98	%	75 - 125
			Acid Extractable Copper (Cu)	2023/05/11		97	%	75 - 125
			Acid Extractable Lead (Pb)	2023/05/11		94	%	75 - 125
			Acid Extractable Lithium (Li)	2023/05/11		93	%	75 - 125
			Acid Extractable Manganese (Mn)	2023/05/11		101	%	75 - 125
			Acid Extractable Mercury (Hg)	2023/05/11		96	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2023/05/11		101	%	75 - 125
			Acid Extractable Nickel (Ni)	2023/05/11		100	%	75 - 125
			Acid Extractable Rubidium (Rb)	2023/05/11		95	%	75 - 125
			Acid Extractable Selenium (Se)	2023/05/11		98	%	75 - 125
			Acid Extractable Silver (Ag)	2023/05/11		97	%	75 - 125
			Acid Extractable Strontium (Sr)	2023/05/11		98	%	75 - 125
			Acid Extractable Thallium (Tl)	2023/05/11		96	%	75 - 125
			Acid Extractable Tin (Sn)	2023/05/11		99	%	75 - 125
			Acid Extractable Uranium (U)	2023/05/11		94	%	75 - 125
			Acid Extractable Vanadium (V)	2023/05/11		99	%	75 - 125
			Acid Extractable Zinc (Zn)	2023/05/11		97	%	75 - 125
8658314	JHY	Method Blank	Acid Extractable Aluminum (Al)	2023/05/11	<10		mg/kg	
			Acid Extractable Antimony (Sb)	2023/05/11	<2.0		mg/kg	
			Acid Extractable Arsenic (As)	2023/05/11	<2.0		mg/kg	
			Acid Extractable Barium (Ba)	2023/05/11	<5.0		mg/kg	
			Acid Extractable Beryllium (Be)	2023/05/11	<1.0		mg/kg	
			Acid Extractable Bismuth (Bi)	2023/05/11	<2.0		mg/kg	
			Acid Extractable Boron (B)	2023/05/11	<50		mg/kg	
			Acid Extractable Cadmium (Cd)	2023/05/11	<0.30		mg/kg	
			Acid Extractable Chromium (Cr)	2023/05/11	<2.0		mg/kg	
			Acid Extractable Cobalt (Co)	2023/05/11	<1.0		mg/kg	
			Acid Extractable Copper (Cu)	2023/05/11	<2.0		mg/kg	
			Acid Extractable Iron (Fe)	2023/05/11	<50		mg/kg	
			Acid Extractable Lead (Pb)	2023/05/11	<0.50		mg/kg	

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Lithium (Li)	2023/05/11	<2.0		mg/kg	
			Acid Extractable Manganese (Mn)	2023/05/11	<2.0		mg/kg	
			Acid Extractable Mercury (Hg)	2023/05/11	<0.10		mg/kg	
			Acid Extractable Molybdenum (Mo)	2023/05/11	<2.0		mg/kg	
			Acid Extractable Nickel (Ni)	2023/05/11	<2.0		mg/kg	
			Acid Extractable Rubidium (Rb)	2023/05/11	<2.0		mg/kg	
			Acid Extractable Selenium (Se)	2023/05/11	<0.50		mg/kg	
			Acid Extractable Silver (Ag)	2023/05/11	<0.50		mg/kg	
			Acid Extractable Strontium (Sr)	2023/05/11	<5.0		mg/kg	
			Acid Extractable Thallium (Tl)	2023/05/11	<0.10		mg/kg	
			Acid Extractable Tin (Sn)	2023/05/11	<1.0		mg/kg	
			Acid Extractable Uranium (U)	2023/05/11	<0.10		mg/kg	
			Acid Extractable Vanadium (V)	2023/05/11	<2.0		mg/kg	
			Acid Extractable Zinc (Zn)	2023/05/11	<5.0		mg/kg	
8658314	JHY	RPD	Acid Extractable Aluminum (Al)	2023/05/11	0.41		%	35
			Acid Extractable Antimony (Sb)	2023/05/11	NC		%	35
			Acid Extractable Arsenic (As)	2023/05/11	1.5		%	35
			Acid Extractable Barium (Ba)	2023/05/11	0.54		%	35
			Acid Extractable Beryllium (Be)	2023/05/11	NC		%	35
			Acid Extractable Bismuth (Bi)	2023/05/11	NC		%	35
			Acid Extractable Boron (B)	2023/05/11	NC		%	35
			Acid Extractable Cadmium (Cd)	2023/05/11	NC		%	35
			Acid Extractable Chromium (Cr)	2023/05/11	0.43		%	35
			Acid Extractable Cobalt (Co)	2023/05/11	4.2		%	35
			Acid Extractable Copper (Cu)	2023/05/11	0.62		%	35
			Acid Extractable Iron (Fe)	2023/05/11	0.63		%	35
			Acid Extractable Lead (Pb)	2023/05/11	4.2		%	35
			Acid Extractable Lithium (Li)	2023/05/11	1.1		%	35
			Acid Extractable Manganese (Mn)	2023/05/11	5.8		%	35
			Acid Extractable Mercury (Hg)	2023/05/11	NC		%	35
			Acid Extractable Molybdenum (Mo)	2023/05/11	NC		%	35
			Acid Extractable Nickel (Ni)	2023/05/11	1.6		%	35
			Acid Extractable Rubidium (Rb)	2023/05/11	3.2		%	35
			Acid Extractable Selenium (Se)	2023/05/11	NC		%	35
			Acid Extractable Silver (Ag)	2023/05/11	NC		%	35
			Acid Extractable Strontium (Sr)	2023/05/11	3.0		%	35
			Acid Extractable Thallium (Tl)	2023/05/11	NC		%	35
			Acid Extractable Tin (Sn)	2023/05/11	NC		%	35
			Acid Extractable Uranium (U)	2023/05/11	8.6		%	35
			Acid Extractable Vanadium (V)	2023/05/11	3.9		%	35
			Acid Extractable Zinc (Zn)	2023/05/11	2.4		%	35
8658528	RST	Matrix Spike [VSR632-02]	D10-Anthracene	2023/05/12		101	%	50 - 130
			D14-Terphenyl	2023/05/12		100	%	50 - 130
			D8-Acenaphthylene	2023/05/12		97	%	50 - 130
			1-Methylnaphthalene	2023/05/12		96	%	50 - 130
			2-Methylnaphthalene	2023/05/12		96	%	50 - 130
			Acenaphthene	2023/05/12		90	%	50 - 130
			Acenaphthylene	2023/05/12		101	%	50 - 130
			Anthracene	2023/05/12		86	%	50 - 130
			Benzo(a)anthracene	2023/05/12		70	%	50 - 130
			Benzo(a)pyrene	2023/05/12		72	%	50 - 130
			Benzo(b)fluoranthene	2023/05/12		90	%	50 - 130
			Benzo(g,h,i)perylene	2023/05/12		74	%	50 - 130
			Benzo(j)fluoranthene	2023/05/12		81	%	50 - 130
			Benzo(k)fluoranthene	2023/05/12		87	%	50 - 130

Bureau Veritas 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.bvna.com

Bureau Veritas Job #: C3C7715
Report Date: 2023/05/19

Dillon Consulting Limited

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Chrysene	2023/05/12		62	%	50 - 130
			Dibenzo(a,h)anthracene	2023/05/12		83	%	50 - 130
			Fluoranthene	2023/05/12		75	%	50 - 130
			Fluorene	2023/05/12		99	%	50 - 130
			Indeno(1,2,3-cd)pyrene	2023/05/12		73	%	50 - 130
			Naphthalene	2023/05/12		87	%	50 - 130
			Perylene	2023/05/12		73	%	50 - 130
			Phenanthrene	2023/05/12		73	%	50 - 130
			Pyrene	2023/05/12		77	%	50 - 130
8658528	RST	Spiked Blank	D10-Anthracene	2023/05/12		92	%	50 - 130
			D14-Terphenyl	2023/05/12		96	%	50 - 130
			D8-Acenaphthylene	2023/05/12		92	%	50 - 130
			1-Methylnaphthalene	2023/05/12		95	%	50 - 130
			2-Methylnaphthalene	2023/05/12		95	%	50 - 130
			Acenaphthene	2023/05/12		91	%	50 - 130
			Acenaphthylene	2023/05/12		95	%	50 - 130
			Anthracene	2023/05/12		82	%	50 - 130
			Benzo(a)anthracene	2023/05/12		59	%	50 - 130
			Benzo(a)pyrene	2023/05/12		77	%	50 - 130
			Benzo(b)fluoranthene	2023/05/12		94	%	50 - 130
			Benzo(g,h,i)perylene	2023/05/12		78	%	50 - 130
			Benzo(j)fluoranthene	2023/05/12		81	%	50 - 130
			Benzo(k)fluoranthene	2023/05/12		85	%	50 - 130
			Chrysene	2023/05/12		60	%	50 - 130
			Dibenzo(a,h)anthracene	2023/05/12		82	%	50 - 130
			Fluoranthene	2023/05/12		80	%	50 - 130
			Fluorene	2023/05/12		97	%	50 - 130
			Indeno(1,2,3-cd)pyrene	2023/05/12		76	%	50 - 130
			Naphthalene	2023/05/12		87	%	50 - 130
			Perylene	2023/05/12		74	%	50 - 130
			Phenanthrene	2023/05/12		88	%	50 - 130
			Pyrene	2023/05/12		81	%	50 - 130
8658528	RST	Method Blank	D10-Anthracene	2023/05/12		60	%	50 - 130
			D14-Terphenyl	2023/05/12		63	%	50 - 130
			D8-Acenaphthylene	2023/05/12		60	%	50 - 130
			1-Methylnaphthalene	2023/05/12	<0.0050		mg/kg	
			2-Methylnaphthalene	2023/05/12	<0.0050		mg/kg	
			Acenaphthene	2023/05/12	<0.0050		mg/kg	
			Acenaphthylene	2023/05/12	<0.0050		mg/kg	
			Anthracene	2023/05/12	<0.0050		mg/kg	
			Benzo(a)anthracene	2023/05/12	<0.0050		mg/kg	
			Benzo(a)pyrene	2023/05/12	<0.0050		mg/kg	
			Benzo(b)fluoranthene	2023/05/12	<0.0050		mg/kg	
			Benzo(g,h,i)perylene	2023/05/12	<0.0050		mg/kg	
			Benzo(j)fluoranthene	2023/05/12	<0.0050		mg/kg	
			Benzo(k)fluoranthene	2023/05/12	<0.0050		mg/kg	
			Chrysene	2023/05/12	<0.0050		mg/kg	
			Dibenzo(a,h)anthracene	2023/05/12	<0.0050		mg/kg	
			Fluoranthene	2023/05/12	<0.0050		mg/kg	
			Fluorene	2023/05/12	<0.0050		mg/kg	
			Indeno(1,2,3-cd)pyrene	2023/05/12	<0.0050		mg/kg	
			Naphthalene	2023/05/12	<0.0050		mg/kg	
			Perylene	2023/05/12	<0.0050		mg/kg	
			Phenanthrene	2023/05/12	<0.0050		mg/kg	
			Pyrene	2023/05/12	<0.0050		mg/kg	

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8658528	RST	RPD [VSR632-02]	1-Methylnaphthalene	2023/05/12	NC		%	50
			2-Methylnaphthalene	2023/05/12	NC		%	50
			Acenaphthene	2023/05/12	NC		%	50
			Acenaphthylene	2023/05/12	NC		%	50
			Anthracene	2023/05/12	NC		%	50
			Benzo(a)anthracene	2023/05/12	NC		%	50
			Benzo(a)pyrene	2023/05/12	119 (2)		%	50
			Benzo(b)fluoranthene	2023/05/12	82 (2)		%	50
			Benzo(g,h,i)perylene	2023/05/12	NC		%	50
			Benzo(j)fluoranthene	2023/05/12	NC		%	50
			Benzo(k)fluoranthene	2023/05/12	NC		%	50
			Chrysene	2023/05/12	48		%	50
			Dibenzo(a,h)anthracene	2023/05/12	NC		%	50
			Fluoranthene	2023/05/12	151 (2)		%	50
			Fluorene	2023/05/12	NC		%	50
			Indeno(1,2,3-cd)pyrene	2023/05/12	NC		%	50
			Naphthalene	2023/05/12	NC		%	50
			Perylene	2023/05/12	NC		%	50
			Phenanthrene	2023/05/12	152 (2)		%	50
			Pyrene	2023/05/12	100 (2)		%	50
8659819	SUR	Matrix Spike [VSR630-05]	Chromium (VI)	2023/05/12		33 (3)	%	70 - 130
8659819	SUR	Spiked Blank	Chromium (VI)	2023/05/12		87	%	80 - 120
8659819	SUR	Method Blank	Chromium (VI)	2023/05/12	<0.18		ug/g	
8659819	SUR	RPD [VSR630-05]	Chromium (VI)	2023/05/12	NC (4)		%	35
8660682	FMA	Matrix Spike [VSR633-04]	Decachlorobiphenyl	2023/05/12		81	%	60 - 130
			Aroclor 1260	2023/05/12		94	%	30 - 130
			Total PCB	2023/05/12		94	%	30 - 130
8660682	FMA	Spiked Blank	Decachlorobiphenyl	2023/05/12		88	%	60 - 130
			Aroclor 1260	2023/05/12		99	%	30 - 130
			Total PCB	2023/05/12		99	%	30 - 130
8660682	FMA	Method Blank	Decachlorobiphenyl	2023/05/12		87	%	60 - 130
			Aroclor 1016	2023/05/12	<0.010		ug/g	
			Aroclor 1221	2023/05/12	<0.010		ug/g	
			Aroclor 1232	2023/05/12	<0.010		ug/g	
			Aroclor 1242	2023/05/12	<0.010		ug/g	
			Aroclor 1248	2023/05/12	<0.010		ug/g	
			Aroclor 1254	2023/05/12	<0.010		ug/g	
			Aroclor 1260	2023/05/12	<0.010		ug/g	
			Total PCB	2023/05/12	<0.010		ug/g	
8660682	FMA	RPD [VSR633-04]	Aroclor 1016	2023/05/12	NC		%	50
			Aroclor 1221	2023/05/12	NC		%	50
			Aroclor 1232	2023/05/12	NC		%	50
			Aroclor 1242	2023/05/12	NC		%	50
			Aroclor 1248	2023/05/12	NC		%	50
			Aroclor 1254	2023/05/12	NC		%	50
			Aroclor 1260	2023/05/12	NC		%	50

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total PCB	2023/05/12	NC		%	50

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Poor RPD due to sample inhomogeneity.

(2) Duplicate: results are outside acceptance limit. Analysis was repeated with similar results.

(3) The matrix spike recovery was below the lower control limit. This may be due in part to the reducing environment of the sample. The matrix spike was reanalyzed to confirm result.

(4) Detection Limit were adjusted due to high moisture content

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Anastassia Hamanov, Scientific Specialist

Bryon Angevine, Senior Analyst

Janah Rhyno, Metals Supervisor-Bedford

Phil Deveau, Scientific Specialist (Organics)

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by {0}, {1} responsible for {2} {3} laboratory operations.

Bureau Veritas 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.bvna.com

Your C.O.C. #: N/A

Attention: Michelle Roche

Dillon Consulting Limited
45 Hebron Way
Suite 202
St John's, NL
CANADA A1A 0P9

Report Date: 2023/06/02
Report #: R7654390
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3E0009
Received: 2023/05/16, 09:56

Sample Matrix: Soil
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Benzo(b/j)fluoranthene Sum (LL soil)	4	N/A	2023/06/02	N/A	Auto Calc.
Hexavalent Chromium in Soil by IC (1, 2)	4	2023/05/24	2023/05/24	CAM SOP-00436	EPA 3060A/7199 m
TEH in Soil (PIRI) (2)	2	2023/05/23	2023/05/23	ATL SOP 00111	Atl. RBCA v3.1 m
TEH in Soil (PIRI) (2)	2	2023/05/23	2023/05/24	ATL SOP 00111	Atl. RBCA v3.1 m
Fraction Organic Carbon in Soil	4	N/A	2023/05/23	ATL SOP 00044	LECO203601224 1991m
Metals Solids Acid Extr. ICPMS	4	2023/05/19	2023/05/19	ATL SOP 00058	EPA 6020B R2 m
Moisture	4	N/A	2023/05/19	ATL SOP 00001	OMOE Handbook 1983 m
PAH in sediment by GC/MS (Low Level) (2)	4	2023/05/18	2023/05/31	ATL SOP 00102	EPA 8270E R6 m
PCBs in soil by GC/ECD (2)	3	2023/05/19	2023/05/23	ATL SOP 00106	EPA 8082A 2007 m
PCBs in soil by GC/ECD (2)	1	2023/05/23	2023/05/25	ATL SOP 00106	EPA 8082A 2007 m
PCB Aroclor sum (soil)	3	N/A	2023/05/23	N/A	Auto Calc.
PCB Aroclor sum (soil)	1	N/A	2023/05/25	N/A	Auto Calc.
Grain Size - Calculated	4	N/A	2023/05/23		
Particle Size (Sieve), Sieve/pan 75um	4	N/A	2023/05/23	ATL SOP 00053	ASTM D1140-17 m
Total Organic Carbon in Soil	4	2023/05/23	2023/05/23	ATL SOP 00044	LECO203601224 1991 m
ModTPH (T1) Calc. for Soil	1	N/A	2023/05/24	N/A	Atl. RBCA v3.1 m
ModTPH (T1) Calc. for Soil	3	N/A	2023/05/25	N/A	Atl. RBCA v3.1 m
VPH in Soil (PIRI) - Field Preserved (3)	2	N/A	2023/05/23	ATL SOP 00119	Atl. RBCA v3.1 m
VPH in Soil (PIRI) - Field Preserved (3)	2	N/A	2023/05/24	ATL SOP 00119	Atl. RBCA v3.1 m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCCFP, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report.

Bureau Veritas 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.bvna.com

Your C.O.C. #: N/A

Attention: Michelle Roche

Dillon Consulting Limited
45 Hebron Way
Suite 202
St John's, NL
CANADA A1A 0P9

Report Date: 2023/06/02
Report #: R7654390
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3E0009
Received: 2023/05/16, 09:56

Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Bureau Veritas Mississauga, 6740 Campobello Rd , Mississauga, ON, L5N 2L8
(2) Soils are reported on a dry weight basis unless otherwise specified.
(3) No lab extraction date is given for C6-C10/BTEX and VOC samples that are field preserved with methanol. Extraction date is date sampled unless otherwise stated.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:
Preeti Kapadia, Project Manager
Email: Preeti.Kapadia@bureauveritas.com
Phone# (902)420-0203 Ext:252

==

This report has been generated and distributed using a secure automated process.
Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Suzanne Rogers, General Manager responsible for Nova Scotia Environmental laboratory operations.

RBCA HYDROCARBONS IN SOIL (FIELD PRES.)

Bureau Veritas ID		VVG659		VVG660		
Sampling Date		2023/05/08 10:00		2023/05/08 11:00		
COC Number		N/A		N/A		
	UNITS	**BH-12 CC-1A (0-1M)**	**QC Batch**	**BH-12 CC-1B (1M-3M)**	**RDL**	**QC Batch**
Petroleum Hydrocarbons						
Benzene	mg/kg	<0.0050	8680834	<0.0050	0.0050	8678963
Toluene	mg/kg	<0.050	8680834	<0.050	0.050	8678963
Ethylbenzene	mg/kg	<0.010	8680834	<0.010	0.010	8678963
Total Xylenes	mg/kg	<0.050	8680834	<0.050	0.050	8678963
C6 - C10 (less BTEX)	mg/kg	<2.5	8680834	<2.5	2.5	8678963
>C10-C16 Hydrocarbons	mg/kg	<10	8678848	<10	10	8678848
>C16-C21 Hydrocarbons	mg/kg	<10	8678848	<10	10	8678848
>C21-<C32 Hydrocarbons	mg/kg	20	8678848	28	15	8678848
Modified TPH (Tier1)	mg/kg	20	8669719	28	15	8669719
Reached Baseline at C32	mg/kg	Yes	8678848	No	N/A	8678848
Hydrocarbon Resemblance	mg/kg	COMMENT (1)	8678848	COMMENT (1)	N/A	8678848
Surrogate Recovery (%)						
Isobutylbenzene - Extractable	%	102	8678848	95		8678848
n-Dotriacontane - Extractable	%	84	8678848	69		8678848
Isobutylbenzene - Volatile	%	80	8680834	127		8678963

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Possible lube oil fraction.

Bureau Veritas 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.bvna.com

RBCA HYDROCARBONS IN SOIL (FIELD PRES.)

Bureau Veritas ID		VVG660			VVG661	VVG662		
Sampling Date		2023/05/08 11:00			2023/05/11 10:30	2023/05/11 13:00		
COC Number		N/A			N/A	N/A		
	UNITS	BH-12 CC-1B (1M-3M) Lab-Dup	RDL	QC Batch	BH-9 CC-1A (0-1M)	BH-9 CC-1B (3-4M)	RDL	QC Batch
Petroleum Hydrocarbons								
Benzene	mg/kg	<0.0050	0.0050	8678963	<0.0050	<0.0050	0.0050	8678963
Toluene	mg/kg	<0.050	0.050	8678963	<0.050	<0.050	0.050	8678963
Ethylbenzene	mg/kg	<0.010	0.010	8678963	<0.010	<0.010	0.010	8678963
Total Xylenes	mg/kg	<0.050	0.050	8678963	<0.050	<0.050	0.050	8678963
C6 - C10 (less BTEX)	mg/kg	<2.5	2.5	8678963	<2.5	<2.5	2.5	8678963
>C10-C16 Hydrocarbons	mg/kg				<10	<10	10	8679190
>C16-C21 Hydrocarbons	mg/kg				<10	<10	10	8679190
>C21-<C32 Hydrocarbons	mg/kg				44	<15	15	8679190
Modified TPH (Tier1)	mg/kg				44	<15	15	8669719
Reached Baseline at C32	mg/kg				Yes	NA	N/A	8679190
Hydrocarbon Resemblance	mg/kg				COMMENT (1)	NA	N/A	8679190
Surrogate Recovery (%)								
Isobutylbenzene - Extractable	%				94	90		8679190
n-Dotriacontane - Extractable	%				107	95		8679190
Isobutylbenzene - Volatile	%	125		8678963	107	106		8678963

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Possible lube oil fraction.

Bureau Veritas 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.bvna.com

Bureau Veritas Job #: C3E0009
Report Date: 2023/06/02

Dillon Consulting Limited

PART. SIZE (SIEVE/PAN 75 UM-CCMEHC,PIRI)

Bureau Veritas ID		VVG659			VVG659			VVG660		
Sampling Date		2023/05/08 10:00			2023/05/08 10:00			2023/05/08 11:00		
COC Number		N/A			N/A			N/A		
	UNITS	**BH-12 CC-1A (0-1M)**	**RDL**	**QC Batch**	**BH-12 CC-1A (0-1M) Lab-Dup**	**RDL**	**QC Batch**	**BH-12 CC-1B (1M-3M)**	**RDL**	**QC Batch**
Calculated Parameters										
Grain Size	N/A	COARSE	N/A	8670379				COARSE	N/A	8670379
Inorganics										
Sieve - #200 (>0.075mm)	%	79	1	8674480	70	1	8674480	100	1	8674480
Sieve - Pan	%	21	1	8674480	30 (1)	1	8674480	<1	1	8674480

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) %RPD acceptable. Duplicate values agree within 10% absolute.

Bureau Veritas ID		VVG661	VVG662		
Sampling Date		2023/05/11 10:30	2023/05/11 13:00		
COC Number		N/A	N/A		
	UNITS	**BH-9 CC-1A (0-1M)**	**BH-9 CC-1B (3-4M)**	**RDL**	**QC Batch**
Calculated Parameters					
Grain Size	N/A	COARSE	COARSE	N/A	8670379
Inorganics					
Sieve - #200 (>0.075mm)	%	66	92	1	8674480
Sieve - Pan	%	34	8	1	8674480

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

Bureau Veritas 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.bvna.com

RESULTS OF ANALYSES OF SOIL

Bureau Veritas ID		VVG659	VVG660	VVG661	VVG662		
Sampling Date		2023/05/08 10:00	2023/05/08 11:00	2023/05/11 10:30	2023/05/11 13:00		
COC Number		N/A	N/A	N/A	N/A		
	UNITS	**BH-12 CC-1A (0-1M)**	**BH-12 CC-1B (1M-3M)**	**BH-9 CC-1A (0-1M)**	**BH-9 CC-1B (3-4M)**	**RDL**	**QC Batch**
Inorganics							
Fraction of Organic Carbon	g/g	0.0096	0.0011	0.022	<0.00050	0.00050	8670610
Moisture	%	22	23	59	9.5	1.0	8672193
Organic Carbon (TOC)	g/kg	9.6	1.1	22	<0.50	0.50	8678367

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Bureau Veritas 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.bvna.com

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Bureau Veritas ID		VVG659	VVG660		VVG661		
Sampling Date		2023/05/08 10:00	2023/05/08 11:00		2023/05/11 10:30		
COC Number		N/A	N/A		N/A		
	UNITS	BH-12 CC-1A (0-1M)	BH-12 CC-1B (1M-3M)	RDL	BH-9 CC-1A (0-1M)	RDL	QC Batch
Inorganics							
Chromium (VI)	ug/g	<0.18	<0.18	0.18	<0.54 (1)	0.54	8681281
Metals							
Acid Extractable Aluminum (Al)	mg/kg	12000	9100	10	13000	10	8674540
Acid Extractable Antimony (Sb)	mg/kg	<2.0	<2.0	2.0	<2.0	2.0	8674540
Acid Extractable Arsenic (As)	mg/kg	10	2.4	2.0	13	2.0	8674540
Acid Extractable Barium (Ba)	mg/kg	33	8.6	5.0	44	5.0	8674540
Acid Extractable Beryllium (Be)	mg/kg	<1.0	<1.0	1.0	<1.0	1.0	8674540
Acid Extractable Bismuth (Bi)	mg/kg	<2.0	<2.0	2.0	<2.0	2.0	8674540
Acid Extractable Boron (B)	mg/kg	<50	<50	50	<50	50	8674540
Acid Extractable Cadmium (Cd)	mg/kg	<0.30	<0.30	0.30	0.32	0.30	8674540
Acid Extractable Chromium (Cr)	mg/kg	27	23	2.0	28	2.0	8674540
Acid Extractable Cobalt (Co)	mg/kg	11	8.6	1.0	11	1.0	8674540
Acid Extractable Copper (Cu)	mg/kg	38	41	2.0	20	2.0	8674540
Acid Extractable Iron (Fe)	mg/kg	26000	22000	50	29000	50	8674540
Acid Extractable Lead (Pb)	mg/kg	13	6.5	0.50	13	0.50	8674540
Acid Extractable Lithium (Li)	mg/kg	20	15	2.0	22	2.0	8674540
Acid Extractable Manganese (Mn)	mg/kg	570	510	2.0	620	2.0	8674540
Acid Extractable Mercury (Hg)	mg/kg	<0.10	<0.10	0.10	<0.10	0.10	8674540
Acid Extractable Molybdenum (Mo)	mg/kg	12	2.1	2.0	11	2.0	8674540
Acid Extractable Nickel (Ni)	mg/kg	22	18	2.0	25	2.0	8674540
Acid Extractable Rubidium (Rb)	mg/kg	2.6	<2.0	2.0	3.9	2.0	8674540
Acid Extractable Selenium (Se)	mg/kg	0.52	<0.50	0.50	0.81	0.50	8674540
Acid Extractable Silver (Ag)	mg/kg	<0.50	5.7	0.50	<0.50	0.50	8674540
Acid Extractable Strontium (Sr)	mg/kg	26	15	5.0	55	5.0	8674540
Acid Extractable Thallium (Tl)	mg/kg	0.23	<0.10	0.10	0.16	0.10	8674540
Acid Extractable Tin (Sn)	mg/kg	2.1	<1.0	1.0	<1.0	1.0	8674540
Acid Extractable Uranium (U)	mg/kg	3.2	0.38	0.10	4.0	0.10	8674540
Acid Extractable Vanadium (V)	mg/kg	42	27	2.0	50	2.0	8674540
Acid Extractable Zinc (Zn)	mg/kg	71	63	5.0	75	5.0	8674540

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) Detection limits were adjusted for high moisture content

Bureau Veritas 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.bvna.com

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Bureau Veritas ID		VVG662			VVG662		
Sampling Date		2023/05/11 13:00			2023/05/11 13:00		
COC Number		N/A			N/A		
	UNITS	**BH-9 CC-1B (3-4M)**	**RDL**	**QC Batch**	**BH-9 CC-1B (3-4M) Lab-Dup**	**RDL**	**QC Batch**
Inorganics							
Chromium (VI)	ug/g	<0.18	0.18	8681281			
Metals							
Acid Extractable Aluminum (Al)	mg/kg	11000	10	8674540	11000	10	8674540
Acid Extractable Antimony (Sb)	mg/kg	<2.0	2.0	8674540	<2.0	2.0	8674540
Acid Extractable Arsenic (As)	mg/kg	4.2	2.0	8674540	3.7	2.0	8674540
Acid Extractable Barium (Ba)	mg/kg	10	5.0	8674540	9.4	5.0	8674540
Acid Extractable Beryllium (Be)	mg/kg	<1.0	1.0	8674540	<1.0	1.0	8674540
Acid Extractable Bismuth (Bi)	mg/kg	<2.0	2.0	8674540	<2.0	2.0	8674540
Acid Extractable Boron (B)	mg/kg	<50	50	8674540	<50	50	8674540
Acid Extractable Cadmium (Cd)	mg/kg	<0.30	0.30	8674540	<0.30	0.30	8674540
Acid Extractable Chromium (Cr)	mg/kg	27	2.0	8674540	32	2.0	8674540
Acid Extractable Cobalt (Co)	mg/kg	11	1.0	8674540	12	1.0	8674540
Acid Extractable Copper (Cu)	mg/kg	26	2.0	8674540	37	2.0	8674540
Acid Extractable Iron (Fe)	mg/kg	24000	50	8674540	25000	50	8674540
Acid Extractable Lead (Pb)	mg/kg	19	0.50	8674540	17	0.50	8674540
Acid Extractable Lithium (Li)	mg/kg	17	2.0	8674540	18	2.0	8674540
Acid Extractable Manganese (Mn)	mg/kg	630	2.0	8674540	730	2.0	8674540
Acid Extractable Mercury (Hg)	mg/kg	<0.10	0.10	8674540	<0.10	0.10	8674540
Acid Extractable Molybdenum (Mo)	mg/kg	3.5	2.0	8674540	4.0	2.0	8674540
Acid Extractable Nickel (Ni)	mg/kg	20	2.0	8674540	23	2.0	8674540
Acid Extractable Rubidium (Rb)	mg/kg	<2.0	2.0	8674540	<2.0	2.0	8674540
Acid Extractable Selenium (Se)	mg/kg	<0.50	0.50	8674540	<0.50	0.50	8674540
Acid Extractable Silver (Ag)	mg/kg	0.63	0.50	8674540	3.9 (1)	0.50	8674540
Acid Extractable Strontium (Sr)	mg/kg	16	5.0	8674540	15	5.0	8674540
Acid Extractable Thallium (Tl)	mg/kg	<0.10	0.10	8674540	<0.10	0.10	8674540
Acid Extractable Tin (Sn)	mg/kg	<1.0	1.0	8674540	<1.0	1.0	8674540
Acid Extractable Uranium (U)	mg/kg	0.68	0.10	8674540	0.69	0.10	8674540
Acid Extractable Vanadium (V)	mg/kg	34	2.0	8674540	35	2.0	8674540
Acid Extractable Zinc (Zn)	mg/kg	69	5.0	8674540	72	5.0	8674540

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
(1) Poor RPD due to sample inhomogeneity. Verified by repeat digestion and analysis.

Bureau Veritas 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.bvna.com

SEMI-VOLATILE ORGANICS BY GC-MS (SOIL)

Bureau Veritas ID		VVG659	VVG660	VVG661	VVG662		
Sampling Date		2023/05/08 10:00	2023/05/08 11:00	2023/05/11 10:30	2023/05/11 13:00		
COC Number		N/A	N/A	N/A	N/A		
	UNITS	**BH-12 CC-1A (0-1M)**	**BH-12 CC-1B (1M-3M)**	**BH-9 CC-1A (0-1M)**	**BH-9 CC-1B (3-4M)**	**RDL**	**QC Batch**
Polyaromatic Hydrocarbons							
1-Methylnaphthalene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	8670035
2-Methylnaphthalene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	8670035
Acenaphthene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	8670035
Acenaphthylene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	8670035
Anthracene	mg/kg	<0.0050	0.013	<0.0050	<0.0050	0.0050	8670035
Benzo(a)anthracene	mg/kg	<0.0050	0.014	<0.0050	<0.0050	0.0050	8670035
Benzo(a)pyrene	mg/kg	0.0064	0.014	<0.0050	<0.0050	0.0050	8670035
Benzo(b)fluoranthene	mg/kg	0.0068	0.012	<0.0050	<0.0050	0.0050	8670035
Benzo(b/j)fluoranthene	mg/kg	<0.010	0.019	<0.010	<0.010	0.010	8670478
Benzo(g,h,i)perylene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	8670035
Benzo(j)fluoranthene	mg/kg	<0.0050	0.0070	<0.0050	<0.0050	0.0050	8670035
Benzo(k)fluoranthene	mg/kg	<0.0050	0.0074	<0.0050	<0.0050	0.0050	8670035
Chrysene	mg/kg	0.0079	0.015	<0.0050	<0.0050	0.0050	8670035
Dibenzo(a,h)anthracene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	8670035
Fluoranthene	mg/kg	0.0071	0.062	<0.0050	<0.0050	0.0050	8670035
Fluorene	mg/kg	<0.0050	0.0081	<0.0050	<0.0050	0.0050	8670035
Indeno(1,2,3-cd)pyrene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	8670035
Naphthalene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	8670035
Perylene	mg/kg	<0.0050	<0.0050	0.066	<0.0050	0.0050	8670035
Phenanthrene	mg/kg	0.0068	0.068	<0.0050	<0.0050	0.0050	8670035
Pyrene	mg/kg	0.017	0.043	<0.0050	<0.0050	0.0050	8670035
Surrogate Recovery (%)							
D10-Anthracene	%	171 (1)	122	118	137 (1)		8670035
D14-Terphenyl	%	194 (1)	134 (1)	131 (1)	147 (1)		8670035
D8-Acenaphthylene	%	169 (1)	124	114	131 (1)		8670035

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) PAH surrogate(s) not within acceptance limits. Sample past recommended hold time for repeat analysis.

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

Bureau Veritas ID		VVG659			VVG659		
Sampling Date		2023/05/08 10:00			2023/05/08 10:00		
COC Number		N/A			N/A		
	UNITS	**BH-12 CC-1A (0-1M)**	**RDL**	**QC Batch**	**BH-12 CC-1A (0-1M) Lab-Dup**	**RDL**	**QC Batch**
PCBs							
Aroclor 1016	ug/g	<0.050	0.050	8674494	<0.050	0.050	8674494
Aroclor 1221	ug/g	<0.050	0.050	8674494	<0.050	0.050	8674494
Aroclor 1232	ug/g	<0.050	0.050	8674494	<0.050	0.050	8674494
Aroclor 1248	ug/g	<0.050	0.050	8674494	<0.050	0.050	8674494
Aroclor 1242	ug/g	<0.050	0.050	8674494	<0.050	0.050	8674494
Aroclor 1254	ug/g	<0.050	0.050	8674494	<0.050	0.050	8674494
Aroclor 1260	ug/g	<0.050	0.050	8674494	<0.050	0.050	8674494
Calculated Total PCB	ug/g	<0.050	0.050	8669507			
Surrogate Recovery (%)							
Decachlorobiphenyl	%	103		8674494	106		8674494

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Bureau Veritas ID		VVG660		VVG661	VVG662		
Sampling Date		2023/05/08 11:00		2023/05/11 10:30	2023/05/11 13:00		
COC Number		N/A		N/A	N/A		
	UNITS	**BH-12 CC-1B (1M-3M)**	**QC Batch**	**BH-9 CC-1A (0-1M)**	**BH-9 CC-1B (3-4M)**	**RDL**	**QC Batch**
PCBs							
Aroclor 1016	ug/g	<0.050	8678614	<0.050	<0.050	0.050	8674494
Aroclor 1221	ug/g	<0.050	8678614	<0.050	<0.050	0.050	8674494
Aroclor 1232	ug/g	<0.050	8678614	<0.050	<0.050	0.050	8674494
Aroclor 1248	ug/g	<0.050	8678614	<0.050	<0.050	0.050	8674494
Aroclor 1242	ug/g	<0.050	8678614	<0.050	<0.050	0.050	8674494
Aroclor 1254	ug/g	<0.050	8678614	<0.050	<0.050	0.050	8674494
Aroclor 1260	ug/g	<0.050	8678614	<0.050	<0.050	0.050	8674494
Calculated Total PCB	ug/g	<0.050	8669507	<0.050	<0.050	0.050	8669507
Surrogate Recovery (%)							
Decachlorobiphenyl	%	122	8678614	81	83		8674494

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Bureau Veritas 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.bvna.com

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	6.1°C

Results relate only to the items tested.

Bureau Veritas 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.bvna.com

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8670035	SA9	Matrix Spike	D10-Anthracene	2023/05/30		140 (1)	%	50 - 130
			D14-Terphenyl	2023/05/30		148 (1)	%	50 - 130
			D8-Acenaphthylene	2023/05/30		139 (1)	%	50 - 130
			1-Methylnaphthalene	2023/05/30		92	%	50 - 130
			2-Methylnaphthalene	2023/05/30		93	%	50 - 130
			Acenaphthene	2023/05/30		99	%	50 - 130
			Acenaphthylene	2023/05/30		99	%	50 - 130
			Anthracene	2023/05/30		115	%	50 - 130
			Benzo(a)anthracene	2023/05/30		86	%	50 - 130
			Benzo(a)pyrene	2023/05/30		93	%	50 - 130
			Benzo(b)fluoranthene	2023/05/30		106	%	50 - 130
			Benzo(g,h,i)perylene	2023/05/30		85	%	50 - 130
			Benzo(j)fluoranthene	2023/05/30		96	%	50 - 130
			Benzo(k)fluoranthene	2023/05/30		105	%	50 - 130
			Chrysene	2023/05/30		78	%	50 - 130
			Dibenzo(a,h)anthracene	2023/05/30		75	%	50 - 130
			Fluoranthene	2023/05/30		103	%	50 - 130
			Fluorene	2023/05/30		98	%	50 - 130
			Indeno(1,2,3-cd)pyrene	2023/05/30		81	%	50 - 130
			Naphthalene	2023/05/30		89	%	50 - 130
			Perylene	2023/05/30		97	%	50 - 130
			Phenanthrene	2023/05/30		106	%	50 - 130
			Pyrene	2023/05/30		102	%	50 - 130
8670035	SA9	Spiked Blank	D10-Anthracene	2023/05/30		131 (1)	%	50 - 130
			D14-Terphenyl	2023/05/30		141 (1)	%	50 - 130
			D8-Acenaphthylene	2023/05/30		131 (1)	%	50 - 130
			1-Methylnaphthalene	2023/05/30		92	%	50 - 130
			2-Methylnaphthalene	2023/05/30		94	%	50 - 130
			Acenaphthene	2023/05/30		95	%	50 - 130
			Acenaphthylene	2023/05/30		97	%	50 - 130
			Anthracene	2023/05/30		111	%	50 - 130
			Benzo(a)anthracene	2023/05/30		85	%	50 - 130
			Benzo(a)pyrene	2023/05/30		85	%	50 - 130
			Benzo(b)fluoranthene	2023/05/30		100	%	50 - 130
			Benzo(g,h,i)perylene	2023/05/30		76	%	50 - 130
			Benzo(j)fluoranthene	2023/05/30		92	%	50 - 130
			Benzo(k)fluoranthene	2023/05/30		97	%	50 - 130
			Chrysene	2023/05/30		75	%	50 - 130
			Dibenzo(a,h)anthracene	2023/05/30		69	%	50 - 130
			Fluoranthene	2023/05/30		97	%	50 - 130
			Fluorene	2023/05/30		92	%	50 - 130
			Indeno(1,2,3-cd)pyrene	2023/05/30		74	%	50 - 130
			Naphthalene	2023/05/30		92	%	50 - 130
			Perylene	2023/05/30		92	%	50 - 130
			Phenanthrene	2023/05/30		101	%	50 - 130
			Pyrene	2023/05/30		96	%	50 - 130
8670035	SA9	Method Blank	D10-Anthracene	2023/05/30		134 (1)	%	50 - 130
			D14-Terphenyl	2023/05/30		148 (1)	%	50 - 130
			D8-Acenaphthylene	2023/05/30		134 (1)	%	50 - 130
			1-Methylnaphthalene	2023/05/30	<0.0050		mg/kg	
			2-Methylnaphthalene	2023/05/30	<0.0050		mg/kg	
			Acenaphthene	2023/05/30	<0.0050		mg/kg	
			Acenaphthylene	2023/05/30	<0.0050		mg/kg	
			Anthracene	2023/05/30	<0.0050		mg/kg	
			Benzo(a)anthracene	2023/05/30	<0.0050		mg/kg	

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Benzo(a)pyrene	2023/05/30	<0.0050		mg/kg	
			Benzo(b)fluoranthene	2023/05/30	<0.0050		mg/kg	
			Benzo(g,h,i)perylene	2023/05/30	<0.0050		mg/kg	
			Benzo(j)fluoranthene	2023/05/30	<0.0050		mg/kg	
			Benzo(k)fluoranthene	2023/05/30	<0.0050		mg/kg	
			Chrysene	2023/05/30	<0.0050		mg/kg	
			Dibenzo(a,h)anthracene	2023/05/30	<0.0050		mg/kg	
			Fluoranthene	2023/05/30	<0.0050		mg/kg	
			Fluorene	2023/05/30	<0.0050		mg/kg	
			Indeno(1,2,3-cd)pyrene	2023/05/30	<0.0050		mg/kg	
			Naphthalene	2023/05/30	<0.0050		mg/kg	
			Perylene	2023/05/30	<0.0050		mg/kg	
			Phenanthrene	2023/05/30	<0.0050		mg/kg	
			Pyrene	2023/05/30	<0.0050		mg/kg	
8670035	SA9	RPD	1-Methylnaphthalene	2023/05/30	NC		%	50
			2-Methylnaphthalene	2023/05/30	NC		%	50
			Acenaphthene	2023/05/30	NC		%	50
			Acenaphthylene	2023/05/30	NC		%	50
			Anthracene	2023/05/30	NC		%	50
			Benzo(a)anthracene	2023/05/30	NC		%	50
			Benzo(a)pyrene	2023/05/30	NC		%	50
			Benzo(b)fluoranthene	2023/05/30	14		%	50
			Benzo(g,h,i)perylene	2023/05/30	NC		%	50
			Benzo(j)fluoranthene	2023/05/30	NC		%	50
			Benzo(k)fluoranthene	2023/05/30	NC		%	50
			Chrysene	2023/05/30	NC		%	50
			Dibenzo(a,h)anthracene	2023/05/30	NC		%	50
			Fluoranthene	2023/05/30	37		%	50
			Fluorene	2023/05/30	NC		%	50
			Indeno(1,2,3-cd)pyrene	2023/05/30	NC		%	50
			Naphthalene	2023/05/30	NC		%	50
			Perylene	2023/05/30	NC		%	50
			Phenanthrene	2023/05/30	29		%	50
			Pyrene	2023/05/30	41		%	50
8672193	LJV	RPD	Moisture	2023/05/19	0.84		%	25
8674480	BBD	QC Standard	Sieve - #200 (>0.075mm)	2023/05/23		99	%	90 - 110
8674480	BBD	Method Blank	Sieve - #200 (>0.075mm)	2023/05/23	<1		%	
			Sieve - Pan	2023/05/23	99,RDL=1		%	
8674480	BBD	RPD [VVG659-01]	Sieve - #200 (>0.075mm)	2023/05/23	12		%	25
			Sieve - Pan	2023/05/23	35 (2)		%	25
8674494	AA0	Matrix Spike [VVG659-04]	Decachlorobiphenyl	2023/05/23		89	%	70 - 130
			Aroclor 1254	2023/05/23		90	%	70 - 130
8674494	AA0	Spiked Blank	Decachlorobiphenyl	2023/05/23		110	%	70 - 130
			Aroclor 1254	2023/05/23		110	%	70 - 130
8674494	AA0	Method Blank	Decachlorobiphenyl	2023/05/23		112	%	70 - 130
			Aroclor 1016	2023/05/23	<0.050		ug/g	
			Aroclor 1221	2023/05/23	<0.050		ug/g	
			Aroclor 1232	2023/05/23	<0.050		ug/g	
			Aroclor 1248	2023/05/23	<0.050		ug/g	
			Aroclor 1242	2023/05/23	<0.050		ug/g	
			Aroclor 1254	2023/05/23	<0.050		ug/g	
			Aroclor 1260	2023/05/23	<0.050		ug/g	
8674494	AA0	RPD [VVG659-04]	Aroclor 1016	2023/05/23	NC		%	50
			Aroclor 1221	2023/05/23	NC		%	50
			Aroclor 1232	2023/05/23	NC		%	50

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Aroclor 1248	2023/05/23	NC		%	50
			Aroclor 1242	2023/05/23	NC		%	50
			Aroclor 1254	2023/05/23	NC		%	50
			Aroclor 1260	2023/05/23	NC		%	50
8674540	JHY	Matrix Spike [VVG662-01]	Acid Extractable Antimony (Sb)	2023/05/19		95	%	75 - 125
			Acid Extractable Arsenic (As)	2023/05/19		92	%	75 - 125
			Acid Extractable Barium (Ba)	2023/05/19		91	%	75 - 125
			Acid Extractable Beryllium (Be)	2023/05/19		90	%	75 - 125
			Acid Extractable Bismuth (Bi)	2023/05/19		92	%	75 - 125
			Acid Extractable Boron (B)	2023/05/19		88	%	75 - 125
			Acid Extractable Cadmium (Cd)	2023/05/19		93	%	75 - 125
			Acid Extractable Chromium (Cr)	2023/05/19		92	%	75 - 125
			Acid Extractable Cobalt (Co)	2023/05/19		93	%	75 - 125
			Acid Extractable Copper (Cu)	2023/05/19		109	%	75 - 125
			Acid Extractable Lead (Pb)	2023/05/19		88	%	75 - 125
			Acid Extractable Lithium (Li)	2023/05/19		93	%	75 - 125
			Acid Extractable Manganese (Mn)	2023/05/19		NC	%	75 - 125
			Acid Extractable Mercury (Hg)	2023/05/19		93	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2023/05/19		81	%	75 - 125
			Acid Extractable Nickel (Ni)	2023/05/19		96	%	75 - 125
			Acid Extractable Rubidium (Rb)	2023/05/19		93	%	75 - 125
			Acid Extractable Selenium (Se)	2023/05/19		94	%	75 - 125
			Acid Extractable Silver (Ag)	2023/05/19		129 (3)	%	75 - 125
			Acid Extractable Strontium (Sr)	2023/05/19		91	%	75 - 125
			Acid Extractable Thallium (Tl)	2023/05/19		95	%	75 - 125
			Acid Extractable Tin (Sn)	2023/05/19		91	%	75 - 125
			Acid Extractable Uranium (U)	2023/05/19		94	%	75 - 125
			Acid Extractable Vanadium (V)	2023/05/19		89	%	75 - 125
			Acid Extractable Zinc (Zn)	2023/05/19		NC	%	75 - 125
8674540	JHY	Spiked Blank	Acid Extractable Antimony (Sb)	2023/05/19		96	%	75 - 125
			Acid Extractable Arsenic (As)	2023/05/19		96	%	75 - 125
			Acid Extractable Barium (Ba)	2023/05/19		92	%	75 - 125
			Acid Extractable Beryllium (Be)	2023/05/19		91	%	75 - 125
			Acid Extractable Bismuth (Bi)	2023/05/19		96	%	75 - 125
			Acid Extractable Boron (B)	2023/05/19		92	%	75 - 125
			Acid Extractable Cadmium (Cd)	2023/05/19		96	%	75 - 125
			Acid Extractable Chromium (Cr)	2023/05/19		94	%	75 - 125
			Acid Extractable Cobalt (Co)	2023/05/19		95	%	75 - 125
			Acid Extractable Copper (Cu)	2023/05/19		94	%	75 - 125
			Acid Extractable Lead (Pb)	2023/05/19		94	%	75 - 125
			Acid Extractable Lithium (Li)	2023/05/19		94	%	75 - 125
			Acid Extractable Manganese (Mn)	2023/05/19		96	%	75 - 125
			Acid Extractable Mercury (Hg)	2023/05/19		95	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2023/05/19		97	%	75 - 125
			Acid Extractable Nickel (Ni)	2023/05/19		97	%	75 - 125
			Acid Extractable Rubidium (Rb)	2023/05/19		94	%	75 - 125
			Acid Extractable Selenium (Se)	2023/05/19		98	%	75 - 125
			Acid Extractable Silver (Ag)	2023/05/19		95	%	75 - 125
			Acid Extractable Strontium (Sr)	2023/05/19		97	%	75 - 125
			Acid Extractable Thallium (Tl)	2023/05/19		96	%	75 - 125
			Acid Extractable Tin (Sn)	2023/05/19		97	%	75 - 125
			Acid Extractable Uranium (U)	2023/05/19		96	%	75 - 125
			Acid Extractable Vanadium (V)	2023/05/19		96	%	75 - 125
			Acid Extractable Zinc (Zn)	2023/05/19		95	%	75 - 125
8674540	JHY	Method Blank	Acid Extractable Aluminum (Al)	2023/05/19	<10		mg/kg	

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Antimony (Sb)	2023/05/19	<2.0		mg/kg	
			Acid Extractable Arsenic (As)	2023/05/19	<2.0		mg/kg	
			Acid Extractable Barium (Ba)	2023/05/19	<5.0		mg/kg	
			Acid Extractable Beryllium (Be)	2023/05/19	<1.0		mg/kg	
			Acid Extractable Bismuth (Bi)	2023/05/19	<2.0		mg/kg	
			Acid Extractable Boron (B)	2023/05/19	<50		mg/kg	
			Acid Extractable Cadmium (Cd)	2023/05/19	<0.30		mg/kg	
			Acid Extractable Chromium (Cr)	2023/05/19	<2.0		mg/kg	
			Acid Extractable Cobalt (Co)	2023/05/19	<1.0		mg/kg	
			Acid Extractable Copper (Cu)	2023/05/19	<2.0		mg/kg	
			Acid Extractable Iron (Fe)	2023/05/19	<50		mg/kg	
			Acid Extractable Lead (Pb)	2023/05/19	<0.50		mg/kg	
			Acid Extractable Lithium (Li)	2023/05/19	<2.0		mg/kg	
			Acid Extractable Manganese (Mn)	2023/05/19	<2.0		mg/kg	
			Acid Extractable Mercury (Hg)	2023/05/19	<0.10		mg/kg	
			Acid Extractable Molybdenum (Mo)	2023/05/19	<2.0		mg/kg	
			Acid Extractable Nickel (Ni)	2023/05/19	<2.0		mg/kg	
			Acid Extractable Rubidium (Rb)	2023/05/19	<2.0		mg/kg	
			Acid Extractable Selenium (Se)	2023/05/19	<0.50		mg/kg	
			Acid Extractable Silver (Ag)	2023/05/19	<0.50		mg/kg	
			Acid Extractable Strontium (Sr)	2023/05/19	<5.0		mg/kg	
			Acid Extractable Thallium (Tl)	2023/05/19	<0.10		mg/kg	
			Acid Extractable Tin (Sn)	2023/05/19	<1.0		mg/kg	
			Acid Extractable Uranium (U)	2023/05/19	<0.10		mg/kg	
			Acid Extractable Vanadium (V)	2023/05/19	<2.0		mg/kg	
			Acid Extractable Zinc (Zn)	2023/05/19	<5.0		mg/kg	
8674540	JHY	RPD [VVG662-01]	Acid Extractable Aluminum (Al)	2023/05/19	2.3		%	35
			Acid Extractable Antimony (Sb)	2023/05/19	NC		%	35
			Acid Extractable Arsenic (As)	2023/05/19	11		%	35
			Acid Extractable Barium (Ba)	2023/05/19	9.8		%	35
			Acid Extractable Beryllium (Be)	2023/05/19	NC		%	35
			Acid Extractable Bismuth (Bi)	2023/05/19	NC		%	35
			Acid Extractable Boron (B)	2023/05/19	NC		%	35
			Acid Extractable Cadmium (Cd)	2023/05/19	NC		%	35
			Acid Extractable Chromium (Cr)	2023/05/19	18		%	35
			Acid Extractable Cobalt (Co)	2023/05/19	6.1		%	35
			Acid Extractable Copper (Cu)	2023/05/19	32		%	35
			Acid Extractable Iron (Fe)	2023/05/19	3.4		%	35
			Acid Extractable Lead (Pb)	2023/05/19	12		%	35
			Acid Extractable Lithium (Li)	2023/05/19	8.3		%	35
			Acid Extractable Manganese (Mn)	2023/05/19	15		%	35
			Acid Extractable Mercury (Hg)	2023/05/19	NC		%	35
			Acid Extractable Molybdenum (Mo)	2023/05/19	14		%	35
			Acid Extractable Nickel (Ni)	2023/05/19	12		%	35
			Acid Extractable Rubidium (Rb)	2023/05/19	NC		%	35
			Acid Extractable Selenium (Se)	2023/05/19	NC		%	35
			Acid Extractable Silver (Ag)	2023/05/19	145 (4)		%	35
			Acid Extractable Strontium (Sr)	2023/05/19	8.5		%	35
			Acid Extractable Thallium (Tl)	2023/05/19	NC		%	35
			Acid Extractable Tin (Sn)	2023/05/19	NC		%	35
			Acid Extractable Uranium (U)	2023/05/19	1.7		%	35
			Acid Extractable Vanadium (V)	2023/05/19	2.1		%	35
			Acid Extractable Zinc (Zn)	2023/05/19	3.7		%	35
8678367	BBD	QC Standard	Organic Carbon (TOC)	2023/05/23		102	%	75 - 125
8678367	BBD	Method Blank	Organic Carbon (TOC)	2023/05/23	<0.50		g/kg	

Bureau Veritas 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.bvna.com

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8678367	BBD	RPD	Organic Carbon (TOC)	2023/05/23	1.3		%	35
8678614	AA0	Matrix Spike	Decachlorobiphenyl	2023/05/25		103	%	70 - 130
			Aroclor 1254	2023/05/25		116	%	70 - 130
8678614	AA0	Spiked Blank	Decachlorobiphenyl	2023/05/25		115	%	70 - 130
			Aroclor 1254	2023/05/25		116	%	70 - 130
8678614	AA0	Method Blank	Decachlorobiphenyl	2023/05/25		96	%	70 - 130
			Aroclor 1016	2023/05/25	<0.050		ug/g	
			Aroclor 1221	2023/05/25	<0.050		ug/g	
			Aroclor 1232	2023/05/25	<0.050		ug/g	
			Aroclor 1248	2023/05/25	<0.050		ug/g	
			Aroclor 1242	2023/05/25	<0.050		ug/g	
			Aroclor 1254	2023/05/25	<0.050		ug/g	
			Aroclor 1260	2023/05/25	<0.050		ug/g	
8678614	AA0	RPD	Aroclor 1016	2023/05/25	NC		%	50
			Aroclor 1221	2023/05/25	NC		%	50
			Aroclor 1232	2023/05/25	NC		%	50
			Aroclor 1248	2023/05/25	NC		%	50
			Aroclor 1242	2023/05/25	NC		%	50
			Aroclor 1254	2023/05/25	NC		%	50
			Aroclor 1260	2023/05/25	NC		%	50
8678848	MSK	Matrix Spike	Isobutylbenzene - Extractable	2023/05/23		93	%	60 - 130
			n-Dotriacontane - Extractable	2023/05/23		75	%	60 - 130
			>C10-C16 Hydrocarbons	2023/05/23		92	%	30 - 130
			>C16-C21 Hydrocarbons	2023/05/23		89	%	30 - 130
			>C21-<C32 Hydrocarbons	2023/05/23		77	%	30 - 130
8678848	MSK	Spiked Blank	Isobutylbenzene - Extractable	2023/05/23		108	%	60 - 130
			n-Dotriacontane - Extractable	2023/05/23		84	%	60 - 130
			>C10-C16 Hydrocarbons	2023/05/23		104	%	60 - 130
			>C16-C21 Hydrocarbons	2023/05/23		100	%	60 - 130
			>C21-<C32 Hydrocarbons	2023/05/23		87	%	60 - 130
8678848	MSK	Method Blank	Isobutylbenzene - Extractable	2023/05/23		90	%	60 - 130
			n-Dotriacontane - Extractable	2023/05/23		81	%	60 - 130
			>C10-C16 Hydrocarbons	2023/05/23	<10		mg/kg	
			>C16-C21 Hydrocarbons	2023/05/23	<10		mg/kg	
			>C21-<C32 Hydrocarbons	2023/05/23	<15		mg/kg	
8678848	MSK	RPD	>C10-C16 Hydrocarbons	2023/05/23	NC		%	50
			>C16-C21 Hydrocarbons	2023/05/23	NC		%	50
			>C21-<C32 Hydrocarbons	2023/05/23	NC		%	50
8678963	A1M	Matrix Spike [VVG660-02]	Isobutylbenzene - Volatile	2023/05/24		122	%	60 - 130
			Benzene	2023/05/24		94	%	60 - 130
			Toluene	2023/05/24		93	%	60 - 130
			Ethylbenzene	2023/05/24		101	%	60 - 130
			Total Xylenes	2023/05/24		102	%	60 - 130
8678963	A1M	Spiked Blank	Isobutylbenzene - Volatile	2023/05/24		101	%	60 - 130
			Benzene	2023/05/24		95	%	60 - 140
			Toluene	2023/05/24		101	%	60 - 140
			Ethylbenzene	2023/05/24		99	%	60 - 140
			Total Xylenes	2023/05/24		102	%	60 - 140
8678963	A1M	Method Blank	Isobutylbenzene - Volatile	2023/05/23		102	%	60 - 130
			Benzene	2023/05/23	<0.0050		mg/kg	
			Toluene	2023/05/23	<0.050		mg/kg	
			Ethylbenzene	2023/05/23	<0.010		mg/kg	
			Total Xylenes	2023/05/23	<0.050		mg/kg	
			C6 - C10 (less BTEX)	2023/05/23	<2.5		mg/kg	
8678963	A1M	RPD [VVG660-02]	Benzene	2023/05/24	NC		%	50

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Toluene	2023/05/24	NC		%	50
			Ethylbenzene	2023/05/24	NC		%	50
			Total Xylenes	2023/05/24	NC		%	50
			C6 - C10 (less BTEX)	2023/05/24	NC		%	50
8679190	MSK	Matrix Spike	Isobutylbenzene - Extractable	2023/05/24		93	%	60 - 130
			n-Dotriacontane - Extractable	2023/05/24		111	%	60 - 130
			>C10-C16 Hydrocarbons	2023/05/24		122	%	30 - 130
			>C16-C21 Hydrocarbons	2023/05/24		126	%	30 - 130
			>C21-<C32 Hydrocarbons	2023/05/24		NC	%	30 - 130
8679190	MSK	Spiked Blank	Isobutylbenzene - Extractable	2023/05/23		101	%	60 - 130
			n-Dotriacontane - Extractable	2023/05/23		113	%	60 - 130
			>C10-C16 Hydrocarbons	2023/05/23		108	%	60 - 130
			>C16-C21 Hydrocarbons	2023/05/23		108	%	60 - 130
			>C21-<C32 Hydrocarbons	2023/05/23		98	%	60 - 130
8679190	MSK	Method Blank	Isobutylbenzene - Extractable	2023/05/23		91	%	60 - 130
			n-Dotriacontane - Extractable	2023/05/23		102	%	60 - 130
			>C10-C16 Hydrocarbons	2023/05/23	<10		mg/kg	
			>C16-C21 Hydrocarbons	2023/05/23	<10		mg/kg	
			>C21-<C32 Hydrocarbons	2023/05/23	<15		mg/kg	
8679190	MSK	RPD	>C10-C16 Hydrocarbons	2023/05/24	26		%	50
			>C16-C21 Hydrocarbons	2023/05/24	26		%	50
			>C21-<C32 Hydrocarbons	2023/05/24	4.8		%	50
8680834	A1M	Matrix Spike	Isobutylbenzene - Volatile	2023/05/24		115	%	60 - 130
			Benzene	2023/05/24		98	%	60 - 130
			Toluene	2023/05/24		96	%	60 - 130
			Ethylbenzene	2023/05/24		103	%	60 - 130
			Total Xylenes	2023/05/24		100	%	60 - 130
8680834	A1M	Spiked Blank	Isobutylbenzene - Volatile	2023/05/24		99	%	60 - 130
			Benzene	2023/05/24		89	%	60 - 140
			Toluene	2023/05/24		92	%	60 - 140
			Ethylbenzene	2023/05/24		90	%	60 - 140
			Total Xylenes	2023/05/24		92	%	60 - 140
8680834	A1M	Method Blank	Isobutylbenzene - Volatile	2023/05/24		84	%	60 - 130
			Benzene	2023/05/24	<0.0050		mg/kg	
			Toluene	2023/05/24	<0.050		mg/kg	
			Ethylbenzene	2023/05/24	<0.010		mg/kg	
			Total Xylenes	2023/05/24	<0.050		mg/kg	
			C6 - C10 (less BTEX)	2023/05/24	<2.5		mg/kg	
8680834	A1M	RPD	Benzene	2023/05/24	NC		%	50
			Toluene	2023/05/24	NC		%	50
			Ethylbenzene	2023/05/24	NC		%	50
			Total Xylenes	2023/05/24	NC		%	50
			C6 - C10 (less BTEX)	2023/05/24	NC		%	50
8681281	SB5	Matrix Spike	Chromium (VI)	2023/05/24		64 (5)	%	70 - 130
8681281	SB5	Spiked Blank	Chromium (VI)	2023/05/24		91	%	80 - 120
8681281	SB5	Method Blank	Chromium (VI)	2023/05/24	<0.18		ug/g	

Bureau Veritas 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.bvna.com

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8681281	SB5	RPD	Chromium (VI)	2023/05/24	NC		%	35

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) PAH surrogate(s) not within acceptance limits. Sample past recommended hold time for repeat analysis.

(2) %RPD acceptable. Duplicate values agree within 10% absolute.

(3) Recovery is within QC acceptance limits. < 10 % of compounds in multi-component analysis in violation.

(4) Poor RPD due to sample inhomogeneity. Verified by repeat digestion and analysis.

(5) The matrix spike recovery was below the lower control limit.This may be due in part to the reducing environment of the sample.The sample was re-analyzed with the same results

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Anastassia Hamanov, Scientific Specialist

Mike MacGillivray, Scientific Specialist (Inorganics)

Phil Deveau, Scientific Specialist (Organics)

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by {0}, {1} responsible for {2} {3} laboratory operations.

Appendix E

Species at Risk Review

DILLON CONSULTING

Roche, Michelle <mroche@dillon.ca>

RE: New Data Request: 2023-04-18 18:18:27

Durocher, Adam <AdamDurocher@gov.nl.ca> 27 April 2023 at 09:57
To: "mroche@dillon.ca" <mroche@dillon.ca>

Hi Michelle,
Attached are the data request results for your Cooper Cove point of interest at the Port of Argentia in Newfoundland & Labrador.

Summary: Within 5km of your point of interest, there were 15 rare animal records and 8 rare plant records found. Of these 8 rare plant records, 5 of them are for Water Pygmyweed (Tillaea aquatica), a plant listed as Vulnerable under our provincial Endangered Species Act (ESA). The other plant records are for plants which are not found on the provincial ESA or federal COSEWIC lists, and outside of Newfoundland and Labrador, none of them are considered globally rare.

As for the 15 rare animal records, there was 1 Lesser Yellowlegs record (Threatened under COSEWIC), 1 Harlequin Duck record (Special Concern under COSEWIC, Vulnerable under our ESA), and 4 Short-eared Owl records (Threatened under COSEWIC, Vulnerable under our ESA). The remaining animal records are for species which are not found on the provincial ESA or federal COSEWIC lists, but they are considered rare on the Island of Newfoundland.

Secondly, our Expert Opinion Maps are the result of our work with species-specific experts to gather suggestions about locations where species at risk - either provincially or COSEWIC listed - may be found. While we don't have observations in our database for these species within your study area, our Expert Opinion Maps suggest that Boreal Felt Lichen, Red Crossbills, and Rusty Blackbirds are possible; while Banded Killifish are possible, but unlikely. Your area is also said to be within the Barrow's Goldeneye's range.

For more information, including a map of the area showing the locations of the rare flora and rare fauna, please refer to the following attached documents:
Map.jpg - shows the locations of the rare fauna, rare flora and the 5 km buffer around the point of interest.
RareFauna.xls - a list of rare animal records, including their SRANK, NRANK, GRANK and habitats.
RareFlora.xls - a list of the rare plant records, including their SRANK, NRANK, GRANK and habitats.
Data Dictionary.doc - explains the various columns in RareFlora.xls and RareFauna.xls.
Ranking.rtf - explains the S, N and GRANKS.
Herbaria.xls - A list of herbariums in case you would like to follow up on the specimens included in this request.
Caveats.doc - The fine print - please read. This is also included at the end of this email.
RQ1044.pdf - Invoice for the data request.

Please do not hesitate to contact me if you have any questions.

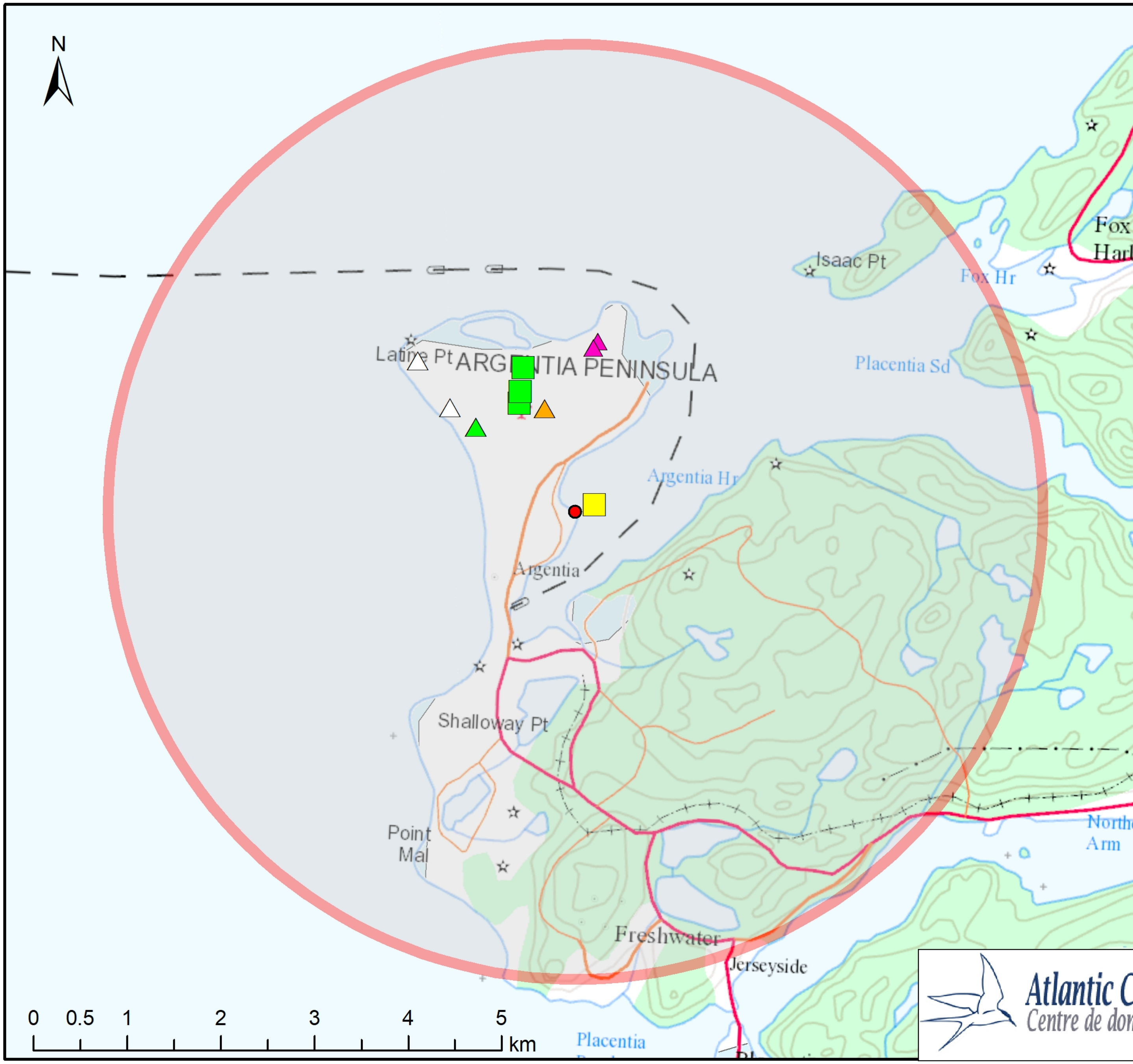
Adam Durocher
Data Manager
Atlantic Canada Conservation Data Centre
Corner Brook, NL
709-637-2494

DATA SOURCES:
All data housed at Atlantic Canada Conservation Data Centre (ACCDC). Refer to the 'CITATION' field for data sources.

CAVEATS:
ACCDC rare taxa occurrence records are offered as a guide recognizing that the ability to find plants and animals will depend upon the season. The ACCDC makes a strong effort to verify the accuracy of all the data it obtains, generates and manages, but it will not be held responsible for inaccuracies in data that it provides.

PLEASE NOTE:
* ACCDC data is restricted for use by the specified data user only; any third party requiring data must make its own request to the ACCDC.
* Specified data users may not publish any information provided by the ACCDC or its partners without prior permission.
* To ensure the currency of the data, the ACCDC requires Data Users to destroy all copies of data 18 months after the date of receipt.
* ACCDC data reports are restricted to that data in our Data System at the time of the request.

GIS Scan of Rare and Provincially/Federally Listed Species for Cooper Cove at the Port of Argentia in Newfoundland and Labrador



Legend

- Point of Interest (POI)
- 5 km Buffer Around POI

Rare Fauna

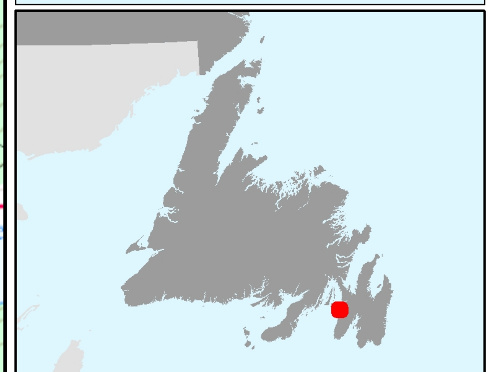
- 1000m Accuracy
- 2500m Accuracy

Rare Flora

- 10m Accuracy
- 25m Accuracy
- 100m Accuracy
- 1000m Accuracy

Atlantic Canada Conservation Data Centre
April 27, 2023
For: Dillon Consulting
Data Request: RQ1044

Datum: Transverse Mercator NAD83
Note: Interpretations of this map should always be conducted in relation with data provided in spreadsheets and any other communications.



Atlantic Canada Conservation Data Centre
Centre de données sur la conservation du Canada atlantique

* Data accuracy is qualified as to location (Accuracy) and time (Date)
* ACCDC data reports are not to be constructed as exhaustive inventories of taxa in an area.
* The non-occupancy of a taxon cannot be inferred by its absence in an ACCDC data report.
* Museum databases, which are the basis for more accessible public databases, such as those of the ACCDC, are works in progress. Essentially, they are finding aids and dynamic data records, constructed primarily to serve scientists engaged in the continuing, active process of plant systematics and taxonomy. Ongoing additions of new collections, and frequent upgrades to the identifications of all plant specimens housed in museum herbaria, may not always be reflected, in real time, by databases such as those of the ACCDC. Specifically, the conservation status of individual species recorded in the ACCDC database may not be absolutely current. It is therefore the responsibility of the data user to contact the relevant museums directly, in order to check for the most current identifications of specimens of interest, and to ascertain from the scientists concerned, their current understanding of the conservation status of individual species in question. The absolute conservation status of any given species is dynamic, and subject to change over short periods of time.

-----Original Message-----
From: Charity Robicheau <charity.robicheau@accdc.ca>
Sent: Tuesday, April 18, 2023 3:50 PM
To: Durocher, Adam <AdamDurocher@gov.nl.ca>
Subject: FW: New Data Request: 2023-04-18 18:18:27

CAUTION :This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.
Hi Adam,

Here's a data request!

Charity

Charity Robicheau
Conservation Data Analyst
Atlantic Canada Conservation Data Centre (AC CDC) charity.robicheau@accdc.ca

-----Original Message-----
From: James Churchill <James.Churchill@accdc.ca>
Sent: Tuesday, April 18, 2023 3:19 PM
To: Jocelyn Pender <jocelyn.pender@accdc.ca>; Charity Robicheau <charity.robicheau@accdc.ca>
Subject: FW: New Data Request: 2023-04-18 18:18:27

From: Apache <apache@webserv2.mta.ca>
Sent: Tuesday, April 18, 2023 3:18:28 PM (UTC-04:00) Atlantic Time (Canada)
To: James Churchill
Subject: New Data Request: 2023-04-18 18:18:27

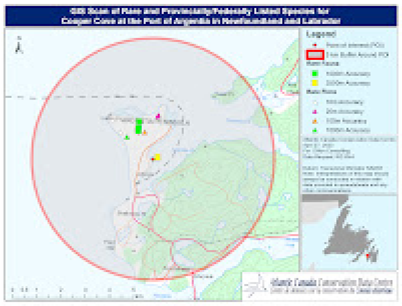
New Data Request:

name: Michelle Roche
company: Dillon Consulting
phone: 7097646863
email: mroche@dillon.ca
email2: mroche@dillon.ca
jobnum: 21-3088-1402
area: Port of Argentia
details: Cooper Cove Species at Risk Survey
lat: 47.2993337
lon: -53.9827741
comment:
asap: standard

“This email and any attached files are intended for the sole use of the primary and copied addressee(s) and may contain privileged and/or confidential information. Any distribution, use or copying by any means of this information is strictly prohibited. If you received this email in error, please delete it immediately and notify the sender.”

---

8 attachments



Map.jpg
1992K

RQ1044.pdf
335K

RareFauna.xls
36K

RareFlora.xls
41K

Caveats.doc
27K

DATA DICTIONARY.doc
34K

herbaria.xls
24K

RANKING.rtf
194K

Atlantic Canada CDC Canada Atlantique

Atlantic Canada
Conservation Data Centre
~~~~~~~~~~~~~~~~~~~~
Centre de données sur
la conservation du
Canada Atlantique

Accounts Receivable
ATTN Jean Breau
PO Box 6416
Sackville NB
E4L 1G6 CANADA

tel. 506-364-2657
jean.breau@accdc.ca

INVOICE

Invoice: RQ1044
Date: 27 Apr 2023

From: Atlantic Canada Conservation Data Centre (NL)
To: Dillon Consulting
Contact: Michelle Roche

Re: Cooper Cove, Port of Argentia - Rare Taxa Report
Project no.: 21-3088-1402
Amount: **$150.00**

Details:	unit	cost
Assemble, present and report data from GIS scan	1.00	$150.00
TOTAL	**1.00**	**$150.00**

Terms: HST not payable. A late-payment charge of 2% per month will be charged on past-due accounts.

Please make cheque payable to:

Atlantic Canada Conservation Data Centre
PO Box 6416
Sackville, New Brunswick E4L 1G6
CANADA

Please address any queries to Jean Breau, (506) 364-2657.

Thank you.
~~~~~~~~~~~~~~~~~~~~

GNAME	GCOMNAME	FAMILY	Observer	TotalNumber	Month	Day
Asio flammeus	Short-eared Owl	Strigidae		2	7	0
Histrionicus histrionicus	Harlequin Duck	Anatidae		1	1	25
Asio flammeus	Short-eared Owl	Strigidae	Bruce Mactavish		7	20
Asio flammeus	Short-eared Owl	Strigidae	Bruce Mactavish		7	23
Pluvialis dominica	American Golden-Plove	Charadriida	Bruce Mactavish,	2	9	2
Pluvialis squatarola	Black-bellied Plover	Charadriida	Bruce Mactavish,	1	9	2
Asio flammeus	Short-eared Owl	Strigidae	Bruce Mactavish	1	7	17
Eremophila alpestris	Horned Lark	Alaudidae	Bruce Mactavish	10	7	17
Circus hudsonius	Northern Harrier	Accipitridae	Bruce Mactavish	1	9	5
Pluvialis squatarola	Black-Bellied Plover	Charadriida	Bruce Mactavish	15	8	18
Tringa flavipes	Lesser Yellowlegs	Scolopacida	Bruce Mactavish	1	8	18
Circus hudsonius	Northern Harrier	Accipitridae	Bruce Mactavish	1	8	18
Tringa melanoleuca	Greater Yellowlegs	Scolopacida	Bruce Mactavish	3	8	18
Calidris alba	Sanderling	Scolopacida	Bruce Mactavish	4	9	5
Pluvialis dominica	American Golden-Plove	Charadriida	Bruce Mactavish	3	9	5

Year	SRANK_2015	SRANK_2	NRANK	GRANK	GeneralStat	COSEWIC_ST	PROVINCIAL
1991	S3B,SUM	S3B	N4B,N3N,N	G5	Secure	Threatened	Vulnerable
1947	S3B, S2N,SUM	S3B,S2N	N4B,N3N,N	G4	Secure	Special Concern	Vulnerable
2019	S3B,SUM	S3B	N4B,N3N,N	G5	Secure	Threatened	Vulnerable
2019	S3B,SUM	S3B	N4B,N3N,N	G5	Secure	Threatened	Vulnerable
2020	S3M	S4N	N4N5B,N5M	G5	Secure		
2020	S3M	S4N	N3B,N5N,N	G5	Secure		
2021	S3B,SUM	S3B	N4B,N3N,N	G5	Secure	Threatened	Vulnerable
2021	S3B,SUM	S4B	N5B,N5N,N	G5	Secure		
2020	S3B,SUM	S3?B	N5B,N4N	G5	Secure		
2021	S3M	S4N	N3B,N5N,N	G5	Secure		
2021	S3M	S3N	N4N5B,N5M	G5	Secure	Threatened	
2021	S3B,SUM	S3?B	N5B,N4N	G5	Secure		
2021	S3B, S4M	S4B,S5M	N5B,N4N,N	G5	Secure		
2020	S3M	S4N	N3B,N4N5N	G5	Secure		
2020	S3M	S4N	N4N5B,N5M	G5	Secure		

SARA	DESCR_HABIT	SITE_NAME		Accuracy	SYNAME
Special Concern	airbase			1000	
Special Concern			Argentia	2500	
Special Concern				1000	
Special Concern				1000	
				1000	
				1000	
Special Concern				1000	
				1000	
				1000	
				1000	
				1000	
				1000	
				1000	
				1000	
				1000	

CITATION	IDNUM
Canadian Wildlife Service	mstr1009443
Montevecchi list	mstr1006198
nf.birds, Jul 20, 2019	mstr1055739
nf.birds, Jul 23, 2019	mstr1055741
nf.birds, Sep 2, 2020	mstr1056971
nf.birds, Sep 2, 2020	mstr1056972
nf.birds, Jul 17, 2021	mstr1061861
nf.birds, Jul 17, 2021	mstr1061862
nf.birds, Sep 5, 2020	mstr1061730
nf.birds, Aug 18, 2021	mstr1061886
nf.birds, Aug 18, 2021	mstr1061887
nf.birds, Aug 18, 2021	mstr1061888
nf.birds, Aug 18, 2021	mstr1061889
nf.birds, Sep 5, 2020	mstr1061726
nf.birds, Sep 5, 2020	mstr1061727

GNAME	GCOMNAME	OBSERVER	MONTH	DAY	YEAR
Crassula aquatica	Water Pigmy-Weed	Fernald, M.L., B. Long, B.	8	26	1924
Stuckenia pectinata	sago pondweed	Fernald, M.L., B. Long, B.	8	26	1924
Suaeda maritima	Maritime Sea-blite	Fernald, M.L., B. Long, B.	8	26	1924
Diphasiastrum digitatum	southern running-pine	Bouchard, A., S. Hay, L. B	7	15	1988
Crassula aquatica	Water Pigmy-Weed	J. E. Maunder	9	20	2006
Crassula aquatica	Water Pigmy-Weed	J. E. Maunder	9	20	2006
Crassula aquatica	Water Pigmy-Weed	John Maunder, Susan Mau	8	17	2020
Crassula aquatica	Water Pigmy-Weed	John Maunder, Susan Mau	8	17	2020

Verification	SRANK_2010	SRANK_2015	NRANK	GRANK	FAMILY
v	S1	S1	N4N5	G5	Crassulaceae
v	S2	S2S3	N5	G5	Potamogetonace
v	S3	S3	N5	G5	Amaranthaceae
v	S2	S2	N5	G5	Lycopodiaceae
v	S1	S1	N4N5	G5	Crassulaceae
v	S1	S1	N4N5	G5	Crassulaceae
v	S1	S1	N4N5	G5	Crassulaceae
v	S1	S1	N4N5	G5	Crassulaceae

PROV_END_A	COSEWIC	DESCR_HABITA	ACCURACY_ME	SYNAME	SITE_NAME
Vulnerable		Sandy and peaty	1000	Crassula aquatic	Argentia
		Sandy and peaty	1000	Potamogeton pe	Argentia
		Damp depressio	1000		Argentia
		In turfy gravel; ol	100	Lycopodium digit	Argentia
Vulnerable		Shallow depress	10	Crassula aquatic	Argentia
Vulnerable		Shallow depress	10	Crassula aquatic	Argentia
Vulnerable		in cracks and de	25	Crassula aquatic	Airstrip, NE end,
Vulnerable		in cracks and de	25	Crassula aquatic	Airstrip, NE end,

SURVEYSITE	ACRONYMS_O	COLLECTION	SOURCES	IDNUM	EST_NF_ID
Argentia.	GH	26737	Bouchard, A. Da	SP024093	975829
Argentia.	GH	26229	Bouchard, A. Da	SP026226	448307
Argentia.	GH	26645	Bouchard, A. Da	SP024028	636771
Argentia.	MT; CAN	88044	Bouchard, A. Da	SP026422	376418
Argentia, Argentia Pe			Water Pygmywe	SP068700	975829
Argentia, Argentia Pe			Water Pygmywe	SP068701	975829
			Email correspon	SP095784	975829
			Email correspon	SP095785	975829

DATA SOURCES:
All data housed at Atlantic Canada Conservation Data Centre (ACCDC). Refer to 'CITATION' field for data sources.

CAVEATS:
ACCDC rare taxa occurrence records are offered as a guide recognizing that the ability to find plants and animals will depend upon the season. The ACCDC makes a strong effort to verify the accuracy of all the data it obtains, generates and manages, but it will not be held responsible for inaccuracies in data that it provides.

PLEASE NOTE:
* ACCDC data is restricted for use by the specified data user only; any third party requiring data must make its own request to the ACCDC.
* Specified data users may not publish any information provided by the ACCDC or its partners without prior permission.
* To ensure the currency of the data, the ACCDC requires Data Users to destroy all copies of data 18 months after the date of receipt.
* ACCDC data reports are restricted to that data in our Data System at the time of the request.
* Data accuracy is qualified as to location (Accuracy) and time (Date)
* ACCDC data reports are not to be constructed as exhaustive inventories of taxa in an area.
* The non-occupancy of a taxon cannot be inferred by its absence in an ACCDC data report.
* Museum databases, which are the basis for more accessible public databases, such as those of the ACCDC, are works in progress. Essentially, they are finding aids and dynamic data records, constructed primarily to serve scientists engaged in the continuing, active process of plant systematics and taxonomy. Ongoing additions of new collections, and frequent upgrades to the identifications of all plant specimens housed in museum herbaria, may not always be reflected, in real time, by databases such as those of the ACCDC. Specifically, the conservation status of individual species recorded in the ACCDC database may not be absolutely current. It is therefore the responsibility of the data user to contact the relevant museums directly, in order to check for the most current identifications of specimens of interest, and to ascertain from the scientists concerned, their current understanding of the conservation status of individual species in question. The absolute conservation status of any given species is dynamic, and subject to change over short periods of time.

DATA DICTIONARY

GNAME	Scientific Name of taxon
GCOMNAME	Common name of taxon
FAMILY	Family of taxon
OBSERVER	Person or persons who observed the taxon
TOTAL NUMBER	The number of specimens at a given observation.
MONTH	Month of survey
DAY	Day of survey
YEAR	Year of survey
SRANK_2010	Subnational rank - CDC ranking system
SRANK_2015	Subnational rank - CDC ranking system
NRANK	National Rank - CDC ranking system
GRANK	Global Rank - CDC ranking system
GeneralStatusRanks	General Status text for the province
COSEWIC_STATUS	Denotes the COSEWIC status.
PROVINCIAL_STATUS	Denotes if the species is on the provincial endangered species list.
SARA	Denotes if the species is on the federal SARA list.
HABITAT	Description of the habitat where plant or animal was found
SITE_NAME	The name of the place where the occurrence occurred
ACCURACY	The accuracy in metres of the location.
SYNAME	Synonym for the plant or animal name in cases it is known by more than one scientific name.
ACRONYM OF HERBARIA	Acronym of the herbarium where this specimen is kept, see the complete definitions of the acronyms in the HERBARIA.xls
COLLECTION NUMBER	The collection number assigned to the specimen by the collector, this should be used to refer to the specimen when contacting the herbarium
CITATION	Primary source of the data
IDNUM	Field Office Number: Internal ACCDC record reference (not the EONUM)

ACRONYM	HERBARIUM	ADDRESS	PO_BOX	CITY	PROVINCE	POSTALCODE
ACAD	Acadia University	32 University Avenue	P.O. Box 48	Wolfville	Nova Scotia	B4P 2R6
ALTA	University of Alberta			Edmonton	Alberta	T6G 2E9
CAN	Canadian Museum of Nature		P.O. Box 3443 Station D	Ottawa	Ontario	K1P 6P4
CO	Museum National d'Histoire Naturelle		B.P. 225	Concarneau		F-29125
DAO	Eastern Cereal and Oilseed Research Centre, Agriculture and Agri-Food Canada	Wm. Saunders Building, Central Experimental Farm		Ottawa	Ontario	K1A 0C6
FFB	Atlantic Forestry Centre	1350 Regent Street Centre, Canadian Forest Service	P. O. Box 4000	Fredricton	New Brunswick	E3B 5P7
GH	Gray Herbarium, Harvard University	22 Divinity Avenue		Cambridge	Massachusetts	02138-2020
GMNP	Gros Morne National Park		P.O. Box 130	Rocky Harbour	Newfoundland	A0K 4N0
H	University of Helsinki		P.O. Box 7	Helsinki		FIN-00014
LD	Botanical Museum	Östra Vallgatan 18		Lund		S-223 61
MB	Herbarium fur Spezielle Botanik, Philipps Universitat			Marburg		D-35032

MO	Missouri Botanical Gardens		P.O. Box 299	St. Louis	Missouri	63166-0299
MT	Herbier Marie-Victorin, Universite de Montreal	4101, rue Sherbrooke est		Montreal	Quebec	H1X 2B2
NASC	Massachusetts College of Liberal Arts	375 Church Street		North Adams	Massachusetts	01247-4100
NFLD	Ayre Herbarium, Memorial University of Newfoundland			St. John's	Newfoundland	A1B 3X9
NFM	Provincial Museum of Newfoundland and Labrador	9 Bonaventure Avenue	P.O. Box 1800	St. John's	Newfoundland	A1C 5P9
NY	New York Botanical Garden	William and Lynda Steere Herbarium		Bronx	New York	10458-5126
OAC	Univeristy of Guelph			Guelph	Ontario	N1G 2W1
QFA	Herbier Louis-Marie, Universite de Laval	Pavillon C.-E. Marchand Sainte-Foy		Quebec	Quebec	G1V 0A6
SLRO	Slippery Rock University	Herbarium Biology Department		Slippery Rock	Pennsylvania	16057-1326
SWGC	Sir Wilfred Grenfell College			Corner Brook	Newfoundland	
TNNP	Terra Nova National Park			Terra Nova	Newfoundland	
TRTE	Erindale College	Herbarium Department of Biology, 3359 Mississauga Road, N		Mississauga	Ontario	L5L 1C6

TSM	Museo Civico di Storia Naturale	Piazza Hortis 4		Trieste		I-34123
UAC	University of Calgary	Department of Biological Sciences		Calgary	Alberta	T2N 1N4
UBC	UBC Herbarium, Beaty Biodiversity Museum	3529-6270 University Boulevard		Vancouver	British Columbia	V6T 1Z4
UNB	University of New Brunswick	Connell Memorial Herbarium Biology Department	P.O. Box 4400	Fredricton	New Brunswick	E3B 5AE
US	Smithsonian Institute	United States National Herbarium Department of Botany NMNH, MRC-	P.O. Box 37012	Washington	District of Columbia	20013-7012
UWO	University of Western Ontario	Herbarium, Department of Biology		London	Ontario	N6A 5B7
WAT	University of Waterloo	Herbarium, Biology Department		Waterloo	Ontario	N2L 3G1

NOTE: All contact information presented here has been extracted from the online Herbaria of the World Index, url: http://sweetgum.nybg.org/ih/index.php fc

COUNTRY	URL	PHONE	CORRESPONDENT	TITLE	EMAIL
Canada		[1] 902/ 585-1335	Ruth Newell	Curator	ruth.newell@acadiau.ca
Canada	http://museums.ualberta.ca/vascularplants/index.aspx	[1] 780/ 492-5523	Jocelyn Hall	Curator of Vascular Plant Herbarium	jocelyn.hall@ualberta.ca
Canada		[1] 613/ 364-4076.	Jennifer Doubt	Chief Collection Manager	jdoubt@mus-nature.ca
France		[33] 2/ 98 97 0659	Marie Le Gal	Curator	ylegal@sb-roscoff.fr
Canada	http://res2.agr.ca/ecorc/dao/index_e.htm	[1] 613/ 759-1373	Paul Catling	Curator	catlingp@agr.gc.ca
Canada	http://www.Atl.cfs.NRCan.gc.ca	[1] 506/ 452-3515	J. Hurley	Curator	J.Edward.Hurley@NRCan.gc.ca
USA	http://www.huh.harvard.edu	[1] 617/ 495-2365	Emily Wood	Manager of Systematics Collections	ewood@oeb.harvard.edu
Canada		Contact [1] 709/ 458-2418	Michael Burzunski	Chief Park Interpreter	Michael.Burzynski@pc.gc.ca
Finland	http://www.fmnh.helsinki.fi/english/botany/index.htm	[358] 9/ 1911	Pertti Uotila	Director, Head Curator of Phanerogams	pertti.uotila@helsinki.fi
Sweden	http://www.biomus.lu.se/indexBe.html	[46] 46/ 222 95 58	Ingvar Kärnefelt	Director	ingvar.karnefelt@botmus.lu.se
Germany	http://staff-www.uni-marburg.de/	[49] 6421/ 282 2091	Hans Weber	Curator	weberh@mailer.uni-marburg.de

USA	http://www.mobot.org/	[1] 314/ 577-5169	James Solomon	Curator of Vascular Plants	jim.solomon@mobot.org
Canada	http://www.irbv.umontreal.ca/francais/herbier/accueil.htm	[1] 514/ 872-8496	Luc Brouillet	Curator	brouille@irbv.umontreal.ca; luc.brouillet@umontreal.ca
USA		[1] 413/ 662-5342	C. Hellquist	Curator of Vascular Plants	bhellqui@mcla.mass.edu
Canada		[1] 709/ 737-7498	Peter Scott	Curator	pscott@mun.ca
Canada	http://www.therooms.ca/museum/	[1] 709/ 729-5007	Nathalie Djan-Chekar	Curator	nathaliedjanchekar@therooms.ca
USA	http://www.nybg.org/	[1] 718/ 817-8626	Barbara Thiers	Director	bthiers@nybg.org
Canada	http://www.uoguelph.ca/ib/facilities/herbarium.shtml	[1] 519/ 824-4120, ext. 58581	Carole Ann Lacroix	Curator of Phanerogam Collections	botcal@uoguelph.ca
Canada	www.herbier.ulaval.ca	[1] 418/ 656-7538	Serge Payette	Curator	serge.payette@herbier.ulaval.ca
USA		[1] 724/ 738-2489	Jerry Chmielewski	Curator	jerry.chmielewski@sru.edu
Canada			Henry Mann		hmann@swgc.mun.ca
Canada			Greg Stroud		Greg.Stroud@pc.gc.ca
Canada		[1] 905/ 828-3984	Peter Ball	Curator	pball@credit.erin.utoronto.ca

Italy		[39] 040/ 6758658	Sergio Dolce	Director	dolces@comune.trieste.it
Canada		[1] 403/ 220-5262	C. Chinnappa	Curator	ccchinna@acs.ucalgary.ca
Canada	http://www.beatymuseum.ubc.ca/herbarium/index.html	[1] 604/ 822-3344; 822-2133.	Jeannette Whitton	Director and Curator of Vascular Plants	jwhitton@interchange.ubc.ca
Canada	http://www.unb.ca/herbarium/	[1] 506/ 452-6205	Bev Benedict	Curator of Vascular Plants	bbenedic@unb.ca
USA	http://www.nmnh.si.edu/sysbiology/	[1] 202/ 633-0920.	George Russell	Collections Manager	russellr@si.edu
Canada		[1] 519/ 661-2111	Jane Bowles	Curator	jbowles@uwo.ca
Canada	http://www.science.uwaterloo.ca/biology/	[1] 519/ 888-4567, ext. 3751	John Semple	Director	jcsemple@sciborg.uwaterloo.ca

›r more information please visit the url provided.

Atlantic Canada CDC Canada Atlantique

2012 Edition

Part I. Conservation Data Centre Subnational Rarity Ranks

Biological diversity or biodiversity can be described at a number of levels, from molecules to ecosystems. Biodiversity is a combination of species diversity (the variety of species), genetic diversity (the genetic variability among individuals of that species), and ecological diversity (the variety of ecosystems/habitats in which they live). Conservation Data Centres (CDCs), as part of The NatureServe* international network, track biodiversity at two levels: species and ecological communities. Species and ecological communities are referred to as **elements** of biodiversity. Elements are ranked in each jurisdiction (province or state) and at global and national levels in order to help prioritize conservation efforts.

NatureServe and all CDCs (called Heritage Programs in the US) use a standardized element ranking system that has evolved over some 30 years, with input from hundreds of scientists, managers and conservationists. The following material describes this element ranking system at the subnational (S) or provincial level and explains how ranks are assigned for species elements of biodiversity. (The community ranking process is slightly different.)

* Formerly known as The Nature Conservancy (TNC)

<u>Definitions of Provincial (subnational) ranks - SRANKS</u>

S1 **Critically Imperiled**—Critically imperiled in the jurisdiction because of extreme rarity or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the jurisdiction.

S2 **Imperiled**—Imperiled in the jurisdiction because of rarity due to very restricted range, very few populations, steep declines, or other factors making it very vulnerable to extirpation from jurisdiction.

S3 **Vulnerable**—Vulnerable in the jurisdiction due to a restricted range, relatively few populations, recent and widespread declines, or other factors making it vulnerable to extirpation.

S4 **Apparently Secure**—Uncommon but not rare; some cause for long-term concern due to declines or other factors.

S5 **Secure**—Common, widespread, and abundant in the jurisdiction.

SX Pr**esumed Extirpated**—Species or ecosystem is believed to be extirpated from the jurisdiction (i.e., nation or state/province). Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.

SH **Possibly Extirpated**— Known from only historical records but still some hope of rediscovery. There is evidence that the species or ecosystem may no longer be present in the jurisdiction, but not enough to state this with certainty. Examples of such evidence include (1) that a species has not been documented in approximately 20-40 years despite some searching or some evidence of significant habitat loss or degradation; (2) that a species or ecosystem has been searched for unsuccessfully, but not thoroughly enough to presume that it is no longer present in the jurisdiction.

S#S# **Range Rank** — A numeric range rank (e.g., S2S3 or S1S3) is used to indicate any range of uncertainty about the status of the species or ecosystem. Ranges cannot skip more than two ranks (e.g., SU is used rather than S1S4).

SU **Unrankable**—Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.

SNR **Unranked**—National or subnational conservation status not yet assessed.

SNA **Not Applicable** —A conservation status rank is not applicable because the species or ecosystem is not a suitable target for conservation activities.

Not applicable cases:
Hybrid – Element represents an interspecific hybrid without conservation value. (Note that hybrids may be assigned a numeric rank if they do have a conservation value.)

Exotic Origin – Element is not native to the nation or subnation.

Accidental/Nonregular – Element is not regularly found in the nation or subnation, in other words, infrequent and outside of normal range.

Not Confidently Present – Element's presence in the nation or subnation has been reported, but the report is unconfirmed or doubtful; Element has been falsely reported, and may or may not potentially occur; Element may potentially occur (e.g., habitat is suitable); Element was never present in the nation or subnation despite presence in surrounding areas.

No Definable Occurrences – Element is native and appears regularly but lacks practical conservation concern in the subnation because it is transient or occurs in a dispersed, unpredictable manner.

Synonym – Element reported as occurring in the nation or subnation, but the national or provincial data center does not recognize this taxon; therefore the Element is not assigned a national or subnational rank.

<u>Rank Qualifier</u>

S#? **Inexact Numeric Rank**—Denotes inexact numeric rank. This designation should not be used with any of the variant national or subnational conservation status ranks or NX, SX, NH, or SH.

Breeding Status Qualifiers[4]

B **Breeding**—Conservation status refers to the breeding population of the species in the nation or state/province.

N **Nonbreeding**—Conservation status refers to the non-breeding population of the species in the nation or state/province.

M **Migrant**—Migrant species occurring regularly on migration at particular staging areas or concentration spots where the species might warrant conservation attention. Conservation status refers to the aggregating transient population of the species in the nation or state/province.

[4] 4A breeding status is only used for species that have distinct breeding and/or non-breeding populations in the nation or state/province. A breeding-status S-rank can be coupled with its complementary non-breeding-status S-rank if the species also winters in the nation or state/province. In addition, a breeding-status S-rank can also be coupled with a migrant-status S-rank if, on migration, the species occurs regularly at particular staging areas or concentration spots where it might warrant conservation attention. Multiple conservation status ranks (typically two, or rarely three) are separated by commas (e.g., S2B,S3N or SHN,S4B,S1M).

Part II. The Ranking Process

To rank species elements, 8-10 different biological criteria are assessed for each species. The ten factors considered in assigning status ranks are described below.

Ranking Matrix Eight ranking criteria and value of letter scores for each criterion.

MATRIX SCORE

	A	B	C	D	E	F	G	H	I
CRITERIA									
Population size	1-50	50-250	250-1000	1000-2500	2500-10000	10000-100000	100000-1000000	>1000000	
Range Extent	<100km²	100-250km²	250-1000km²	1000-5000km²	5000-20000 km²	20000-200000 km²	200000 – 2500000 km²		
Short-term Trend	Decline >90%	Decline of 80-90%	Decline of 70-80%	Decline of 50-70%	Decline of 30-50%	Decline of 10-30%	Relatively Stable (<10% change)	Increase of 10-25%	Increase of >25%
Long-term Trend	Decline >90%	Decline of 80-90%	Decline of 70-80%	Decline of 50-70%	Decline of 30-50%	Decline of 10-30%	Relatively Stable (<10% change)	Increase of 10-25%	Increase of >25%
Area of Occupancy	<0.4km²	0.4-4km²	4-20km²	20-100km²	100-500km²	500-2000km²	2000-20000km²	>20000 km²	

Number of Element Occurrences (EOs)	0-5	6-20	21-100	>100					
Number of EOs with Good Viability	No occurrences with excellent or good viability or ecological integrity	Very few (1-3) occurrences with excellent or good viability or ecological integrity	Few (4-12) occurrences with excellent or good viability or ecological integrity	Some (13-40) occurrences with excellent or good viability or ecological integrity	Many (41-125) occurrences with excellent or good viability or ecological integrity	Very Many (>125) occurrences with excellent or good viability or ecological integrity			
Enviro-nmental Specificity	Very Narrow	Narrow	Moderate	Broad					
Threat Scope	Pervasive (71-100%)	Large (31-70%)	Restricted (11-30%)	Small (1-10%)					
Threat Severity	Pervasive (71-100%)	Large (31-70%)	Restricted (11-30%)	Small (1-10%)					

1. Population Size

Population size is the estimated current total population of the species which is naturally occurring and wild within the area of interest (globe, nation, or subnation), and that is of reproductive age or stage (at an appropriate time of the year), including mature but currently non-reproducing individuals, which should be included in counts or estimates. Abundance is measured in different ways depending on the biology of the species. For animal populations it is usually measured by the number of individuals, for plants it may be measured by the area occupied by a distinct population, and for aquatic invertebrates it may be measured by the stream length that the species occupies:

Z = Zero, no individuals believed extant (i.e., species presumed extinct)
A = 1–50 individuals
B = 50–250 individuals
C = 250–1,000 individuals
D = 1,000–2,500 individuals
E = 2,500–10,000 individuals
F = 10,000–100,000 individuals
G = 100,000–1,000,000 individuals
H = >1,000,000 individuals
U = Unknown
Null = Factor not assessed

*A value range (e.g., DE) can also be used to indicate uncertainty.
(DE would indicate between 1000 – 10000 individuals).

2. Range Extent

This denotes the approximate range of the species as a percentage of the province's area. It is defined as the current area contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known, inferred or projected sites of occurrence, but, *excluding* significant areas where the species does not occur due to unsuitable habitat. Thus the estimate of range for a species exhibiting a linear use of coastal forests or riverine habitats would not consider tracts of unsuitable habitat in the interior of the polygon.

Z = Zero (no occurrences believed extant; species presumed extinct or ecosystem believed eliminated throughout its range)
A = <100 km^2
(less than about 40 square miles)
B = 100–250 km^2
(about 40–100 square miles)
C = 250–1,000 km^2
(100–400 square miles)
D = 1,000–5,000 km^2
(400–2,000 square miles)
E = 5,000–20,000 km^2
(2,000–8,000 square miles)
F = 20,000–200,000 km^2
(8,000–80,000 square miles)
G = 200,000–2,500,000 km^2
(80,000–1,000,000 square miles)
H = $>2,500,000$ km^2
(greater than 1,000,000 square miles)

3. Short-term Trend

The rating code that best describes the observed, estimated, inferred, or suspected degree of change in population size, extent of occurrence (range extent), area of occupancy, number of occurrences, and/or number of occurrences or percent area with good viability or ecological integrity over the short term, whichever most significantly affects the conservation status assessment in the area of interest (globe, nation, or subnation). Consider short-term historical trend within ten years or three generations (for long-lived taxa), whichever is the longer (up to a maximum of 100 years), or, for communities and systems, typically 30 years, depending on the characteristics of the type.

The trend may be recent or current, and the trend may or may not be known to be continuing. Trends may be smooth, irregular, or sporadic. Fluctuations will not normally count as trends, but an observed change should not be considered as merely a fluctuation rather than a trend unless there is evidence for this. Conservation Status Assessments: Factors for Assessing Extinction Risk 25
In considering trends, do not consider newly discovered but presumably long existing occurrences, nor newly discovered individuals in previously poorly known areas.

Also, consider fragmentation of previously larger occurrences into a greater number of smaller occurrences to represent a decreasing area of occupancy as well as decreasing number of good occurrences or populations.

A = Decline of >90%
B = Decline of 80–90%
C = Decline of 70–80%
D = Decline of 50–70%
E = Decline of 30–50%
F = Decline of 10–30%
G = Relatively Stable (≤10% change)
H = Increase of 10–25%
I = Increase of >25%
U = Short-term trend unknown
Null = Factor not assessed

4. Long-term Trend

The rating code that best describes the observed, estimated, inferred, or suspected degree of change in population size, extent of occurrence (range extent), area of occupancy, number of occurrences, and/or number of occurrences or percent area with good viability or ecological integrity over the long term (ca. 200 years) in the area of interest (globe, nation, or subnation).

A = Decline of >90%
B = Decline of 80–90%
C = Decline of 70–80%
D = Decline of 50–70%
E = Decline of 30–50%
F = Decline of 10–30%
G = Relatively Stable (≤10% change)
H = Increase of 10–25%
I = Increase of >25%
U = Long-term trend unknown
Null = Factor not assessed

5. Area of Occupancy

Area of occupancy for taxa can be defined as (modified from the International Union for the Conservation of Nature 2001):
“...the area within its ‘extent of occurrence’, which is occupied by a taxon or ecosystem type, excluding cases of vagrancy. The measure reflects the fact that a taxon or type will not usually occur throughout the area of its extent of occurrence, which may contain unsuitable or unoccupied habitats. In some cases, (e.g., irreplaceable colonial nesting sites, crucial feeding sites for migratory taxa) the area of occupancy is the smallest area essential at any stage to the survival of existing populations of a taxon. The size of the area of occupancy will be a function of the scale at which it is measured, and should be

at a scale appropriate to relevant biological or ecological aspects of the taxon or type, the nature of threats and the available data.”

A = <0.4km^2
B = 0.4-4
C = 4-20 km^2
D = 20-100 km^2
E = 100-500 km^2
F = 500-2000 km^2
G = 2000-20000 km^2
H = >20000 km^2

5b. Linear Distance of Occupancy

Ecosystems that occur as linear strips. They are often ecotonal between terrestrial and aquatic ecosystems. In undisturbed conditions, typical occurrences range in linear distance from 0.5 to 100 km.

A = <4km^2
B = 4-40
C = 40-200 km^2
D = 200-1000 km^2
E = 1000-5000 km^2
F = 5000-20000 km^2
G = 20000-200000 km^2
H = >200000 km^2

6. Number of Element Occurrences (EOs)

An “element occurrence” is the mapping unit of CDC methodology. It is generally defined as an area of land or water on which an “element of biodiversity” (plant and animal species or natural community) is or was present. It is a physical location important to the conservation of a species or community, an area worth preserving to insure the survival of a community or species at risk. For a species it is generally the habitat occupied by a local population, for a community it is the area containing a stand or patch. What constitutes an occurrence also varies between species (e.g. hibernacula, den sites, breeding ponds where adults, egg masses and/or larvae have been identified, breeding colonies, etc.). Some species can have more than one type of occurrence, for example breeding and wintering occurrences.

A single letter code (below) represents the number of estimated occurrences believed extant for the species in the province. When a species’ distribution is extremely limited and there are very few site occurrences, it is very susceptible to any number of ecological disturbances, both predictable and unpredictable. This criteria is therefore an important factor influencing SRANK when the number of occurrences is few. If the letter code for this field is A or B, the species usually qualifies for a rank of S1 or S2.

A = 0 - 5 occurrences
B = 6 - 20 occurrences

C = 21 - 100 occurrences
D = 101+ occurrences

7. Number of EOs with Good Viability

For species, an occurrence with at least good (i.e., excellent-to-good) viability exhibits favorable characteristics with respect to population size and/or quality and quantity of occupied habitat; and, if current conditions prevail, the occurrence is likely to persist for the foreseeable future (i.e., at least 20–30 years) in its current condition or better. See Hammerson et al. (2008) for more details. For ecosystems, an occurrence has excellent-to-good ecological integrity when it exhibits favorable characteristics with respect to reference conditions for structure, composition, and function, operating within the bounds of natural or historic disturbance regimes, and is of exemplary size (Faber-Langendoen et al. 2008). One would expect only minor to moderate alterations to these characteristics for an occurrence to maintain good ecological integrity.

For many occurrences, viability or ecological integrity assessments or ranks have been applied by biologists and ecologists throughout the NatureServe network. For species, these Element Occurrence (EO) ranks estimate the probability of persistence of the occurrence. For ecosystems, the rank is a succinct assessment of the degree to which, under current conditions, an occurrence of an ecosystem matches reference conditions for that system, without any presumptions made about future status or persistence. Ranks for species and ecosystems are based on a set of "occurrence rank factors," namely size (including population size and/or occupied area), abiotic and biotic condition, and landscape context. These factors may be further refined to specific indicators or metrics. The overall ranks range from A = Excellent viability/integrity, to D = Poor viability/integrity

A = No occurrences with excellent or good (assessed as A or B) viability or ecological integrity
B = Very few (1–3) occurrences with excellent or good viability or ecological integrity
C = Few (4–12) occurrences with excellent or good viability or ecological Integrity
D = Some (13–40) occurrences with excellent or good viability or ecological integrity
E = Many (41–125) occurrences with excellent or good viability or ecological integrity
F = Very many (>125) occurrences with excellent or good viability or ecological integrity
U = Unknown number of occurrences with excellent or good viability or ecological integrity
Null = Factor not assessed

8. Environmental Specificity

Environmental Specificity is the degree to which a species or ecosystem depends on a relatively scarce set of habitats, substrates, food types, or other abiotic and/

or biotic factors within the overall range. Relatively narrow requirements are thought to increase the vulnerability of a species or ecosystem. This factor is most important when the number of occurrences, and the range extent or area of occupancy, are largely unknown.

- **A** = Very Narrow. Specialist or ecosystem with key requirements scarce. For species, specific habitat(s), substrate(s), food type(s), hosts, breeding/ non-breeding microhabitats, or other abiotic and/or biotic factor(s) are used or required by the species or ecosystem in the area of interest, with these habitat(s) and/or other requirements furthermore being scarce within the generalized range of the species or ecosystem within the area of interest, and the population (or the number of breeding attempts) expected to decline significantly if any of these key requirements become unavailable. For ecosystems, environmental requirements are both narrow and scarce (e.g., calcareous seepage fens).
- **B** = Narrow. Specialist or ecosystem with key requirements common. Specific habitat(s) or other abiotic and/or biotic factors (see above) are used or required by the species or ecosystem, but these key requirements are common and within the generalized range of the species or ecosystem within the area of interest. For ecosystems, environmental requirements are narrow but common (e.g., floodplain forest, alpine tundra).
- **C** = Moderate. Generalist or community with some key requirements scarce. Broad-scale or diverse (general) habitat(s) or other abiotic and/or biotic factors are used or required by the species or ecosystem, but some key requirements are scarce in the generalized range of the species or ecosystem within the area of interest. For ecosystems, environmental requirements are broad but scarce (e.g., talus or cliff forests and woodlands, alvars, many rock outcrop communities dependent more on thin, droughty soils per se than specific substrate factors).
- **D** = Broad. Generalist or community with all key requirements common. Broad-scale or diverse (general) habitat(s) or abiotic and/or biotic factors are used or required by the species or ecosystem, with all key requirements common in the generalized range of the species or ecosystem in the area of interest. For animals, if the preferred food(s) or breeding/non-breeding microhabitat(s) become unavailable, the species switches to an alternative with no resulting decline in numbers of individuals or number of breeding attempts. For ecosystems, environmental requirements are broad and common (e.g., forests or prairies on glacial till, or forests and meadows on montane slopes).

9. Threat Severity

Within the scope (as defined spatially and temporally in assessing the scope of the Threat), severity is the level of damage to the species or ecosystem from the Threat that can reasonably be expected with continuation of current circumstances and trends (including potential new threats) (Table 7). Note that severity of Threats is assessed within a ten-year or three-generation time frame, whichever is longer (up to 100 years).

For species, severity is usually measured as the degree of reduction of the species' population. Surrogates for adult population size (e.g., area) should be used with caution, as occupied areas, for example, will have uneven habitat suitability and uneven population density. For ecosystems, severity is typically measured as the degree of degradation or decline in integrity (of one or more key characteristics).

Extreme	Within the scope, the Threat is likely to destroy or eliminate the occurrences of an ecological community, system or species, or reduce the species population by 71–100%
Serious	Within the scope, the Threat is likely to seriously degrade/reduce the effected occurrences or habitat or, for species, to reduce the species population by 31–70%
Moderate	Within the scope, the Threat is likely to moderately degrade/reduce the effected occurrences or habitat or, for species, to reduce the species population by 11–30%
Slight	Within the scope, the Threat is likely to only slightly degrade/reduce the effected occurrences or habitat or, for species, to reduce the species population by 1–10%

10. Threat Scope

Scope is defined herein as the proportion of the species or ecosystem that can reasonably be expected to be affected (that is, subject to one or more stresses) by the Threat within ten years with continuation of current circumstances and trends (Table 6). Current circumstances and trends include both existing as well as potential new threats. The ten-year time frame can be extended for some longer-term threats, such as global warming, that need to be addressed today. For species, scope is measured as the proportion of the species' population in the area of interest (globe, nation, or subnation) affected by the Threat. For ecosystems, scope is measured as the proportion of the occupied area of interest (globe, nation, or subnation) affected by the Threat. If a species or ecosystem is evenly distributed, then the proportion of the population or area affected is equivalent to the proportion of the range extent affected by the Threat; however, if the population or area is patchily distributed, then the proportion differs from that of range extent.

Pervasive	Affects all or most (71–100%) of the total population or occurrences
Large	Affects much (31–70%) of the total population or occurrences
Restricted	Affects some (11–30%) of the total population or occurrences.
Small	Affects a small (1–10%) proportion of the total population or occurrences.

11. Intrinsic Vulnerability

Note that this factor is not used if the Threats status factor has been assessed.

Intrinsic Vulnerability is the observed, inferred, or suspected degree to which characteristics of the species or ecosystem (such as life history or behavior characteristics of species, or likelihood of regeneration or recolonization for ecosystems) make it vulnerable or resilient to natural or anthropogenic stresses or catastrophes. For ecosystems, Intrinsic Vulnerability is most readily assessed using the dominant species and vegetation structure that characterize the ecosystem, but it can also refer to ecological processes that make an ecosystem vulnerable or lack resiliency (e.g., shoreline fens along estuarine and marine coasts subject to rising sea levels).

Since geographically or ecologically disjunct or peripheral occurrences may show additional vulnerabilities not generally characteristic of a species or ecosystem, characteristics of Intrinsic Vulnerability are to be assessed for the species or ecosystem throughout the area of interest, or at least for its better occurrences. Information on population size, number of occurrences, area of occupancy, extent of occurrence, or environmental characteristics that affect resiliency should not be considered when assessing Intrinsic Vulnerability; these are addressed using other status factors.

Note that the Intrinsic Vulnerability characteristics exist independent of human influence, but may make the species or ecosystem more susceptible to disturbance by human activities. The extent and effects of current or projected extrinsic influences themselves should be addressed in the comments field of the Threats status factor.

A = Highly Vulnerable. Species is slow to mature, reproduces infrequently, and/or has low fecundity such that populations are very slow (>20 years or five generations) to recover from decreases in abundance; or species has low dispersal capability such that extirpated populations are unlikely to become reestablished through natural recolonization (unaided by humans). Ecosystem occurrences are highly susceptible to changes in composition and structure that rarely if ever are reversed through natural processes even over substantial time periods (>100 years).

B = Moderately Vulnerable. Species exhibits moderate age of maturity, frequency of reproduction, and/or fecundity such that populations generally tend to recover from decreases in abundance over a period of several years (on the order of 5–20 years or 2–5 generations); or species has moderate dispersal capability such that extirpated populations generally become reestablished through natural recolonization (unaided by humans). Ecosystem occurrences may be susceptible to changes in composition and structure but tend to recover through natural processes given reasonable time (10–100 years).

C = Not Intrinsically Vulnerable. Species matures quickly, reproduces frequently, and/or has high fecundity such that populations recover quickly (<5 years or 2 generations) from decreases in abundance; or species has high dispersal capability such that extirpated populations soon become reestablished through natural recolonization (unaided by humans). Ecosystem occurrences are resilient or resistant to irreversible changes in composition and structure and quickly recover (within 10 years).

U = Unknown

Null = Factor not assessed

12. Other Considerations

Other considerations in determining the rank that are not apparent from the letter codes selected for the above criteria. Generally, these considerations will raise rather than lower the rank, e.g., "Never sexually reproduces" or "All occurrences are in areas under development".

References

Master, L., D. Faber-Langendoen, R. Bittman, G. A.
Hammerson, B. Heidel, J. Nichols, L. Ramsay, and A. Tomaino. 2009.
NatureServe Conservation Status Assessments: Factors for Assessing
Extinction Risk. NatureServe, Arlington, VA.

Appendix F

Cooper Cove Infill Feasibility Study (2019)

DILLON
CONSULTING

ARGENTIA MANAGEMENT AUTHORITY INC.

Cooper Cove Infill Feasibility Study

Argentia, NL

May 2019 – 19-9401

DILLON
CONSULTING

May 3, 2019

Argentia Management Authority Inc.
P.O. Box 95
Argentia, NL
A0B 1W0

Attention: Mr. Chris Newhook
General Manager

Cooper Cove Infill Feasibility Study
Argentia, NL

Dear Mr. Newhook:

Dillon Consulting Limited (Dillon) is pleased to provide the Cooper Cove Infill Feasibility Study report. We trust the following meets your current needs. However, if you have any questions or concerns please contact the undersigned at your convenience.

Sincerely,

DILLON CONSULTING LIMITED

William Hayhoe, E.I.T.,
Project Manager, Associate

Stephen Pearce, P. Eng.
Senior Reviewer, Partner

WCH:rbc
Enclosure

Our file: 19-9401

66 Kenmount Road
Suite 203
St. John's
Newfoundland and Labrador
Canada
A1B 3V7
Telephone
709.754.2374
Fax
709.754.2380

Dillon Consulting Limited

Table of Contents

Executive Summary

1.0 Introduction 1

2.0 Geotechnical Desktop Study 2

3.0 Civil and Structural Preliminary Design and Cost Estimates 3

3.1 Wharf Layouts 3
3.2 Preliminary Wharf Designs and Cost Estimates 4
3.2.1 Option 1 – Steel Piled Wharf 4
3.2.2 Option 2 – Concrete Caisson Wharf 5
3.2.3 Cost Estimates 6
3.2.4 Discussion and Recommendations 7

4.0 Coastal Investigation 8

4.1 Wind and Wave Climate 8
4.1.1 Extreme Value Analysis 9
4.1.2 Parametric Hindcast 9
4.2 Water Levels 12
4.2.1 Tides 12
4.2.2 Storm Surge 13
4.2.3 Sea Level Rise 13
4.2.4 Design Water Level 14
4.3 Shoreline Impact Assessment 15
4.4 Coastal Investigation Figures 16

5.0 Environmental Considerations 23

5.1 The Undertaking 23
5.1.1 Environmental Background 23
5.1.1.1 Topography, Soils and Drainage 23
5.1.1.2 Climate 24
5.1.1.3 Atmospheric Environment 24
5.1.1.4 Terrestrial Habitat 24
5.1.1.5 Marine Environment 24

5.1.1.6 Species at Risk 26

5.1.1.7 Sensitive Areas 27

5.1.2 Project Physical Features 27

5.1.2.1 Project Structure / Infill Area 27

5.1.2.2 Wharf Structure 28

5.1.2.3 Fill Material 28

5.1.2.4 Roads 28

5.1.2.5 Navigation and Pilotage 28

5.1.2.6 Storage and Handling of Hazardous Materials 28

5.1.3 Environmental Management Considerations 28

5.1.3.1 Potential Environmental Impacts during Construction and Operations 29

5.1.3.2 Potential Mitigation Considerations during Construction and Operations 29

5.1.3.3 Climate Change Considerations 30

5.1.3.4 Potential Resource Conflicts 30

5.2 Regulatory Approval of the Proposed Undertaking 31

5.2.1 Permits, Licenses and Approvals 31

5.2.2 Stakeholder Consultation 31

5.3 Permitting Tasks, Estimate of Costs & Schedule 32

5.3.1 Environmental Permitting Tasks 32

5.3.2 Preliminary Permitting Cost Estimate 33

5.3.3 Preliminary Permitting Schedule 34

Figures

Figure 1.1: Location of Cooper Cove (copyright Google Maps 2019) 1

Figure 3.1: Location of Stockpile of Existing Pit-run Material (copyright Google Maps 2019) 6

Figure 4.1: Wave Height Rose for MSC50 Hindcast Point #M6012361 (Offshore of Argentia and Cooper Cove) 16

Figure 4.2: Wave Height Probability of Exceedance for MSC50 Hindcast Point #M6012361 (Offshore of Argentia and Cooper Cove) 17

Figure 4.3: Wind Speed Rose for MSC50 Hindcast Point #M6012361 (Offshore of Argentia and Cooper Cove) 18

Figure 4.4: Wind Speed Probability of Exceedance for MSC50 Hindcast Point #M6012361 (Offshore of Argentia and Cooper Cove) 19

Figure 4.5: Monthly Wind Speed Roses for MSC50 Hindcast Point #M6012361 (Offshore of Argentia and Cooper Cove) 19

Figure 4.6: Extreme Value Analyses for Predicted Wind Speed from MSC50 Hindcast Point #M6012361 20

Figure 4.7: Extreme Value Analyses for Predicted Wind Speed from MSC50 Hindcast Point #M6012361 20

Figure 4.8: General Pareto Distribution EVA for Winds from MSC50 Hindcast Point #M6012361 21

Figure 4.9: General Pareto Distribution EVA for Significant Wave Height Predicted by Parametric Hindcast 21

Figure 4.10: Measured and Predicted Tides at Argentia (CHS Station #835) 22

Figure 4.11: Extreme Value Analyses for Storm Surge at Argentia (CHS Station #835) 22

Figure 4.12: General Pareto Distribution EVA for Storm Surge at Argentia (CHS Station #835) 23

Figure 5.1: Cost Estimate by Task 33

Tables

Table 3.1: Summary of Cost Estimates 6

Table 3.2: Engineering Costs 7

Table 4.1: Summary of Extreme Value Analysis of MSC50 Winds Hindcast (Point # M6012361) 9

Table 4.2: Summary of Parametric Hindcast at Cooper Cove 10

Table 4.3: Summary of Extreme Value Analysis of Wave Predictions from Parametric Hindcast 11

Table 4.4: Summary of Tidal Planes at Argentia (CHS Station 835) 12

Table 4.5: Summary of Extreme Value Analysis of Storm Surge at Argentia (CHS Station #835) 13

Table 4.6: Summary of Tidal Planes at Argentia in Meters (CHS Station 835) 14

Table 4.7: Existing and Future Extreme Water Levels at Cooper Cove 14

Appendices

A Stantec Geotechnical Desktop Study

B Drawings

C Cost Tables

References

Executive Summary

This report presents the results of a feasibility study investigating infilling Cooper Cove in the Port of Argentia and constructing a marginal wharf along the perimeter of the infilled area. The intended use of this area is for heavy marine operations associated with the offshore industry. The infilled area would provide space for buildings, equipment operation, and material laydown. The new marginal wharf would provide docking space for various vessels associated with the offshore industry including shuttle tankers, drilling rigs, and floating production, storage and offloading (FPSO) vessels.

Two options for infill material are proposed, the first being an existing stockpile of pit-run material at an adjacent site and the second being the material forming the bund wall at the nearby Husky construction site. A geotechnical desktop study concluded that the existing stockpile of material is suitable for use as marine infill. However, the material forming the bund wall contains percentages of fine soils greater than recommended for use as marine infill. Further discussion with Husky is recommended to consider all of the factors before completely ruling out using this material as marine infill, such as washing and screening the available seabund material to produce infill material of a suitable gradation. The geotechnical study also concluded that based on available information from adjacent sites the Cooper Cove area is suitable for construction of either a steel pile or concrete caisson wharf structure.

Preliminary designs and cost estimates for the site infill and for construction of either a steel pile or concrete caisson marginal wharf were completed. Two options for wharf face layout were considered, Option A with a continuous straight face off of the existing Fleet Dock and Option B with a bend in the wharf face resulting in less site infill. The estimated site infill cost for Option A is $5.2 million and for Option B is $2.4 million. The estimated cost to construct a wharf along the perimeter of either infilled area is $44.9 million for a steel piled wharf and $56.6 million for a concrete caisson wharf. However, based on the specific site and cost needs the layout and resulting cost of the infill area and wharf can be modified.

A coastal investigation determined applicable design parameters for future detailed design of the wharf including design water level and design wave heights. The coastal investigation also determined that the proposed work will likely have little to no impact on updrift or downdrift wave climate, hydrodynamic regime, or sediment transport.

An environmental review of the proposed work identified likely environmental considerations that will need to be addressed as part of the work including but not limited to terrestrial and marine habitats, species at risk, and sensitive areas. The environmental review also established a permitting road map and associated cost estimate for proceeding with the work.

1.0 Introduction

The Port of Argentia retained Dillon Consulting Limited (Dillon) to complete a feasibility study investigating infilling Cooper Cove and constructing a marginal wharf along the perimeter of the infilled area. The location of Cooper Cove and the adjacent Argentia Fleet Dock is shown in Figure 1.1.

Figure 1.1: Location of Cooper Cove (copyright Google Maps 2019)

The intended purpose of the marginal wharf and infilled area is to service the offshore industry. The new wharf would provide additional berthing space for large vessels and the infilled area would provide space for buildings, equipment operation, and material laydown. The purpose of this feasibility study is to complete a preliminary design and cost estimate for the proposed work, investigate coastal impacts of the proposed work, and identify environmental concerns and a permitting roadmap for moving forward with the work. In view of this purpose the scope of the study includes the following components:

- A geotechnical desktop study to investigate the soil conditions in the area and the proposed infill methodology.
- A preliminary design and associated cost estimates for construction of the wharf and infill area.

DILLON CONSULTING

- A coastal investigation to establish design coastal conditions and comment on potential project coastal impacts.
- An environmental background review and presentation of a permitting road map for completion of the work.

2.0 Geotechnical Desktop Study

Stantec Consulting Limited (Stantec) was retained as a subconsultant by Dillon in order to complete desktop study of the soil conditions in Cooper Cove. Stantec's scope included the following items:

- Review of all available geotechnical information from the nearby area to comment on the probably suitability of the Cooper Cove area to support new fill under use by heavy marine operations.
- Comment on the probably suitability of the Cooper Cove area to support either a steel piled or concrete caisson wharf structure at the perimeter of the proposed infill area.
- Review of the geotechnical suitability of an existing stockpile of pit-run aggregate material at an adjacent site in Argentia for use as infill.
- Review of the geotechnical suitability of material forming the bund wall at the adjacent Husky project for use as infill.
- Provide recommendations as to future required geotechnical work in order to complete detailed design of the infill area and wharf.

Stantec's full report is included in Appendix A. Key items from Stantec's report include the following:

- The subsurface conditions and profile of the Cooper Cove area will be suitable for land reclamation, provided adherence is given to appropriate infill material and placement techniques.
- Based on a review of adjacent wharf structures and soil conditions, it is anticipated that piles or concrete caissons may be feasible for construction of a wharf in Cooper Cove.
- In order to proceed with detailed design of a wharf and site infill, a marine geotechnical borehole investigation would be required.
- The existing stockpile of pit-run material at the adjacent site is suitable for use as infill.
- Analysis of the soils forming the bund wall at the Husky site indicate that the proportion of fines (silts/clay) are generally in the range of 0-17%. Materials forming marine infill should consist of a fine content less than 2%. Although there are likely some layers within the bund wall that exhibit suitable fines content, extracting these soils may prove difficult or cost prohibitive. Further discussion with Husky is recommended to consider all of the factors before completely ruling out using this material as marine infill, such as washing and screening the available seabund material to produce infill material of a suitable gradation.

3.0 Civil and Structural Preliminary Design and Cost Estimates

Based on the geotechnical recommendations provided by Stantec, and preliminary design was completed for both the site infill and for the proposed marginal wharf.

3.1 Wharf Layouts

Drawing C1 in Appendix B illustrates two possible wharf layouts investigated. Option A was developed by extending the existing face of the adjacent Fleet Dock to the north in a straight line. Option B was developed by creating one corner near where the wharf would join the existing Fleet Dock and then projecting a straight wharf face that will result in an approximate average draft of -12 m. A vessel draft of 12 m would provide sufficient draft for use by various vessels associated with the offshore industry including most shuttle tankers, drilling rigs, and floating production, storage and offloading (FPSO) vessels. Fill quantities and cost estimates for each of these options were investigated.

The total useable wharf face for Option A is approximately 546 m. The total useable wharf face for Option B is also approximately 546 m, with 24 m of this face extending off of the existing Fleet Dock and 522 m of wharf face after the bend.

Advantages of Option A include:

- Maintaining a straight wharf face continuing on from the adjacent Fleet Dock will result in a more efficient wharf interface, as there will be one continuous wharf face with no bend.
- This arrangement will allow for easier vessel berthing and departing compared to Option B considering the shallow area to northeast of the wharf. The shallow area is illustrated by the contours on drawing C1 in Appendix B.
- This option results in more useable upland space behind the wharf.

Advantages of Option B include:

- Significantly less infill material is required.

Infill amounts for each option were determined by creating cross sections through the site at intervals along the wharf face, calculating the infill required at each cross section, and averaging the areas calculated along the length of the wharf. In the calculation of required infill areas, it was assumed that 1m of existing material would either settle or be displaced.

For both wharf layout options A and B, it is assumed that the northeast face of the infilled area will not consist of a marginal wharf and will instead consist of a sloped face protected by armourstone.

The total amount of infill required for Option A is estimated as 1,300,000 cubic meters. The total amount of infill required for Option B is estimated as 600,000 cubic meters.

3.2 Preliminary Wharf Designs and Cost Estimates

Based on Stantec's recommendations, two possible wharf construction compositions were considered, steel pipe piles and concrete caissons. The wharf designs are preliminary and are based on the following assumptions for design loads:

- A maximum uniformly distributed live load of 50 kPa.
- Safe operation and travel of a 150 tonne crane at any point along the wharf.
- Safe operation of a GMHK 7608 mobile harbour crane at a heavy lift area. This is the crane currently in use at Berth 3 of the existing Fleet Dock. Safe travel of the GMHK 7608 crane along the remainder of the wharf is also considered.

3.2.1 Option 1 – Steel Piled Wharf

A partial plan view and typical section view of the steel piled option is shown on drawing C2 in Appendix B.

At this time there are no marine boreholes or other geotechnical information available for this site. Therefore the preliminary design of the steel piles is based off of review of available information from the adjacent Argentia Fleet Dock construction. It is possible that the soil conditions in Cooper Cove vary significantly from the soil conditions at the adjacent Fleet Dock. If this were the case, the design and cost estimates presented in this report would also vary as the design would have to be modified to suit the specific soil conditions at the site.

As-built structural drawings of the adjacent Fleet Dock show 406 mm diameter closed end steel bearing piles driven to an approximate average penetration depth of 8.3 m. The approximate average ultimate strength for these piles as obtained from test pile results on the as-built drawings is 1840 kN. Applying a 0.6 reduction factor as recommended for load tested piles in the Canadian Engineering Foundation Manual results in a factored pile capacity of 1104 kN for a 406 mm diameter closed end pile with 8.3 m of embedment. For the purposes of the preliminary design and cost estimates presented in this report, capacities for piles were based off of extrapolation of this pile capacity.

The width of the wharf was determined by setting a minimum draft of -12.0 m at the face of the wharf. The slope of the harbour bottom was then extended back at a 1.5:1 slope until a bottom elevation of -6.0 m was reached. An elevation of -6.0 m corresponds the approximate depth at which a tied-back steel sheet pile wall can retain all remaining fill behind the sheet piling. This layout methodology results in a total wharf deck width of 12.2 m.

This option consists of the following components:

- 610 mm diameter closed end steel pipe piles driven to an approximate tip elevation of -24 m.
- Concrete pile caps with a size of 1.2m x 1.2m running perpendicular to the face of the wharf. The pile bents are spaced at 4.3m along the length of the wharf.
- A 2.5 m deep concrete cope wall running along the face of the wharf, allowing for attachment and support of fenders for safe berthing of vessels.
- A 350 mm thick concrete deck spanning between pile caps.
- A steel sheet pile wall at the back of the wharf retaining fill behind the wharf. The sheet pile wall will be tied back with steel tierods and concrete deadmen.
- Mooring bollards with additional pile supports spaced at 17.2 m along the face of the wharf.

A typical heavy lift area is also shown on drawing C2 in Appendix B. The width of the heavy lift area is 18 m and the heavy lift area extends 24 m along the length of the wharf. The size of the heavy lift area is based on safe operation of the mobile harbour crane. At the heavy lift area the following changes are made to the wharf structure:

- The thickness of the concrete deck is increased from 350 mm to 500 mm.
- The spacing of the pile bents is changed from 4.3 m to 4.0 m.
- The spacing of the piles within each bent is changed from 5.0 m to 4.0 m.

3.2.2 Option 2 – Concrete Caisson Wharf

A section view of the concrete caisson option is shown on a drawing in Appendix B. This section is typical along the entire length of the wharf. The preliminary design of the concrete caisson option is similar to the design of the concrete caissons at Berth 3 of the existing Fleet Dock. As the depth of the caissons at this location is slightly deeper than the depth at Berth 3, the caissons are also slightly wider than the Berth 3 caissons.

This option consists of the following components:

- A rock mattress to form a level bearing surface for the caissons.
- Concrete caissons composed of concrete walls and gravel fill. The bottom of the caissons is at an elevation of -13.5 m. The width of each caisson is 13 m.
- A concrete cope wall running along the face of the wharf, allowing for attachment and support of fenders for safe berthing of vessels. The concrete cope wall is supported by concrete buttress walls located at each perpendicular caisson wall.
- A 400mm thick concrete slab-on-grade with a width of 13.8 m. At the heavy lift area the thickness of the slab-on-grade would be increased to 500 mm and the width increased to 2 m in order to provide a safe working area for the mobile harbour crane.
- Scour protection at the base of the caisson to protect from undermining caused by wave, tidal and vessel propeller forces.

3.2.3 Cost Estimates

A summary of the estimated costs is shown in Table 3.1.

Table 3.1: Summary of Cost Estimates

		Wharf Cost	Site Infill Cost	Total Cost
Steel Pile Wharf	Option A	$44,940,000	$5,200,000	$50,140,000
	Option B	$44,940,000	$2,400,000	$47,340,000
Concrete Caisson Wharf	Option A	$56,570,000	$5,200,000	$61,770,000
	Option B	$56,570,000	$2,400,000	$58,970,000

Tables illustrating the itemized cost for each wharf option are included in Appendix C. The values shown in Table 3.1 for wharf construction include a 20% contingency. The values shown for site infill costs assume that the existing stockpile of material at the adjacent site is used for infill, as opposed to material from the Husky site. The location of this stockpile of material is shown in Figure 3.1. As shown in Figure 3.1 the existing stockpile is adjacent to Cooper Cove. The average hauling distance to move material to Cooper Cove is approximately 1 km. The unit rate cost assumed to move material from the existing stockpile and place it in Cooper Cove in accordance with the method described in Stantec's report is $4 per cubic meter.

Figure 3.1: Location of Stockpile of Existing Pit-run Material (copyright Google Maps 2019)

Through discussion with the Port it is understood that the Port's estimate of the amount of material stockpiled at the adjacent site is 3,000,000 tonnes. Assuming a material unit weight of 21 kN per cubic meter, this results in a volume of 1,400,000 cubic meters. As the total infill volume required for Option A is 1,300,000 cubic meters, there is sufficient material stockpiled at the adjacent site to infill Cooper Cove. As the amount of existing material is understood to only be an estimate, it is recommended that this estimate be confirmed by more detailed calculations.

Engineering costs are not included in Table 3.1. Approximate engineering costs to complete this project are shown in Table 3.2. The amount shown for contract administration includes full time site inspection over an approximate construction duration of 1.5 years. These costs may vary depending on the final scope of the project and results of the geotechnical investigation.

Table 3.2: Engineering Costs

Geotechnical Field Program and Reporting	$100,000
Civil Engineering for Site Infill	$40,000
Structural Engineering of Wharf	$100,000
Wharf Construction Contract Administration	$200,000
Updated Sounding Survey	$10,000
Land-Based Survey	$7,500
Environmental Permitting	refer to Section 5.0

3.2.4 Discussion and Recommendations

The preliminary wharf layouts and cost estimates presented in this report can be modified in order to suit the specific site and cost requirements of the project. Possible modifications to the wharf and site layout include:

- Two wharf face options (options A and B) are presented in this report in order to give a range of possible options and associated costs. Other wharf face alternatives could be investigated including a wharf face oriented in between options A and B.
- The total length of wharf and infill area could be reduced in order to reduce overall project cost.
- The entire site could be infilled as shown in Option A, but a wharf could be constructed along only a portion of the infilled area in order to reduce project cost.

The two wharf construction options presented in this report are a steel pile wharf and a concrete caisson wharf. The cost estimates for each of the options indicate that the concrete caisson option is the more costly alternative by a factor of approximately 1.25. However, a concrete caisson structure will result in a more durable structure with less maintenance and a longer design life. Therefore, if this project is going to proceed it is recommended to complete a life cycle cost analysis comparing the two options in order to determine the preferred option. This analysis should be completed after a geotechnical field program has been completed so that site specific geotechnical design parameters for both wharf options can be used in the analysis.

The two site infill options considered are using material from the adjacent stockpile and using material from the Husky bund wall. Stantec have concluded that the adjacent stockpile is suitable for use as infill. However, further discussion with Husky is recommended in order to determine whether measures such as washing and screening the bund wall material in order to remove fine soils and produce a suitable material are practical and can be investigated further. If the Port wishes to pursue this alternative, a discussion involving the Port, Husky, Stantec, and Dillon is recommended.

4.0 Coastal Investigation

A coastal investigation was completed in order to describe the wind and wave climate at Cooper Cove, determine design water levels, and comment on potential impact the proposed wharf could have on adjacent wave climate, hydrodynamic regime, and sediment transport.

4.1 Wind and Wave Climate

The wind and wave climate near Cooper Cove was estimated using a series of desktop analyses and based on local measurements. Definition of the metocean climate is necessary to provide information on the design and evaluate potential impacts the proposed wharf modifications may have on the neighboring shoreline.

The MSC50 is a state of the art hindcast developed by Environment Canada and Ocean Weather (Swail, V. R., et al, 2006). The wave climate from point # M6012361 from the MSC50 hindcast was selected as a representative wind climate for the site. The hindcast provides hourly predictions of significant wave height, peak wave period, and wave direction for the period (1954-2013). A wave height rose and probability of exceedance curve for wave height provided in Figure 4.1 and Figure 4.2, respectively. These figures show that the maximum significant wave height (Hs) at the hindcast point is approximately 5m, and that the predominant wave direction is from the southwest. The peak wave period associated with the maximum wave height is approximately 12-14s.

Cooper Cove is more exposed to a northerly fetch, and is sheltered from southerly and southwesterly waves by the Argentia shoreline. Unfortunately, the MSC50 hindcast does not provide a node north of Cooper Cove that appropriately defines the northerly wave climate. However, the MSC50 hindcast also provides hourly predictions of wind speed and wind direction, which can be used to provide estimates of the wave climate at Cooper Cove. A wind speed rose and probability of exceedance curve for wind speed provided in Figure 4.3 and Figure 4.4, respectively. Monthly (seasonal) wind speed roses are provided in Figure 5. These figures show that the maximum wind speed at the hindcast point is approximately 25 m/s. The predominant wind direction is from the west, with smaller components from the northwest and southwest. The largest wind events typically occur in the winter months (November to March).

4.1.1 Extreme Value Analysis

A two-part analysis was completed to identify extreme wind events to estimate wave conditions at Cooper Cove. The first step was to generate a storm list (identify individual storm events) using a Peaks over Threshold (POT) analysis. A POT analysis extracts peak storm values from a continuous record during which values exceed a defined threshold for a defined amount of time above the threshold, with a defined amount of time between successive events. The peak values from the generated storm list can then be used as inputs into the extreme value analysis and synthetic storm generation.
The second part of this analysis involved conducting an Extreme Value Analysis (EVA). The EVA uses the peak values from the storm listing generated from the POT and predicts values for various probabilities using different statistical distributions. In other words, the results of the EVA can be used to define extreme values for a variety of defined return periods. The results of the EVA on the winds from the MSC50 hindcast for four statistical distributions (General Pareto Distribution, Generalized Extreme Value Analysis, Weibull, and Log-Normal) are summarized in Table 4.1 and plotted in Figure 4.6 and Figure 4.7. The actual peak values are plotted as points, and the fits are plotted as lines. Each distribution shows a strong correlation (r-squared value) with the peak storm data; however, the General Pareto Distribution (GPD) appears to have the best fit with the lower frequency (higher return period) events. The GPD also has a tail with negative concavity, which is more realistic when considering extreme winds. The EVA using the GPD fit on the MSC50 winds is provided in Figure 4.8.

Table 4.1: Summary of Extreme Value Analysis of MSC50 Winds Hindcast (Point # M6012361)

Return Period (Years)	GPD	GEV	Weibull	Log-Normal
1	22.0	21.7	21.8	21.8
2	22.4	22.1	22.1	22.1
5	23.4	23.0	23.1	22.8
10	24.0	23.7	23.8	23.3
20	24.4	24.3	24.5	23.7
25	24.5	24.5	24.7	23.9
50	24.8	25.1	25.2	24.2
100	25.1	25.7	25.8	24.6

4.1.2 Parametric Hindcast

A parametric hindcast was completed to estimate wave characteristics at Cooper Cove. This parametric hindcast uses empirical equations described in the Shore Protection Manual, and updated by Hurdle and Stive (Hurdle et. all, 1989). The hindcast uses wind speed, wind direction, fetch length, and a representative fetch depth to predict wave characteristics, including significant wave height and peak wave period. This parametric hindcast treats each input wind condition independently, and therefore does not allow for storms to fully develop or propagate, as a wave hindcast, such as the MSC50 hindcast would allow.

A parametric hindcast is considered to be a conservative approach to estimating wave conditions. This is due to the limitations of using empirical equations. For example the parametric hindcast does not account for refraction, diffraction, or shoaling, and assumes a constant or representative bathymetry across the entire fetch. A parametric hindcast assumes that the waves are fetch-limited, and not limited by water depth or storm duration, and generally predicts higher wave conditions than more sophisticated wave propagation or hindcast models. However, the parametric hindcast does provide a conservative estimate of the wave conditions at the site, and also provides an efficient method to predict extreme wave conditions.

The fetch lengths were measured every 10 degrees from a point adjacent to the proposed wharf modifications until they intersected the shoreline. One representative depth along this fetch length was selected, based on the available bathymetry. The largest wind event from each directional bin was selected from the POT analysis and used as input for the parametric hindcast. The parametric hindcast inputs and predicted wave heights and periods are summarized in Table 4.2.

The most severe wave conditions predicted by the parametric hindcast are from the north, with a maximum significant wave height of approximately 3m and a peak wave period of 8 s. A similar EVA was completed to estimate wave conditions for various return periods. The results of this EVA are summarized in Table 4.3 and visualized in Figure 4.9. Upon observation of this EVA, it is clearly visible that there are only marginal increases in the wave conditions despite significant increases in wind speed. This likely confirms that the waves are fetch-limited, and are appropriate to help inform preliminary design considerations.

Table 4.2: Summary of Parametric Hindcast at Cooper Cove

Direction	Fetch	Wind Speed	Wave Height	Wave Period
(°)	*(km)*	*(m/s)*	*(m)*	*(s)*
0	41.0	26.9	3.0	7.2
10	32.0	24.7	2.7	6.4
20	13.0	24.1	2.0	4.8
30	8.0	23.8	1.6	4.1
40	6.0	22.6	1.3	3.6
50	8.0	23.4	1.6	4.1
60	4.0	20.9	1.0	3.1
70	4.0	20.4	1.0	3.0

Direction	Fetch	Wind Speed	Wave Height	Wave Period
80	3.5	21.9	1.0	3.0
90	3.5	23.1	1.0	3.1
100	5.7	21.3	1.2	3.5
110	2.0	21.2	0.7	2.5
120	1.3	21.2	0.6	2.1
130	1.3	22.5	0.6	2.2
140	1.2	22.5	0.6	2.1
150	1.2	23.9	0.6	2.2
160	1.4	23.4	0.7	2.3
170	1.4	28.5	0.9	2.5
180	1.6	24.6	0.8	2.4
190	2.0	28.5	1.0	2.8
200	1.0	27.0	0.7	2.2
210	1.0	26.3	0.7	2.1
220	1.0	27.0	0.7	2.2
230	1.0	27.0	0.7	2.2
240	1.0	27.0	0.7	2.2
250	1.0	24.3	0.6	2.1
260	1.0	24.1	0.6	2.1
270	1.0	24.1	0.6	2.1
280	41.0	24.3	2.8	6.9
290	16.0	24.3	2.2	5.2
300	15.6	23.3	2.1	5.0
310	25.0	21.9	2.3	5.7
320	26.0	23.0	2.4	5.9
330	29.0	26.9	2.9	6.5
340	23.0	24.5	2.5	5.8
350	58.0	23.5	2.8	7.4

Table 4.3: Summary of Extreme Value Analysis of Wave Predictions from Parametric Hindcast

Return Period	Wind Speed	Wave Height
-	*(m/s)*	*(m)*
1	23.1	2.7
2	23.6	2.8

Return Period	Wind Speed	Wave Height
5	24.9	2.9
10	25.7	2.9
20	26.4	3.0
25	26.6	3.0
50	27.2	3.1
100	27.8	3.1

4.2 Water Levels

4.2.1 Tides

Local water levels at Argentia are influenced by the combined effects of tides, storm surges and sea level rise, with tides being the main component. The water level range and its frequency are of significant importance in evaluating the water levels that will help inform the design and evaluate the impacts the proposed wharf will have on the adjacent shoreline.

Time series of tidal predictions and water level observations obtained from the Canadian Hydrographic Services (CHS) Station 835 at Argentia were used as the representative water level climate at Cooper Cove. The tides at Argentia are semi-diurnal, with a maximum tidal range of 2.1m. Typical tidal planes are presented in Table 4.4. The elevation of these tides is presented in Chart Datum (CD), which is equivalent to Lowest Astronomical Tide (LAT). The spring (large) tidal range is the most extreme tidal range and occurs around a full or new moon, when the gravitational forces of both the Sun and Moon are in phase. At Argentia, the peak range in the spring tide is approximately 2m, whereas the neap (mean) tidal range is less extreme and occurs just after the first or third quarters of the moon when there is the least difference between high and low water. At Argentia, the neap tidal range is approximately 1.3m. Each of these tide ranges occurs once per lunar cycle (every 28 days), and therefore occurs, on average, 13 times per year.

Table 4.4: Summary of Tidal Planes at Argentia (CHS Station 835)

Tidal Plane	Elevation (m, CD)
Higher High Water Large Tide	2.4
Higher High Water Mean Tide	2.1
Mean Water Level	1.2
Lower Low Water Mean Tide	0.8
Lower Low Water Large Tide	0.4

4.2.2 Storm Surge

Water levels can be affected by storm surge, which is caused by meteorological effects on the sea level, such as wind set-up and low atmospheric pressure. In the absence of a comprehensive numerical model, storm surge can be estimated by computing the difference between the observed water level during a storm and the predicted astronomical tide. A brief time series of the observed water level and predicted tides at Argentia are presented in Figure 4.10.

An EVA similar to the assessment to determine extreme waves and winds was conducted to estimate extreme storm surge values for various return periods. The results of this EVA are summarized in Table 4.5 and visualized in Figure 4.11. Each distribution shows a strong correlation (r-squared value) with the peak storm data; however, the General Pareto Distribution (GPD) appears to have the best fit with the lower frequency (higher return period) events. The GPD also has a tail with negative concavity, which is more realistic when considering extreme winds. The EVA using the GPD fit on the Argentia storm surge data is provided in Figure 4.12.

Table 4.5: Summary of Extreme Value Analysis of Storm Surge at Argentia (CHS Station #835)

Return Period (Years)	GPD	GEV	Weibull	Log-Normal
1	0.87	0.84	0.85	0.83
2	0.90	0.88	0.88	0.86
5	0.98	1.03	0.98	0.92
10	1.02	1.16	1.05	0.97
20	1.06	1.32	1.11	1.01
25	1.08	1.37	1.13	1.02
50	1.11	1.56	1.20	1.06
100	1.13	1.79	1.26	1.10

There is a narrow range of the extreme storm surges (0.9 m for a 1-year return period and 1.1 m for a 100-year return period). This is somewhat typical of tidal environments. For simplicity, it can be stated that extreme storm surges generally increase the water level at Argentia by approximately 1m.

4.2.3 Sea Level Rise

Estimates of Sea Level Rise (SLR) vary greatly and can represent a large component of design or extreme water levels. Fisheries and Oceans Canada recently developed the online Canadian Extreme Water Level Adaptation Tool (CEWLAT) based on (Zhai et. al., 2014). CEWLAT provides SLR allowances for various sites in the Atlantic Region, including Argentia. The tool provides predictions for two climate change scenarios, which vary based on the estimated concentration of atmospheric carbon dioxide. In terms of simplicity, they can be summarized as the following:

- RCP4.5 (medium climate change scenario)

- RCP8.5 (high climate change scenario)

The CEWLAT provide SLR predictions for each climate change scenario for the next 90 years. These have been summarized in Table 4.6. In terms of long-term planning and design, it would be prudent to consider an allowance for SLR of at least 50-70cm over the next 100 years. The wharf should either plan for this increase in sea level now, or allow flexibility to accommodate for this rise for future upgrades.

Table 4.6: Summary of Tidal Planes at Argentia in Meters (CHS Station 835)

Year	MRSL RCP4.5 (medium)	MRSL RCP8.5 (high)
2020	0.04	0.04
2030	0.09	0.11
2040	0.16	0.18
2050	0.23	0.25
2060	0.28	0.34
2070	0.34	0.41
2080	0.39	0.51
2090	0.45	0.61
2100	0.5	0.72

4.2.4 Design Water Level

The design water level takes each component into consideration (tides, storm surge, and sea level rise). Extreme tidal components occur frequently and the range of the storm surge component is quite small. The sea level rise component carries a considerable amount of uncertainty and may not be applicable for current design considerations. Therefore a series of estimates of extreme water levels have been provided for both existing and future scenarios. These estimates are summarized in Table 4.7.

Table 4.7: Existing and Future Extreme Water Levels at Cooper Cove

Return Period (Years)	Existing (2019)	Future (MRSL RCP4.5)	Future (MRSL RCP8.5)
1	3.27	3.77	3.99
2	3.30	3.80	4.02
5	3.38	3.88	4.10
10	3.42	3.92	4.14
20	3.46	3.96	4.18
25	3.48	3.98	4.20
50	3.51	4.01	4.23
100	3.53	4.03	4.25

4.3 Shoreline Impact Assessment

More detailed descriptions of the proposed modifications at Cooper Cove are discussed in Section 3.0; however, the modifications generally involve extending the existing Fleet Dock wharf from the southwest across Cooper Cove to the northeast. The shoreline in this area is relatively uniform and mostly undeveloped. The shoreline is protected by an armour stone revetment with little to no beach material.

The following bullets provide an assessment of the impact the wharf extension and proposed infilling will have both downdrift (southwest) and updrift (northeast):

- The proposed modifications will likely have little to no impact on the updrift and downdrift wave climate. Both the existing wharf and the proposed wharf are fairly sheltered by the Argentia headland. This headland even provides additional shelter from the most predominant wave direction, the north. The proposed wharf will likely provide some mild increases to reflected wave energy; however, the incident wave direction is already quite parallel to the orientation of the proposed wharf. Therefore, it is very unlikely that the proposed modifications will have any significant impact on the updrift or downdrift wave climate.
- Similarly, it is unlikely that the proposed wharf and infilling will impact the hydrodynamic regime (tides, storm surge, etc.). The wharf alignment is relatively parallel to the shoreline and should not have any adverse impact on tidal currents or storm surge.
- The proposed modifications will likely have no major impacts on the sediment transport regime in Cooper Cove. The only foreseeable impact on the sediment transport regime would be that the existing shoreline may be retaining some sediment. Once this shoreline has been infilled, it could slightly increase the sediment transport **potential** towards the southwest. However, one important difference between actual sediment transport rates and sediment transport **potential**, is that there has to be sediment suspended in the water column to be transported. Typically these can be identified by locating areas such as beaches or coves, where sediment can accumulate based on the orientation of the shoreline and the local bathymetry. At Argentia, there are no signs of major sediment depositions to the southwest – the shoreline appears to be quite stable and steep, which are typically not conducive to sediment accumulation.
  - It is noted that no sediment transport modeling was completed as part of this assessment.
- The proposed modifications will likely have no impacts on the ice conditions in Cooper Cove. On the rare occasion that ice is present in Cooper Cove, it would not be impacted by a small development such as the proposed wharf modifications and infilling along the shoreline.

Based on the points above, it is unlikely that the proposed modifications will have any adverse impacts on the updrift or downdrift shoreline at Cooper Cove. In fact, the proposed wharf will likely have almost no hydrodynamic impact whatsoever on the surrounding shoreline.

4.4 Coastal Investigation Figures

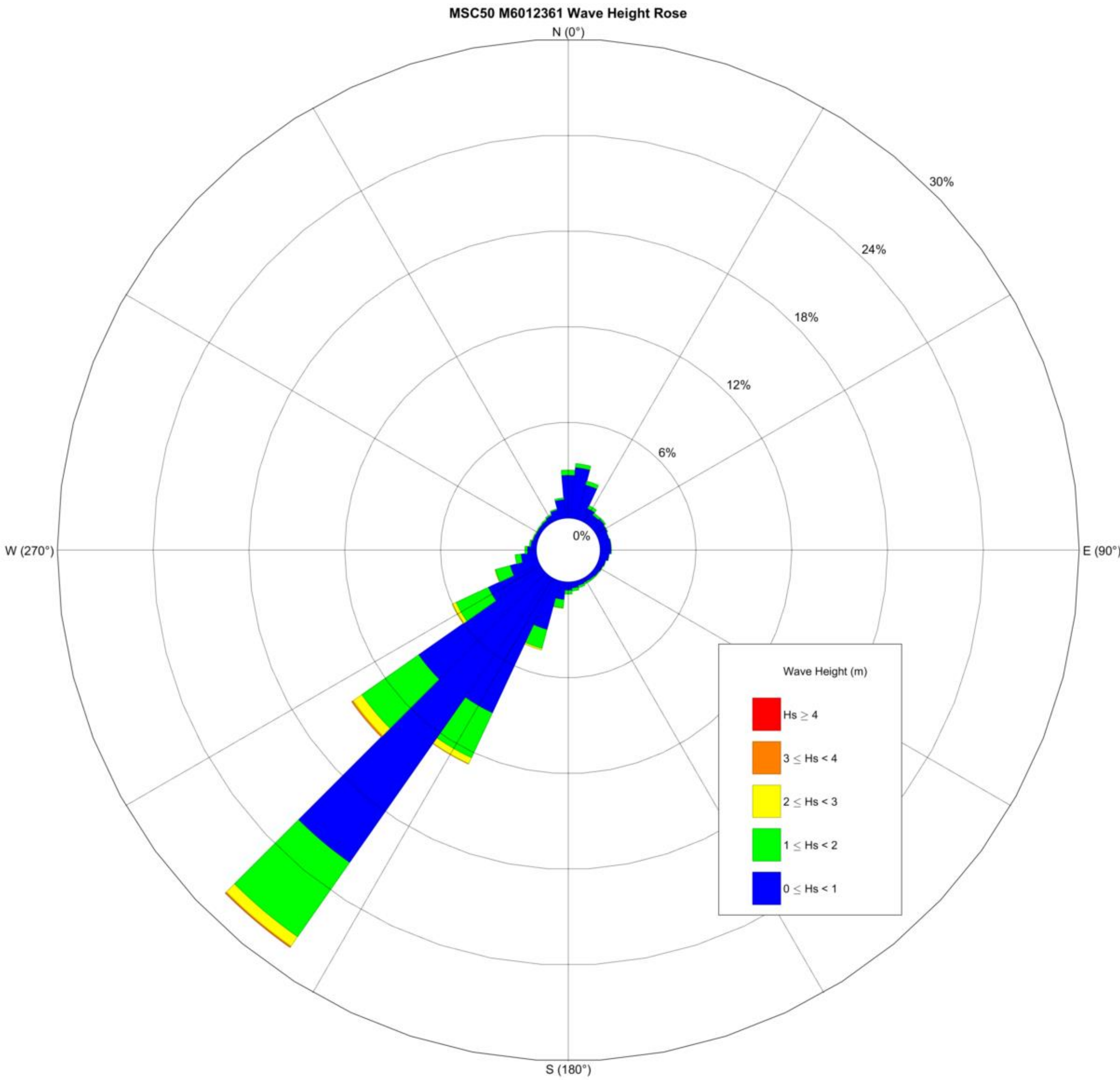


Figure 4.1: Wave Height Rose for MSC50 Hindcast Point #M6012361 (Offshore of Argentia and Cooper Cove)

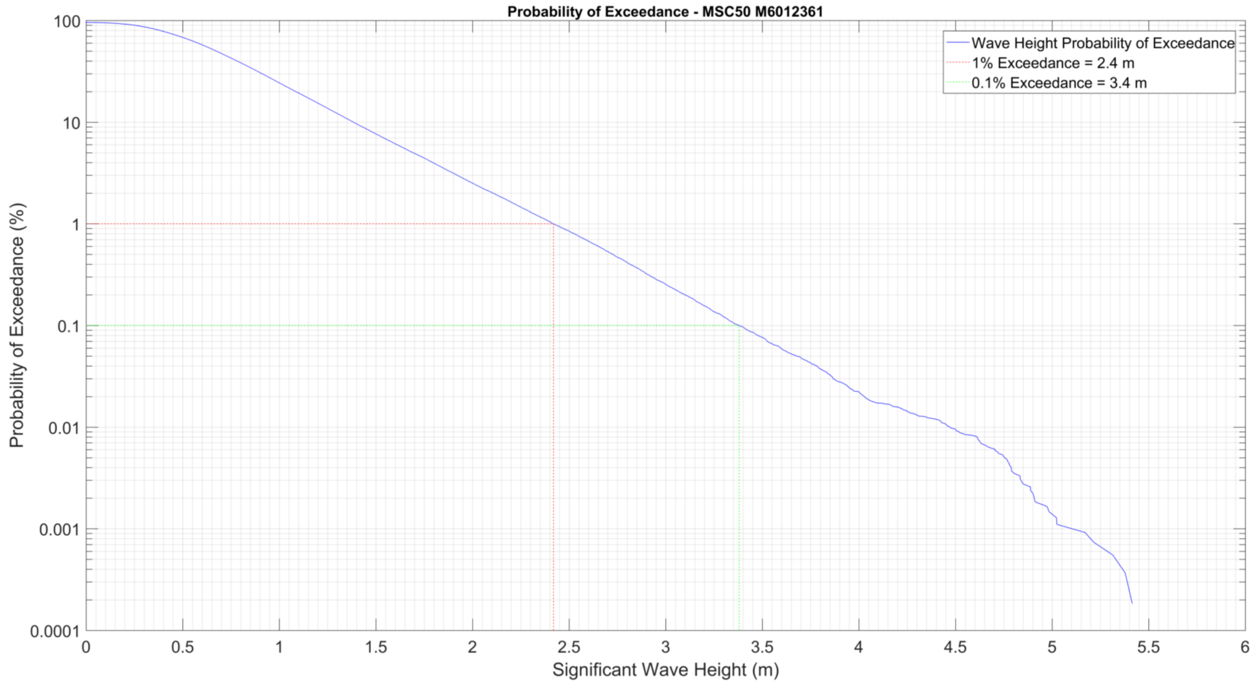


Figure 4.2: Wave Height Probability of Exceedance for MSC50 Hindcast Point #M6012361 (Offshore of Argentia and Cooper Cove)

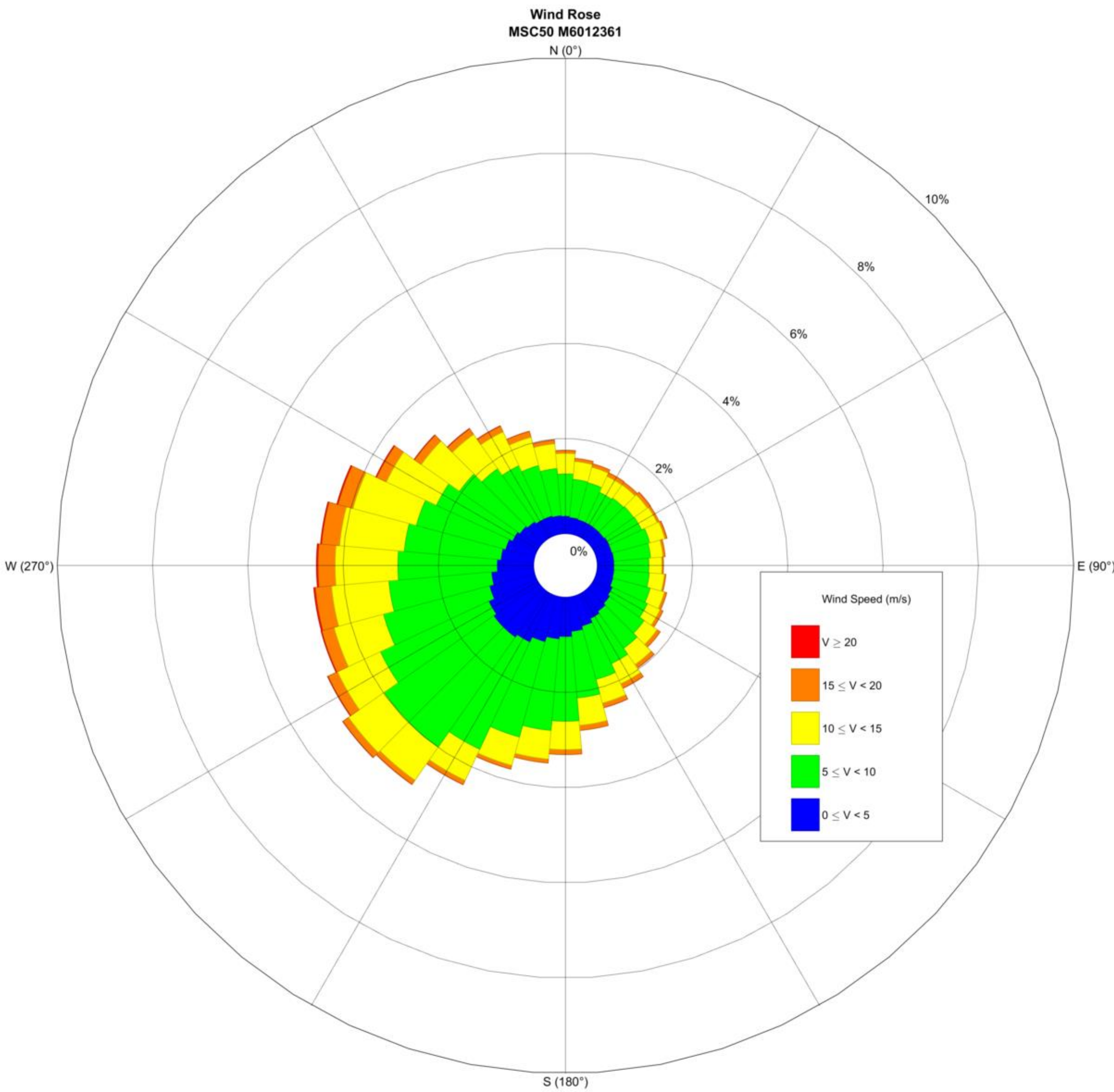


Figure 4.3: Wind Speed Rose for MSC50 Hindcast Point #M6012361 (Offshore of Argentia and Cooper Cove)

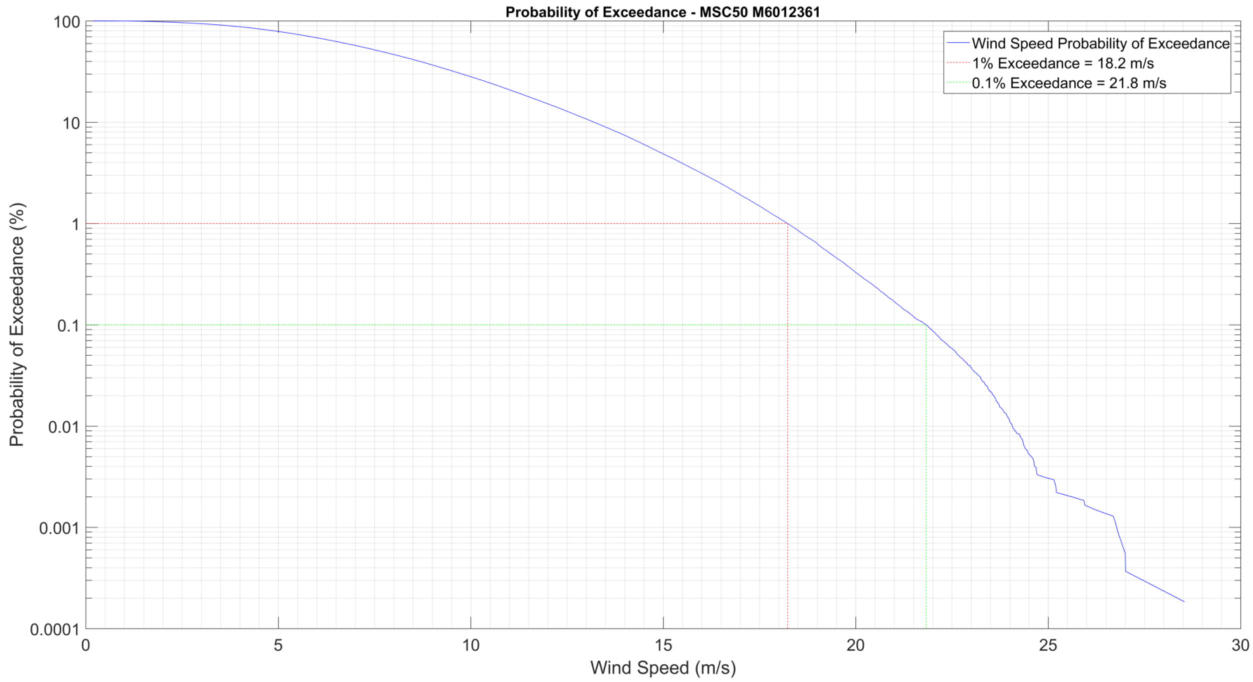


Figure 4.4: Wind Speed Probability of Exceedance for MSC50 Hindcast Point #M6012361 (Offshore of Argentia and Cooper Cove)

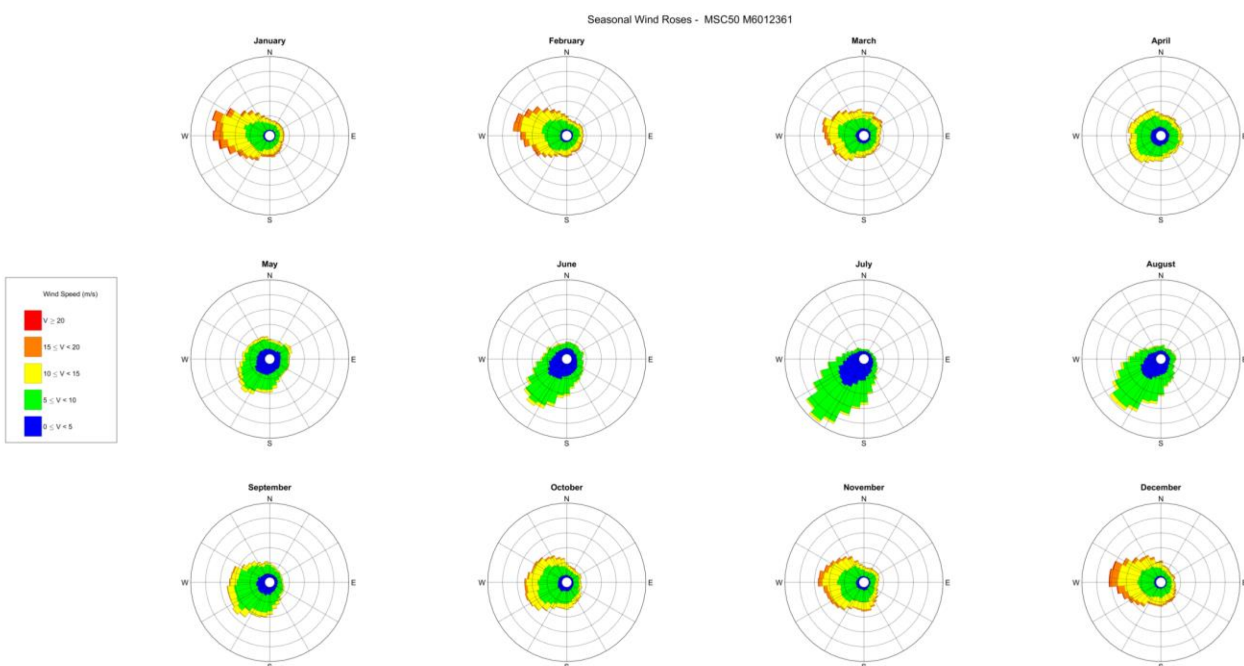


Figure 4.5: Monthly Wind Speed Roses for MSC50 Hindcast Point #M6012361 (Offshore of Argentia and Cooper Cove)

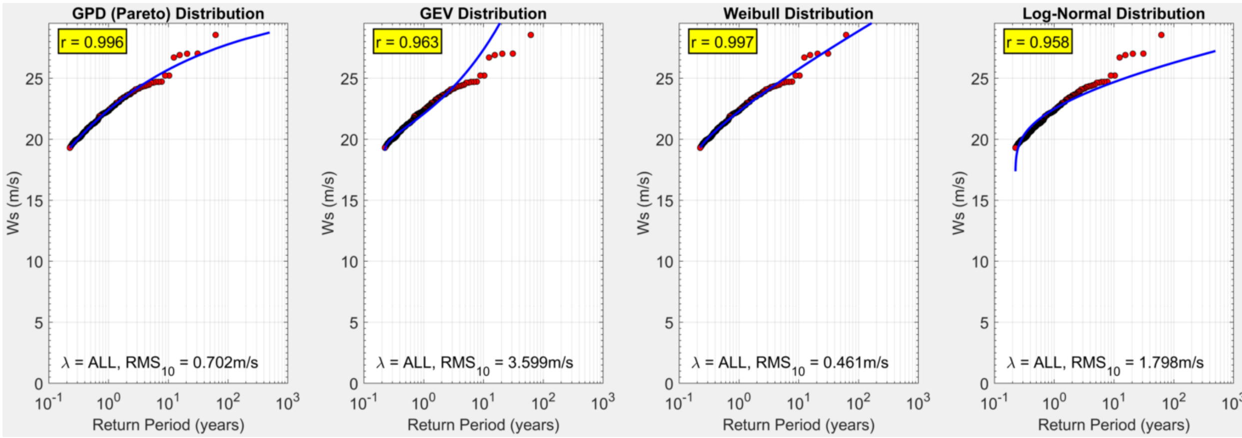


Figure 4.6: Extreme Value Analyses for Predicted Wind Speed from MSC50 Hindcast Point #M6012361

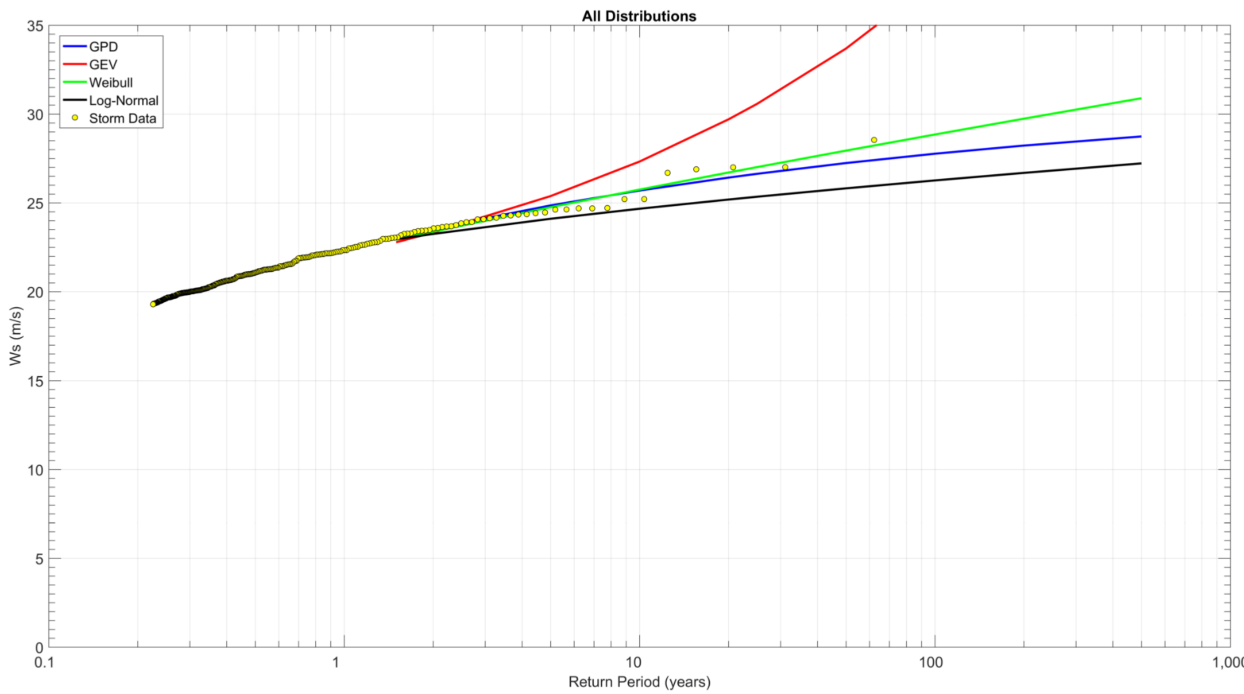


Figure 4.7: Extreme Value Analyses for Predicted Wind Speed from MSC50 Hindcast Point #M6012361

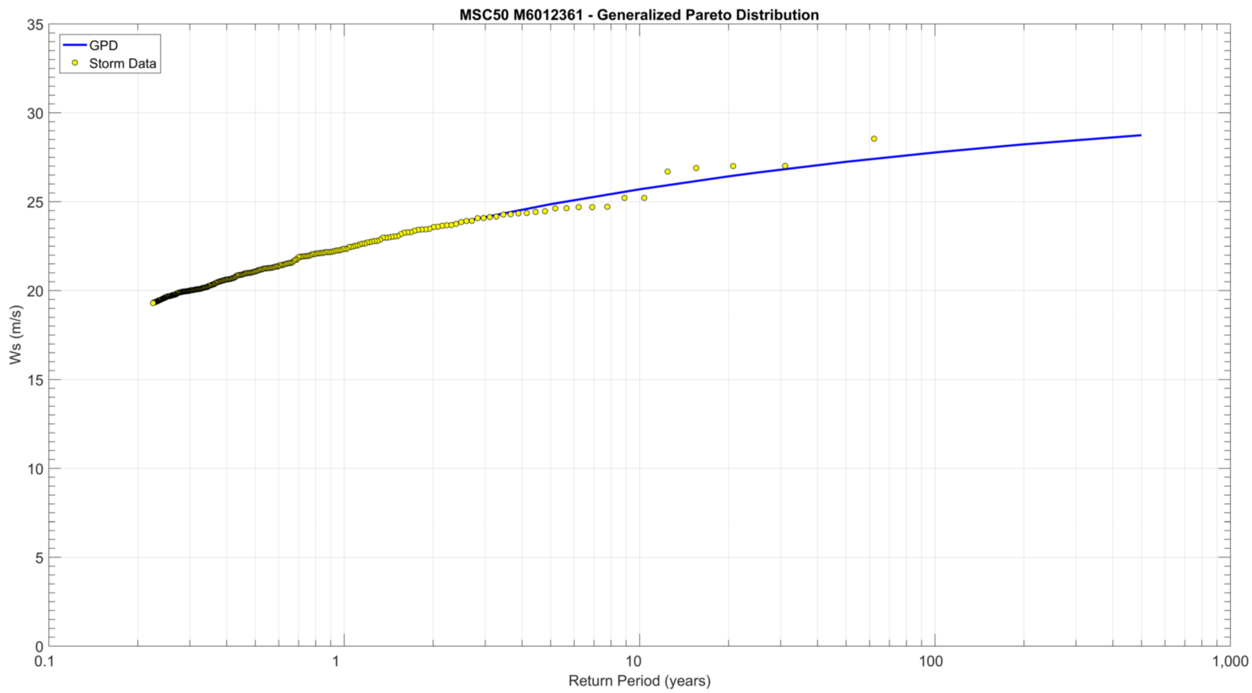


Figure 4.8: General Pareto Distribution EVA for Winds from MSC50 Hindcast Point #M6012361

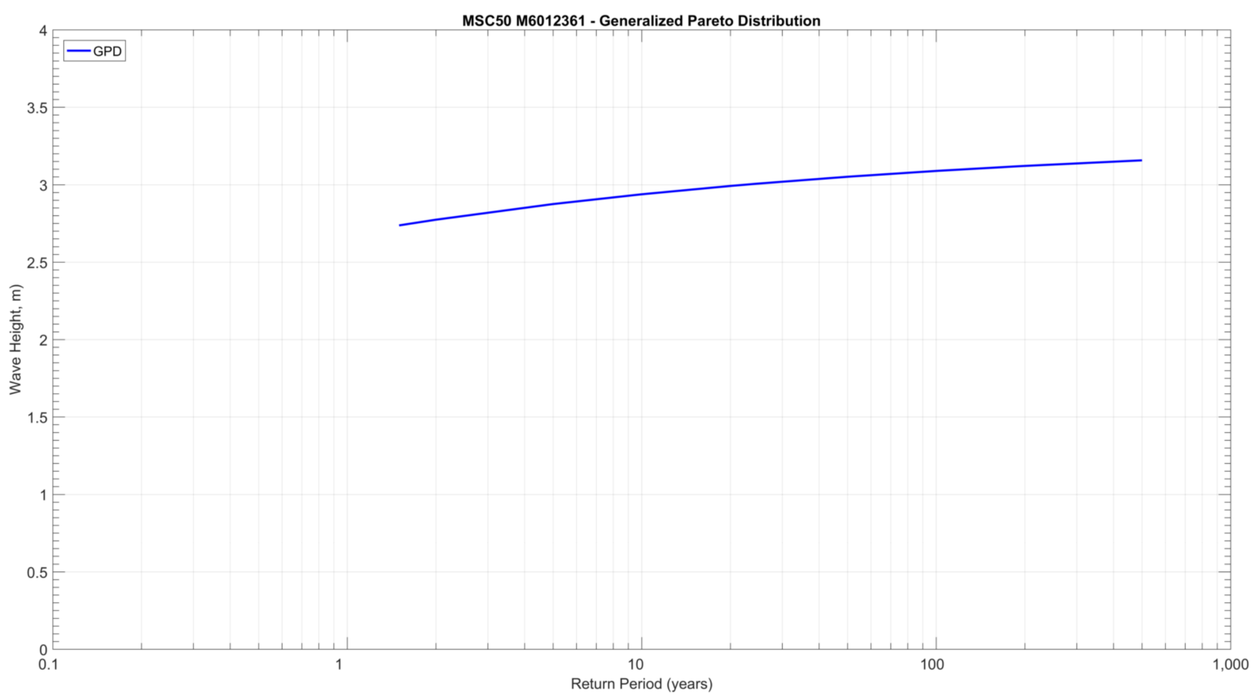


Figure 4.9: General Pareto Distribution EVA for Significant Wave Height Predicted by Parametric Hindcast

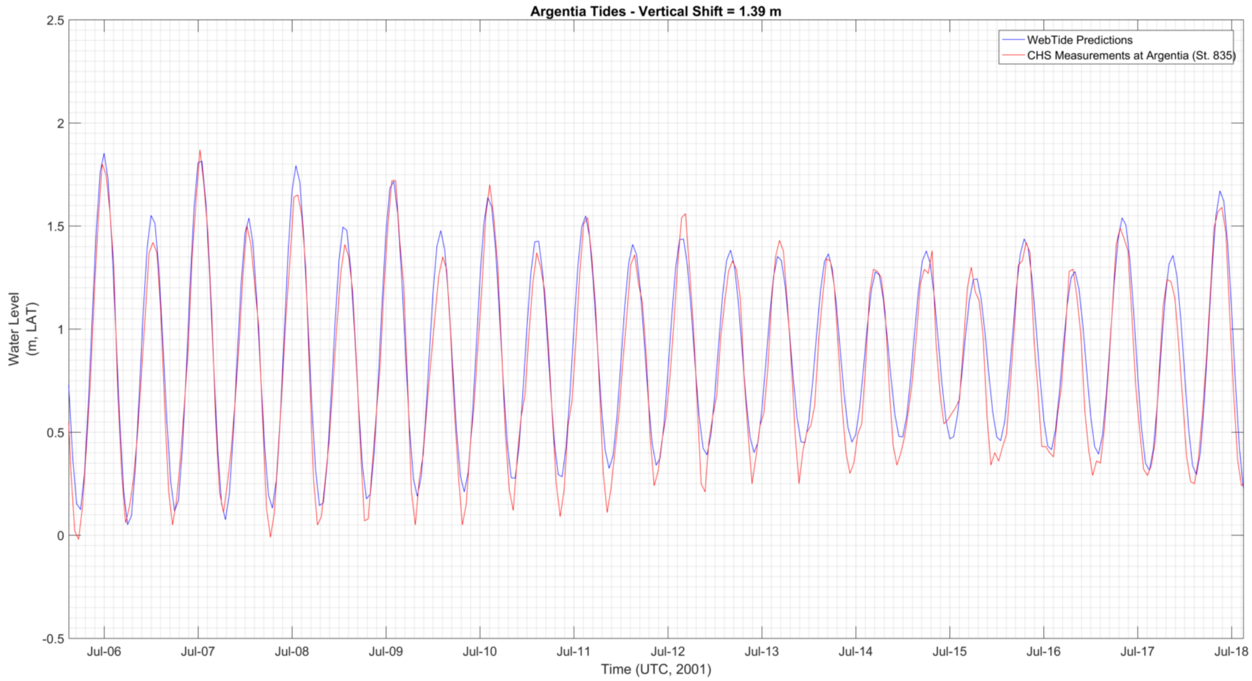


Figure 4.10: Measured and Predicted Tides at Argentia (CHS Station #835)

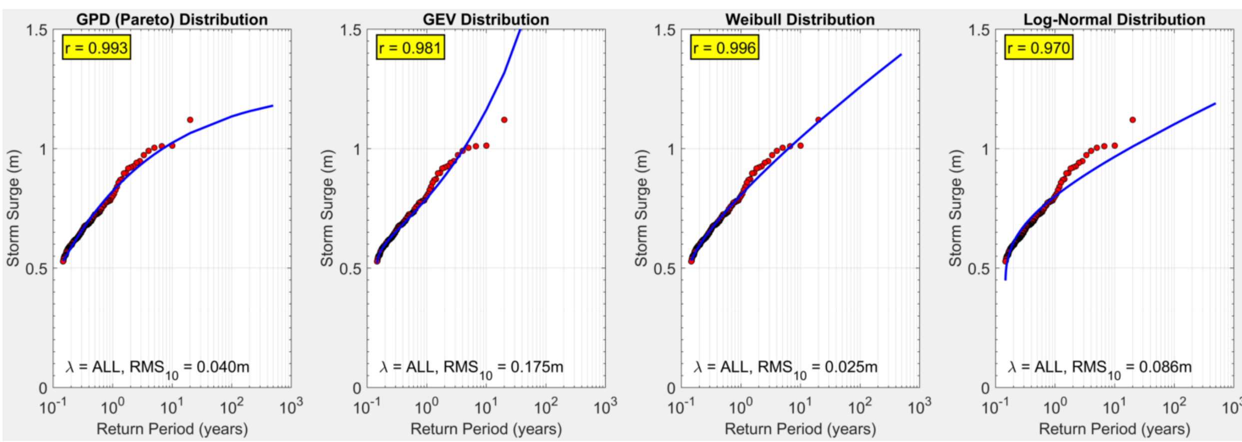


Figure 4.11: Extreme Value Analyses for Storm Surge at Argentia (CHS Station #835)

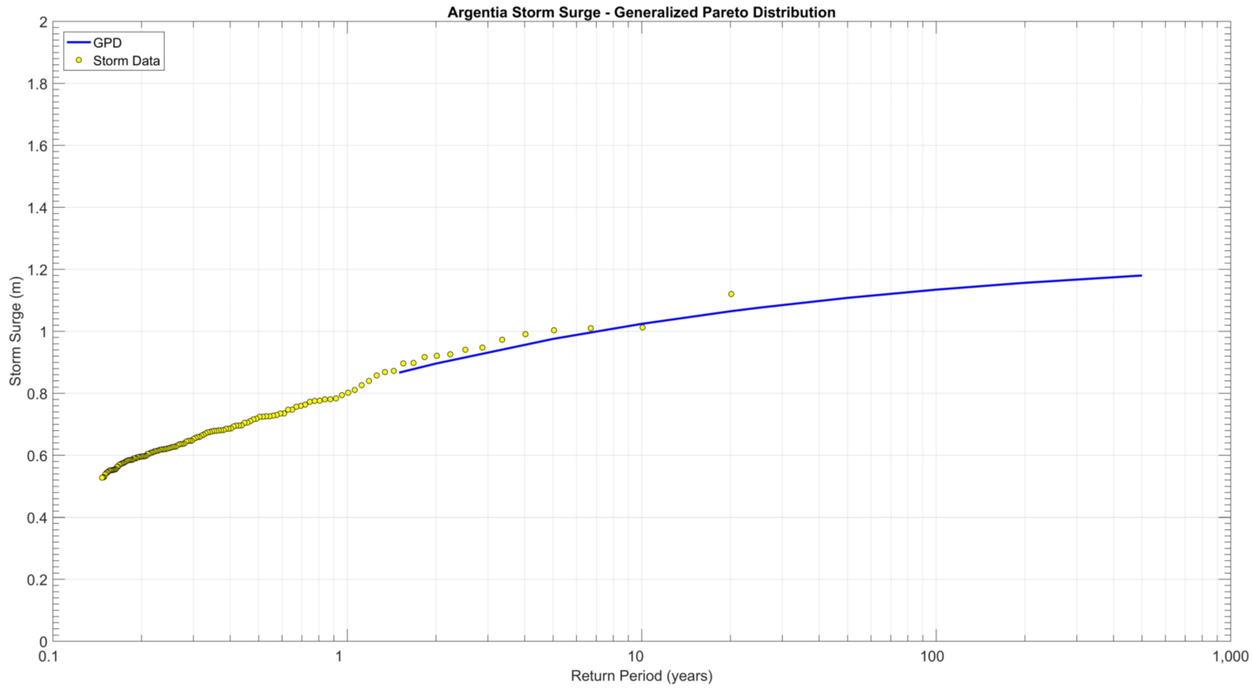


Figure 4.12: General Pareto Distribution EVA for Storm Surge at Argentia (CHS Station #835)

5.0 Environmental Considerations

5.1 The Undertaking

5.1.1 Environmental Background

5.1.1.1 Topography, Soils and Drainage

The topography of the shoreline adjacent to the proposed infill and wharf development area gradually slopes to the east towards Argentia Harbour and the Cooper Cove waterlot. Based on site topography, surface drainage appears to be to the east. It is anticipated that groundwater also generally flows in this direction at the Site, however the direction of shallow groundwater flow at the Site may be influenced by the presence of underground utility corridors immediately to the west of the Site and is not necessarily a reflection of regional or local groundwater flow.

Land surfaces along the shoreline area of the project location generally consist of native gravel, cobble and boulder material and low, sparse and shrubby vegetation. Surfaces adjacent the project location to the north, south and west, also consist of asphalt paved and gravel surface areas. It is assumed that stormwater drains by infiltration and overland flow in the area between Waterfront Drive and the shoreline.

5.1.1.2 Climate

The nearest Canadian Climate Normal Station to the project location is North Harbour, NL (47°08'00" N 53°40'00"W). Monthly average temperatures range from -3.9 to 16.3°C with extremes ranging from -25 to 28.5 °C. Average annual rainfall is 1395 mm with, on average, the most rain falling in October (158mm). The least rain falls on average in January (94mm), when peak snowfall occurs (53.8cm on average). The region receives an average of 177cm of snow annually between October and May (Environment Canada 2019).

The general average weather conditions were summarized by Husky Energy (Husky Energy 2012) and they noted that thunderstorms occur far less over Placentia Bay than the surrounding land area, but have the potential to occur throughout the year, particularly in the summer months; hail is typically associated with thunderstorms. In Argentia, the highest frequency of greater than 10 km visibility occurs in the fall; meanwhile, the greatest occurrence of reduced visibilities occurs during the late spring and early summer. Poor visibility conditions (less than 2km) increase through the spring and peak in July, occurring over 30% of the time.

5.1.1.3 Atmospheric Environment

The Come By Chance air quality monitoring site is the closest known monitoring site to the proposed project location. Background concentrations of air quality indicators at the Come By Chance indicate that the area meets the air quality regulations of the province, and attains the National Ambient Air Quality Objectives of Canada. The closest industrial sites to Argentia are the North Atlantic Refining Limited refinery at Come By Chance and the Newfoundland Transshipment Terminal at Whiffen Head. The nickel processing facility operated by Vale Newfoundland & Labrador Limited is active at Long Harbour. The refinery at Come By Chance is the dominant source of emissions in the airshed.

5.1.1.4 Terrestrial Habitat

Few terrestrial mammals are expected to be found in the vicinity of the proposed project area, as much of the surrounding area is characterized by existing or former brownfield sites. Potential resident terrestrial wildlife in the Argentia area, but not likely to be on the Argentia Peninsula, may include otter, muskrat and moose (VBNC 2002). Mammals located onshore near Argentia include small rodents such as rats and mice, meadow vole, snowshoe hare, mink, fox and masked shrew (ARG 1995; VBNC 2002). Numerous species of birds inhabit the Argentia Peninsula. During the summer, gannet, alcid and gull nesting and shearwater foraging communities populate the inshore zone of Placentia Bay; a substantial waterfowl population occurs in the nearshore waters of Placentia Bay in the winter (VBNC 2002). No known species at risk reside, feed, stage or overwinter on the Argentia Peninsula (VBNC 2002).

5.1.1.5 Marine Environment

Placentia Bay has an irregular coastline shape and includes bays, inlets and islands. The eastern shoreline is dominated by rocky headlands, gravel pocket beaches and rock platforms (CEA Agency 2008). Merasheen Island, Long Island and Red Island divide the inner bay into three channels. The eastern channel between the eastern shores of the bay and the eastern shores of Red and Long Island is the widest, the deepest and the least obstructed by shoals (LGL 2007). These nearshore rock/gravel/sand habitats and their attendant marine algae shelter a variety of species that could include anemones, barnacles and sponges, sea urchins, sand dollars, mussels, scallop, hermit crabs, lobsters and small numbers of cod, flounder and plaice (LGL 2007).

Cod is the most important species harvested in Northwest Atlantic Fisheries Organization (NAFO) Unit Area 3PSc (Placentia Bay), followed by snow crab and herring (NAFO, summarized by Husky Energy 2012). While lobster accounts for only a small percentage by weight of the overall 2005 to 2010 catch (less than 1%), given its consistently high value, this species remains very important to many area fishers. The fisheries in Placentia Bay are conducted year-round, the peak harvesting months in terms of quantity of harvest have been June and July (NAFO, summarized in Husky Energy 2012). Cod fishing activities generally occur throughout all months except April, noting that June and July generally account for more than 55% of the total cod catch and there is also a fairly strong fishery in the fall and early winter period. Snow crab fisheries are concentrated in the May to July period. The herring fishery has a spring and late fall/winter component, with most taken in December. Lobster, following the open season for this species (typically mid- to late April to late June) in this area (LFA 10), is strongly focused in those months. Capelin are harvested in June and July, although this species fishery usually takes place in a very short period (six to eight days) during the season.

Underwater Habitat Types

Based on the preliminary project description, an underwater benthic habitat survey (UBHS) will likely be required by Fisheries and Oceans Canada in the nearshore area, prior to their review of the Project. The results of this survey would also be incorporated into the Project's provincial environmental assessment. An UBHS involves the characterization of substrate, and documentation of macrofaunal and macrofloral species presence and abundance. This type of assessment is typically completed for projects that involve infilling or dredging activities. In general, UBHS programs involve the characterization of marine/fish habitat through analysis of underwater photography and video.

For reference, the methodology for completion of an UBHS will include:

- Transects of various lengths with dive spot checks on either side of each transect. The transects will be videoed the entire length and interpretation provided for every five (5) metres (m), including site specific information on the substrate type and marine macrofaunal/faunal species present.
- Detailed descriptions of observed biological (especially fish) presence and/or habitat that are related to commercial, recreational or aboriginal fisheries;
- Examination of the proposed project areas for shellfish presence, including siphon holes. Where areas are identified, an attempt to determine abundance is included. Abundance is estimated using the following scale:
    I. Abundant – Numerous (not quantifiable) observations made throughout the 5 m segment.

II. Common – Numerous (not quantifiable) observations made intermittently along the 5 m segment.
III. Occasional – Quantifiable (number of individuals) observations made intermittently along the 5 m segment.
IV. Uncommon – Quantifiable (number of individuals) observations made infrequently along the 5 m segment.

- General characterization and delineation of substrate types (i.e., rippled sand/rock/gravel) and a general characterization (i.e., what percentage of area is sand).

In recent years, confirmation of presence and extent, if any, of eelgrass beds (vs. small concentrations of eelgrass) within the extent of proposed infilling or dredging areas has been a focus for Fisheries and Oceans Canada. If encountered, the perimeter of any eelgrass beds will be visually represented in video format and mapped to provide approximate distances from the project. Based on Dillon's understanding of the characteristics of Cooper Cove, eelgrass beds are not anticipated to be present. However, it is noted that eelgrass has been observed in Argentia Harbour in areas approximately 1 km to the northeast of Cooper Cove. Eelgrass is classified as an ecologically significant species under federal legislation.

5.1.1.6 Species at Risk

A species at risk is defined as a species which is extirpated, endangered, threatened or of special concern. A number of species at risk have the potential to exist in or can migrate within project areas, and may be affected by project activities. Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assessed species at risk fish that could occur in Placentia Bay include: Atlantic cod (Newfoundland and Labrador population, Southern population); American plaice (Newfoundland and Labrador and Maritime populations, listed as endangered); American eel (listed as threatened); and Atlantic salmon (south Newfoundland Population listed as threatened). Based on an environmental assessment conducted in 2012 for a project with 1km of the proposed project site (Husky Energy 2012), there are no known critical nesting, feeding, staging or overwintering areas of at-risk bird and mammal species in the immediate vicinity of the nearshore area. Bird species at risk that may occur within the project area include the Harlequin Duck (Species at Risk Act (SARA)-listed as Special Concern) and red Knot rufa subspecies (COSEWIC-assessed as endangered). Marine mammals species at risk that may occur in Placentia Bay include the blue whale (COSEWIC-assessed and SARA-listed as endangered), fin whale (COSEWIC-assessed and SARA-listed as special concern) and the harbour porpoise (Northwest Atlantic population, COSEWIC-assessed as special concern, SARA-listed threatened). The leatherback sea turtle is COSEWIC assessed as endangered and listed as a Schedule 1 species under SARA and may also be present in Placentia Bay.

A search of the ACCDC data base within a 5 km radius of the project site, as well as species at risk review to address any potentially new species to the area and/or species that have been federally listed as a species at risk by COSEWIC or SARA since the 2012 assessment will be required.

5.1.1.7 Sensitive Areas

Sensitive areas of habitat within the nearshore study area that must be considered include eelgrass beds, capelin beaches, the Placentia Bay Extension Ecologically and Biologically Significant Area (EBSA), coastal wetlands, Important Bird Areas, and otter haul-outs.

As part of a fish habitat survey conducted by Husky Energy in 2012, eelgrass was observed in Argentia Harbour. Eelgrass is primarily a subtidal species that penetrates to some extent into the intertidal zone. It is common on mud flats that are exposed at low tide, in estuaries and shallow, protected bays (Kelly et al. 2009). Habitat provided by eelgrass along the coast is highly productive and a haven for juvenile fish of many species, with most fish found in the 3 to 5 m zone (DFO 2010). Catto et al. (1999) identified extensive eelgrass beds in Placentia Bay.

The arrival of capelin to the head of Placentia Bay generally occurs in June and July (VBNC 2002). Capelin spawning on beaches near Argentia has been reported historically (VBNC 2002). The size of the substrate on a beach will determine its suitability for capelin spawning. Capelin appear to prefer gravel 5 to 15 mm in diameter but will spawn on substrate as small as 2 mm diameter and as large as 25 mm diameter (VBNC 2002). There are several capelin spawning beaches throughout Placentia Bay. Typical capelin beaches are located at Fox Harbour (north of Argentia) and Point Verde, southern Ship Cove and Gooseberry Cove (along the Cape Shore south of Argentia) (Catto et al. 1999).

There are major seabird colonies at or near the mouth of Placentia Bay, with smaller colonies located on inner islands and along the coastlines of Placentia Bay. Cape St. Mary's Seabird Ecological Reserve (an Important Bird Area), is located at the mouth of Placentia Bay and is the most important breeding area in Placentia Bay (Husky Energy 2012). Cape St. Mary's covers 64 km^2 and, during the breeding season, is home to Northern Gannet, Black-legged Kittiwake, Common Murre and Thick-billed Murre. In addition, Razorbill, Black Guillemot, Double-crested, Great Cormorant and Northern Fulmar nest at the Reserve (Newfoundland and Labrador Department of Environment and Conservation 2011). The adjacent marine environment is an important wintering site for thousands of sea ducks, including Harlequin Duck, Common Eider, scoter and Long-tailed Duck (Husky Energy 2012).

5.1.2 Project Physical Features

5.1.2.1 Project Structure / Infill Area

The proposed work will create additional waterfront land through the infill of Cooper Cove. The created land will be adjacent to Waterfront Drive (Highway 102), a property owned by the Port of Argentia. The proposed infill, wharf plan, and seabed depths are shown in the drawings in Appendix B.

An area of approximately 40 acres is proposed for infilling. The water depth within the proposed infill area ranges from 0.5 m along the shoreline to a maximum of 16 m lowest astronomical tide (LAT) along an area of the wharf face. Water depths along the proposed wharf face range from approximately 12 to 16 m.

5.1.2.2 Wharf Structure

As described in Section 3.0, the proposed wharf structure will consist of either rectangular concrete caissons or steel pipe piles supporting a concrete deck. In the case of the steel pipe piles, a steel sheet pile wall will be used to retain material behind the wharf.

5.1.2.3 Fill Material

There is an existing stockpile of pit-run aggregate material located on an adjacent site. This stockpile was used for the 2008 construction of a nearby concrete caisson wharf. Any aggregate material used as fill material for the project would be subject to analysis for contaminants prior to construction.

5.1.2.4 Roads

The proposed site layout includes construction of access roads, with capacity to handle fully loaded trucks. Access to the Site will be from the existing Waterfront Drive, which would be upgraded (e.g. signage, turning lanes) as required.

5.1.2.5 Navigation and Pilotage

A detailed survey of Argentia Bay within the vicinity of Cooper Cove should be conducted to provide information on the placement of navigation markers, buoys and beacons according to Transport Canada regulations. Placement and anchoring of markers and buoys are the responsibility of the Canadian Coast Guard. Charting of Placentia Bay and Argentia Harbour and approaches should be conducted by a qualified harbour pilot, as may be required.

5.1.2.6 Storage and Handling of Hazardous Materials

It is likely that storage and handling of bulk and hazardous materials related to wharf activities and to supply offshore industries will be required at the project site, both during construction and operational periods. There may also be a fuel tank farm for storage and handling of fuels for vessels at the supply dock. Containment systems will be required at fuel storage facilities and chemical storage areas in accordance with requirements of the provincial Department of Municipal Affairs and Environment. Storage and handling of hazardous materials should be done by trained personnel according to applicable regulations and best industry practices.

5.1.3 Environmental Management Considerations

Project site development may consist of the following main components:

- Access road development
- Infilling and site development; and,
- Wharf construction.

5.1.3.1 Potential Environmental Impacts during Construction and Operations

A detailed project specific environmental protection plan (EPP) would be required for the construction phase of the project, which would support in ensuring compliance with Provincial and Federal regulations and guidelines, and project-specific permits and approvals.

The Project should be designed and constructed so as to minimize risk and potential environmental impacts, including sources of pollutants. Potential environmental impacts that have been identified at the project feasibility stage include:

- Increased vessel traffic in Argentia Harbour may interfere with local fishing boats and other vessel traffic;
- Impacts to water quality from materials and techniques used in construction;
- Impacts to wildlife, including plants, avifauna, fish, and marine mammals and their habitats;
- Erosion and sedimentation of waterbodies resulting from on-land and in-water activities;
- Dust generation;
- Risk of fuel, lubricant, and hydraulic fuel release;
- Airborne exhaust emissions from construction and operational equipment;
- Noise and light pollution from construction and operational activities;
- Disturbance to historic resource;
- Lighting, noise and project construction activities can potentially interfere with the migratory patterns of birds and the behaviour of transient or resident marine birds;
- Marine construction activities can include noise and disturbance to fish and fish habitat, as well as disturb nearshore terrestrial habitat and cause seabirds, waterfowl and marine mammals to avoid the area.
- Project vessel traffic may interfere with local fishing boats and other vessel traffic. The potential exists for vessels to collide, run aground and/or sink. Such events may lead to the accidental release of fuel and other hazardous materials to the marine environment. The release of ballast or bilge water could introduce non-indigenous species or deleterious substances into Placentia Bay.
- Temporary increase in on-site and off-site traffic (during equipment mobilization and construction); and,
- Alteration of water level views which may interfere with recreational and commercial activities.

Small volumes of non-hazardous solid waste materials (i.e., construction debris) may also be generated during assembly from materials and parts packaging.

5.1.3.2 Potential Mitigation Considerations during Construction and Operations

In project planning, it is recommended that the Port of Argentia consider implementing the following project specific mitigation measures during construction and operations so as to mitigate potential sources of pollutants from entering the environment:

- A site specific Environmental Management Plan (EMP) should be developed and followed.

- All debris and waste materials will be disposed of in accordance with the latest regulations respecting Solid Waste Resource Management issued by the Newfoundland and Labrador Department of Municipal Affairs and Environment (MAE). Non-hazardous construction debris will be either recycled or salvaged.
- On completion of the Project, all construction equipment, surplus materials and temporary works should be cleared away and removed from the site.
- If any dredging is required to fulfill project requirements, management of dredged materials must meet regulatory permitting requirements (e.g. disposal at sea).
- Infill material must be clean, with appropriate analysis completed on the source material.
- Dust mitigation measures should be implemented.
- Effective erosion and sediment control measures should be identified in the EPP and implemented prior to construction and infilling activities.
- All equipment used on site should be in good working order to reduce effects of noise.
- All construction activities should occur during working hours as determined by local bylaws and as defined in permits.
- All soils and surface water impacted via spills and releases should be disposed of off-site in accordance with all applicable environmental regulations and legislation.

5.1.3.3 Climate Change Considerations

In addition to existing regulations and policies, engineering of infrastructure at the proposed Site should take into account impacts of extreme weather events and projected climate-related trends. Specifically, catchment design should take into account capacities needed to capture runoffs during peak rainfall and snow melt. Dock and shore side infrastructure design should accommodate long term change in intertidal extents and storm surge. Application of appropriately sized and positioned buffer zones would minimize runoff during heavy rainfall periods.

5.1.3.4 Potential Resource Conflicts

While Cooper Cove is not currently identified as an active fishing area, there may occasionally be recreational and commercial fishing vessels in the vicinity of the proposed Project area. During stakeholder consultations, it is anticipated that Argentia area fish harvesters may identify potential causes of resource conflicts associated with the Project, including:

- Infilling and wharf construction activities in the nearshore area;
- Designated safety zones around the construction footprint
- Potential in-water blasting.

Timing construction activities for the late Fall through winter period, during a period of limited fishing activity and less vessel traffic, would help mitigate interactions. Vessel traffic associated with the Project will likely be negligible in comparison to the routine vessel traffic currently in the area.

Fill material is expected to be sourced from either the adjacent stockpile or from the bund wall at the Husky site. If material is sourced from the Husky site, regulators may require that the material be sampled and tested for possible contaminants.

No known heritage properties are located within the immediate vicinity of the proposed project. If, however, historic resources are encountered during construction and/or operations, work in the area should be stopped immediately and the appropriate authorities should be notified in accordance with *the Historic Resources Act* (1985).

Other considerations may be required as public feedback and other inputs are gathered during stakeholder consultation activities.

5.2 Regulatory Approval of the Proposed Undertaking

5.2.1 Permits, Licenses and Approvals

The following is a list of the anticipated permits, licenses and approvals required for an undertaking of this nature.

Approvals/Permits/Registration	Regulatory Agency
NL Environmental Assessment Registration	NL Department of Municipal Affairs and Environment, Environmental Assessment Division
Request for Review or Fisheries Act Authorization	Fisheries and Oceans Canada
Application to Alter a Body of Water	NL Department of Municipal Affairs and Environment, Water Resources Division
Navigable Waters Protection Approval	Transport Canada

The Project must also adhere to the Department of Municipal Affairs and Environment's guidelines for the Construction and Maintenance of Wharves, Breakwaters, Slipways and Boathouses.

At a minimum, it is recommended that preliminary regulatory agency consultation be carried out with the following federal and provincial agencies: NL Municipal Affairs and Environment (NLMAE); Transport Canada (TC); and Fisheries and Oceans Canada (DFO) to determine project-specific permit application requirements.

5.2.2 Stakeholder Consultation

A consultation plan to engage stakeholders in the project's environmental and socio-economic assessments is recommended.

5.3 Permitting Tasks, Estimate of Costs & Schedule

5.3.1 Environmental Permitting Tasks

Based on our understanding of the proposed project, Dillon has identified tasks to complete regulatory permitting for the project. The seven (7) tasks are outlined below:

Task 1: Project Initiation and Review

- Desktop review of available information should be completed to identify information pertaining to current environmental and socio-economic conditions at and adjacent the proposed Cooper Cove project site. Readily available sources of this type of information can include topographic and resource maps, aerial imagery, environmental databases, government websites, and previous assessments completed in the area. This review has been partially completed, as contained herein. Additionally, an Atlantic Canada Conservation Data Centre (ACCDC) database search would be undertaken for the defined study area. Typically the data provided is for a 5 km buffer around the study area. A short list of potential priority species is identified based on preferred habitat for species identified in the ACCDC screening and potential habitats within the study area. Habitats would initially be evaluated based on available mapping, provincial landscape data and digital satellite data. Information obtained from the desktop review would then support findings from a field assessment.

Task 2: Site Reconnaissance and Underwater Benthic Habitat Surveys

- Site visit and initial site reconnaissance to support preparation of regulatory applications. On-site review of aquatic resources, terrestrial habitat, atmospheric environment, and land use (on property and adjacent properties) would be required within the Study Area.
- Completion of underwater benthic habitat survey (UBHS), including technical report, will likely be required by Fisheries and Oceans Canada for the proposed infill area and wharf development. The results of this survey would also be incorporated into the Project's provincial environmental assessment, and likely reviewed by Transport Canada.

Task 3: Preliminary Regulatory Agency Consultation

- Complete preliminary regulatory agency consultation with the following federal and provincial agencies: NL Municipal Affairs and Environment (NLMAE); Transport Canada (TC); and Fisheries and Oceans Canada (DFO) to determine project-specific permit application requirements, and scope of studies required.

Task 4: Provincial Environmental Assessment Registration

- Prepare and submit Environmental Assessment Registration document to NLMAE (Environmental Assessment Division; completed under Newfoundland and Labrador's Environmental Assessment Act, 2010).

- Note: This submission would not include an Environmental Preview Report (EPR), Environmental Impact Statement (EIS) or Environmental Protection Plan (EPP) which may be requested by NLMAE following their review of the EA Registration Document.
- Note: Projects having capital costs in excess of $5 million are subject to applicable cost recovery fees. This fee schedule would be provided by NLMAE to Argentia Management Authority following submission of EA Registration document.

Task 5: Fisheries and Oceans Canada: Request for Review

- Prepare and submit project-specific Request for Review application package to Fisheries and Oceans Canada. At a minimum, and for scheduling purposes, preliminary design drawings would be required as part of this application package. Note: This submission does not include requirements related to a Project Authorization under the Fisheries Act.

Task 6: Transport Canada: "Notice of Works" Application

- Prepare and submit "Notice of Works" application package to Transport Canada for review. Note: This initial submission does not serve as an "Application for Approval", which may be required pending review of the "Notice of Works" application by Transport Canada.

Task 7: Provincial "Permit to Alter a Body of Water" Application

- Prepare and submit application package for "Permit to Alter a Body of Water" to NLMAE. It is recommended that this application be prepared and submitted following release of the project from the NL Environmental Assessment process.

5.3.2 Preliminary Permitting Cost Estimate

Figure 5.1: Cost Estimate by Task

Task	Description	Cost Estimate
1	Detailed Background Review, ACCDC Costs and Review	$4,000
2	Field Program/Site Reconnaissance and Underwater Benthic Habitat Surveys	$10,000
3	Preliminary Regulatory Agency Consultation	$2,000
4	Provincial Environmental Assessment Registration	$10,000
5	Fisheries and Oceans Canada: Initial Request for Review	$4,000
6	Transport Canada: 'Notice of Works' Application	$2,000
7	Provincial Permit to Alter a Body of Water Application	$1,500

As noted in the Tasks above, the estimate of costs does not include additional document and permitting requirements that may be required by regulatory agencies following their review of initial permit applications outlined above. Additional document and permitting requirements may include, but not be limited to, DFO *Fisheries Act* Authorization, TC "Application for Approval", and/or Environmental Preview Report, Environmental Impact Statement and/or Project Environmental Protection Plan required by NLMAE (Environmental Assessment Division).

5.3.3 Preliminary Permitting Schedule

Although not required under the Newfoundland and Labrador Environmental Assessment process or by DFO or TC, Dillon recommends consulting with relevant regulatory authorities to confirm approach and requirements to be fulfilled in the provincial EA Registration document, and in application packages for other provincial and federal permits and approvals in order to prevent potential costly delays and unnecessary expenses.

Assuming detailed project specifications (even if only preliminary) are available, the EA Registration document, DFO Request for Review package and TC "Notice of Works" application package can be prepared and submitted to the respective regulatory agencies within approximately six (6) to eight (8) weeks, following the completion of Tasks 1 to 3 outlined above.

Appendix A

Stantec Geotechnical Desktop Study

Desktop Study of Marine Geotechnical Conditions for Infill Feasibility Study, Cooper Cove, Argentia, NL

Stantec

Prepared for:
Dillon Consulting Limited
66 Kenmount Road
St. John's, Newfoundland, A1B 3V7

Prepared by:
Stantec Consulting Ltd.
141 Kelsey Drive
St. John’s, NL A1B 0L2
Tel: (709) 576-1458
Fax: (709) 576-2126

File No: 121622483

Final Report

April 2, 2019

Table of Contents

1.0 INTRODUCTION 1

2.0 BACKGROUND 1

3.0 SITE AND GEOLOGY 2

4.0 SUBSURFACE CONDITIONS 2

4.1 Marine Atlantic Ferry Terminal 2
4.2 Argentia Fleet Dock 3
4.3 Husky White Rose Extension Project 3
4.4 Approach Lighting System 4

5.0 INFERRED SUBSURFACE CONDITIONS AT COOPER COVE 4

6.0 DISCUSSION ON SITE DEVELOPMENT 4

7.0 FOUNDATION TYPES 5

8.0 PROPOSED INFILL MATERIALS 6

8.1 Northland 6
8.2 Husky 6

9.0 CLOSURE 7

10.0 REFERENCES 8

LIST OF APPENDICES

Appendix A Statement of General Conditions
Appendix B Figures

LIST OF FIGURES

Figure 1 General Area Plan, Cooper Cove ..... Appendix B
Figure 2 Site Location Plan, Cooper Cove ..... Appendix B
Figure 3 Approximate Seabed Profile, Cooper Cove ..... Appendix B

1.0 INTRODUCTION

Further to the request of Dillon Consulting Limited (Dillon), this report presents the results of a desktop study carried out to infer the marine geotechnical conditions to support a feasibility study for infilling Cooper Cove, Argentia, NL and constructing a new wharf.

The work for this study was performed in general accordance with our proposal dated February 11th and your authorization dated February 26th, 2019. The scope generally consisted of the following:

- Review all available geotechnical information from the nearby area to comment on the probable suitability of the Cooper Cove area to support new fill for use of heavy marine operations.
- Comment on the probable suitability of the Cooper Cove area to support either a steel piled or concrete caisson wharf structure at the perimeter of the proposed infill area.
- Review of geotechnical suitability of an existing stockpile of pit-run aggregate material at an adjacent site (Northland) in Argentia; based on report prepared by Jacques Whitford (now Stantec) for the 2008 construction of concrete caissons. Report contains gradation analysis, shear test results, unit weights, and petrographic analysis of the proposed infill material.
- Provide a recommendation as to required future geotechnical work in order to complete detailed design of the infill area and wharf.

Subsequent to award of above scope of work, the Port of Argentia through Dillon, requested if Stantec could also include as additional scope the possibility of using the berm wall (seabund wall) material from the adjacent Husky site as infill in Cooper Cove. We have reviewed the material provided and our comments are included in this report.

This report has been prepared specifically and solely for the work described herein and contains our findings and includes preliminary geotechnical recommendations for site development.

2.0 BACKGROUND

The Argentia area has a long history of civil and military construction stemming from its development as a United States Naval Base and Air Station which operated from 1941 to its closure in 1994. The development of the Trans-Canada Highway and road network in the 1960’s led to a new ferry terminal opening in 1967 and significant upgrades in the 1980’s for both the ferry terminal and adjacent Fleet Dock, which took its name from the US Navy fleet of ships which were serviced from this site.

As part of this history, Stantec has compiled our inhouse geotechnical information collected during specific work assignments, as well as historical documentation we compiled during geotechnical and environmental investigations following closure and decommissioning of the former military sites.

For this desktop study we have focused on four (4) project sites on the Argentia Peninsula where we have information on the geotechnical conditions which may provide insight to those that could be anticipated at Cooper Cove. The sites are located on the appended Figure 1: General Area Plan and are identified as follows:

1. Marine Atlantic Argentia Ferry Terminal
2. Argentia Fleet Dock
3. Husky White Rose Extension Project
4. Approach Lighting System

3.0 SITE AND GEOLOGY

Cooper Cove is located on the east side of the Argentia Peninsula (also referred to as the Northside) and within Argentia Harbour, Placentia Bay, NL, as shown on the appended General Area Plan: Figure 1. The proposed infill area will span the cove for a berthing face of approximately 750 m in length and will extend from the shoreline about 250 m at its furthest extent. Water depths up to about 12 m to 14 m at the berthing face are anticipated based on the available bathymetry data.

Provincial government mapping available on the The Landforms and Surficial Geology of the Argentia Map Sheet (NTS 1N/05), provides a landform classification for the Argentia Peninsula as Marine-terrace (M_t) for its depositional environment. A broad range of materials are described including clay, silt, sand, gravel and cobbles, generally formed by fluvial and glaciofluvial erosion or marine wave action. The soils within Placentia Bay are typically described as glaciomarine gravelly sand and silt with surficial post glacial mud and the seabed has been shaped and modified by ice sheet and glacier movement (Brushett et. al., 2007).

A review of previous historic projects completed at Argentia confirms a wide range of materials encountered across the Argentia Peninsula ranging from surficial thick deposits of predominantly sand to sand and gravel with trace silt; underlain by mixtures of cobble and builder rich sand and gravel; in turn underlain by clay and clay/silt/sand mixtures at depth.

4.0 SUBSURFACE CONDITIONS

The general subsurface conditions described for the projects selected below form the basis of our discussion and comments for anticipated conditions and proposed infilling of Cooper Cove.

4.1 Marine Atlantic Ferry Terminal

One deep marine geotechnical borehole was drilled in 2008 at Marine Atlantics Ferry Terminal to support the design and construction of mooring buoy anchorage facility in Argentia (Site 1 as shown on Figure No. 1). The borehole was drilled to a depth of 33.0 m below the seafloor. The borehole elevation was referenced to the top of the existing concrete wharf deck and having an assumed elevation of ±0.0 m. The subsurface stratigraphy encountered in the borehole generally consisted of approximately 5.0 m of very loose silty sand (marine sediment) underlain by a sequence of generally dense coarse-grained soils (sand, silty sand, gravel) and an approximately 5 m thick layer of very stiff to hard clay encountered in between the sandy soils at a depth of 26 m.

4.2 Argentia Fleet Dock

Geotechnical investigations were completed in 1985 by Hardy Associates and in 1986 by Nolan, Davis and Associates for the Argentia Fleet Dock area (Site 2 as shown on Figure No. 1). Several boreholes were drilled through the concrete deck and the subsurface conditions encountered in these boreholes generally consisted of soft sediments with organics, underlain by compact to very dense granular materials (sand, gravel, silty sand and cobbles). The maximum thickness of the soft layer was approximately 3.0 m below seabed.

During the reconstruction of the Fleet Dock in 2005, geotechnical information available from borehole investigations completed in between 1992 and 1993 by Nolan, Davis and Associates in the area of south Fleet Dock were reviewed by Stantec (former JWA). Nine boreholes were completed as a part of the 1992-93 field investigations including eight marine boreholes (one inland borehole) drilled to depths ranging from 26.2 m to 36.7 m below seabed. The seabed elevations ranged from -3.4 m to -10.8 m at the borehole locations (Datum CHS BM No. 6 – 1942, El. +5.6 m). The subsurface stratigraphy encountered in the marine boreholes generally consisted of loose to dense, medium to coarse grained sand with gravel, some silt and black organics on surface, underlain by a sequence of generally dense to very dense, coarse-grained soils (sand and gravel, gravelly sand, and silty sand) with varying amounts of silt content. Occasional cobbles and boulders were encountered throughout the depths of all boreholes. This site is closest to the proposed development and thus is likely to be more representative of subsurface conditions in Cooper Cove.

4.3 Husky White Rose Extension Project

Geotechnical investigations were completed by Stantec and Golder Associates at the Husky Graving Dock Site (Site 3 as shown on Figure No. 1) completing a number of inland boreholes between 2011 and 2012. The ground surface elevation ranged from 7.7 m to 3.7 m at the 2011 borehole locations and the borehole depths ranged from 24.4 m to 29.5 m. Based on the materials encountered in the 2011 boreholes, the subsurface stratigraphy generally consisted of upper sand and gravel layers followed by loose to very dense fine-grained sands (silty sands) with silt seams and layers, underlain by approximately 5 m thick, very stiff to hard clay and very dense sand. The elevation at the top of the clay layer varied from -5.3 m to -16.0 m (Geodetic Datum).

The depth of 2012 boreholes were in excess of 40 m and consisted of a very heterogeneous mixture of glacially derived materials consisting of gravels, sands, silts and clays and various combinations of these constituents. In some of the boreholes, more permeable strata were encountered in the upper section of the boreholes with some silt and clay layers at depth. While at other borehole locations, impermeable layers in the upper section of the boreholes were encountered with more permeable layers at depth. Boreholes located near or in the seabund indicated permeable layers above the dock floor level (El. -18 m CD) and some silts and clay layers below -18 m CD.

4.4 Approach Lighting System

Geotechnical investigations were completed around 1963 to support the construction of an approach lighting system for the former runway (Site 4 as shown on Figure No. 1). This included two boreholes drilled inland having a surface elevation ranging from +5.0 m to +4.4 m (Datum Plane Mean Low Water to Seabed). These boreholes were approximately 4.6 m to 11.0 m deep. Subsurface information encountered in the boreholes generally consisted of compact to very dense, boulder till underlain by a compact to dense sand layer.

Four boreholes were also drilled in the marine environment having depths below seabed ranging from 11.0 m to 12.5 m. The elevations of the seabed at the borehole locations varied from elevation -2.7 m to -7.6 m. Subsurface information encountered in these boreholes generally consisted of loose, fine sand to sand and gravel followed by compact to very dense, sand with cobbles and boulders. The upper loose layer was approximately 1.0 m to 1.5 m thick.

5.0 INFERRED SUBSURFACE CONDITIONS AT COOPER COVE

After reviewing the subsurface information described above from the four different sites located near the proposed infill area, the following subsurface stratigraphy may be anticipated at Cooper's Cove.

The subsurface conditions may consist of very loose marine sediments (sand or silty sand) with some organics underlain by compact to very dense, coarse-grained soils (sand, silty sand, gravel) with interbedded silt seams and layers. A stiff to hard clay layer may be also anticipated at depths below the coarse-grained soils. The thickness of the upper very loose layer may vary from 3.0 to 5.0 m. To confirm the anticipated subsurface conditions at the proposed infill area, a marine geotechnical borehole investigation would be required. This investigation would also characterize the density and strength profiles of the encountered soils for design of foundations and estimated settlements and to verify other site development constraints including slope stability.

6.0 DISCUSSION ON SITE DEVELOPMENT

Based on the available bathymetry contour plan (Figure 2) and approximate seabed profile (Figure 3), the seabed slopes are generally flat in nature (less than 10°) within the proposed infill area. This profile, in combination with the anticipated subsurface conditions described above, suggests that the proposed land reclamation will be feasible, provided adherence is given to appropriate infill material and placement techniques.

It is assumed that dredging to remove anticipated loose/soft soils (if encountered) will likely not be permitted or will be cost prohibitive.

We provide the following general points for typical infill project development:

- Use of rock fill or granular fill materials (sand and gravel) is recommended for infilling. Preferred rock fill materials should consist of 200 mm minus well graded, durable blasted rock with little to no fines. For sand and gravel type materials, a fines content of less than 2% is typically recommended to avoid siltation effects to the marine environment and to avoid segregation of materials (creating zones of weak soil).
- Materials with more than desirable fines are sometimes used, however they are typically in a confined area behind a sheet pile wall or crib or above the waterline.
- Rock fill should be placed from the shoreline and pushed over the leading edge progressing to the outer reach of the infill area. The rock fill should be piled at the leading edge before pushing over the slope to help promote any possible failure in any very loose soils (or weak soft soils) and help create a mud wave in front of the leading edge; progressively pushing the organic sediment into deeper water and limiting its presence beneath the pad. Monitoring of mud waves during advancing of the leading edge is essential to ensure that it will not be trapped under the new fill placed beyond and side slopes of the advancing edge. Provisions should be made to excavate and remove the soft mud wave soils in case of unacceptable mounding (1 m to 2 m high).
- Compaction of rockfill above the waterline is recommended. The upper 1 m of fill thickness should have appropriate gradation for any foundation construction, typically 100 mm minus well graded rock fill. The 100 mm minus structural fill above the waterline should be placed in 200 mm to 300 mm thick lifts and compacted with a minimum 15 tonne roller to achieve 100% of Standard Proctor maximum dry density. The structural fill above the water line should have a slope of not steeper than 2 H:1V. Scour protection is recommended for the underwater rockfill slopes.
- Some settlement of the reclaimed area may be anticipated depending on the thickness of the loose sediments. However, most of this settlement (about 80%) will occur during land reclamation/fill placement.
- Pending the type of material placed, ultimate subsurface conditions encountered and the desired foundation loading requirements, fills placed below mean sea level can be improved by dynamic compaction methods, such as drop weight or hammer.

7.0 FOUNDATION TYPES

A broad range of marine facilities have been developed along the Argentia shoreline, utilizing both wood and steel piles and gravity type structures including wood timber cribs and concrete caissons. The Fleet Dock perhaps contains the best record of marine subsurface conditions and has examples of wharf construction using steel pipe piles, H-piles and sheet piles which support a concrete deck and development of an infill area behind the dock face, as well as use of filled concrete caissons with concrete wharf deck. Predominantly steel pipe piles have been utilized for the mooring buoys and berthing face at the Marine Atlantic Ferry Dock, and pipe piles were used in the near shore marine environment to support the Approach Lighting System located at the north end of the runway.

As such, it is anticipated that piles or concrete caissons (gravity structure) may be feasible for development of Cooper Cove. Shallow concrete footings may also be utilized above the waterline within the infill area. Typically, contact pressures in the range of 100 kPa to 200 kPa for reinforced concrete footings are possible pending the type of infill materials used, and suitable degree of compaction.

8.0 PROPOSED INFILL MATERIALS

8.1 Northland

It is our understanding that there is an existing stockpile of pit-run aggregate at an adjacent site in Argentia and the Port Authority would like to use the aggregate as infill material. During the reconstruction of Argentia Fleet Dock, an assessment of this stockpile aggregate was completed by Stantec (former JWA) between 2004 and 2005 to determine the suitability and physical properties of the aggregate. This included visual examination and gradation analyses of two samples. Detailed assessment of four samples including gradation analysis, direct shear testing, unit weight determinations and petrographic analyses was also completed.

The gradation analysis provided an average of 15% cobbles (150 mm maximum size), 51% gravel, 32% sand, and 2% silt and the materials were described as a poorly graded gravel with sand and cobbles. Based on the direct shear test results and literature, an angle of internal friction of 37° to 38° was recommended for this material. A saturated and submerged unit weight on the order of 2,330 kg/m^3 and 1,300 kg/m^3 (in salt water) were also recommended. Two petrographic analyses were completed on the aggregate which yielded petrographic numbers of PN 119 and PN 123. These values indicate the material is suitable for many aggregate applications, such as concrete and asphalt.

Based on reviewing the Northland material described above, the stockpiled aggregate will be suitable to use as marine infill.

8.2 Husky

Besides the existing stockpile as described above, the Port Authority would also like to consider the possibility of using the bund wall material from the adjacent Husky Graving Dock site as marine infill in Cooper Cove. It is understood that bund wall materials will probably be excavated during the flooding of the dry dock to mobilize the Husky GBS structure. The seabund is primarily composed of native materials with construction of a central slurry cut-off wall.

As mentioned before, boreholes located near or in the seabund indicated permeable layers above the dock floor level (El. -18m CD) and some silts and clays layers below -18m CD. The permeable layers mainly consisted of sand and gravel with interbedded layers of silty sand to silty gravel and occasional cobbles.

Gradation analyses completed on gravel samples obtained from above elevation -18 m, contained approximately 5% to 45% of sand and 0% to 12% fines (silt/clay). It was also reported that gradation analyses completed on gravel and sand samples obtained from above elevation -18 m, contained approximately 2% to 17% fines (silt/clay).

As described earlier, materials proposed for marine infill should consist of 150 mm minus well graded fill with fines content less than 2%. Based on reviewing the seabund materials, it is understood that the seabund section contains granular materials with fines content which generally exceeds 5%.

While there may be some natural granular layers within the seabund that probably exhibits suitable fines content, appropriate separation and recovery may be difficult or cost prohibitive due to several factors which may include the presence of a slurry cut-off wall within the central portion of the seabund, as well as production & handling schedule. Further discussion with Husky personnel is recommended to consider all of the factors before completely ruling out using this material as marine infill, such as washing and screening the available seabund material to produce infill material of a suitable gradation.

9.0 CLOSURE

Use of this report is subject to the Statement of General Conditions provided in appendix A. It is the responsibility of Dillon Consulting Limited, who is identified as “the Client” within the Statement of General Conditions, and its agents to review the conditions and to notify Stantec should any of the conditions not be satisfied. The Statement of General Conditions addresses the following: use of the report; basis of the report; standard of care; interpretation of the site conditions; varying or unexpected site condition; planning, design or construction.

We trust this report meets your present requirements. Should any additional information be required, please do not hesitate to contact our office at your convenience. This report has been prepared by the undersigned and reviewed by Dr. Arun Valsangkar, Ph.D., P.Eng.

Sincerely,

STANTEC CONSULTING LTD.

Rajib Dey, Ph.D., P.Eng. Geotechnical Engineer	Lorne Boone, M. Eng., P.Eng., P.Geo. Senior Geotechnical Engineer

10.0 REFERENCES

ARUP (2013). White Rose Extension Project: Graving Dock – Slope Stability Engineering Design. Husky Document No. WH-K-98W-K-TN-00007-001, Rev. B2.

ARUP (2013). Argentia Graving Dock Geotechnical Design. Husky Document No. WH-K-98W-K-TN-00001-001, Rev. C1.

Brushett, D., Bell, T., Batterson, M. J., and Shaw, J. (2007). Ice-Flow History of Placentia Bay, Newfoundland: Multibeam Seabed Mapping. Newfoundland and Labrador Department of Natural Resources, Geological Survey, Report 07-1, pages 215-228.

Catto, N. R. (1992). Surficial Geology and Landform Classification of the Argentia Map Sheet. Geological Survey Branch, Department of Mines and Energy, Government of Newfoundland and Labrador, Map Sheet, NTS 1N/5.

Department of the Navy (U.S.) Bureau of Yards and Docks (1964). U.S. Naval Station, Argentia, Approach Lighting System, General Pan - Drawing No. 1035730 and Boring Logs - Drawing No. 1035750.

Hardy Associates (1985). Report on Subsurface Investigation, Argentia Harbour, NF (Fleet Dock). Job No. V603893.

Jacques Whitford (2005). Stockpile Aggregate Testing, Argentia Fleet Dock Reconstruction, Argentia, NL. JW Project No. NFS10944.

Jacques Whitford (2005). Bearing Capacity Analyses, Slipway Design, Argentia Fleet Dock Reconstruction, Argentia, NL. JW Project No. NFS10884.

Jacques Whitford (2009). Mooring Buoy Anchorage, Argentia, NL. JW Project No. 1046647.

King, A.F. (1988). Geology of the Avalon Peninsula. Mineral Development Divisions, Department of Mines, Government of Newfoundland and Labrador, Map 88-01.

Nolan, Davis & Associates (NS) Limited (1986). Report on Geotechnical Investigation, Argentia NF (Fleet Dock). ADI Nolan Davis. Project No. 862124.

Nolan, Davis & Associates (NS) Limited (1993). Report on Geotechnical Drilling/Sampling/Testing, Argentia NF (South Fleet Dock Area). ADI Nolan Davis. Project No. N92365.

Newfoundland Geosciences Limited (1997). Geotechnical Information for Northside Argentia, NL. NGL Internal Report.

Stantec (2012). Interim Progress Report – Site A Results Geotechnical and Environmental Services, Stage 2 - Geotechnical / Environmental Site Investigation, Proposed GBS Construction Site, Argentia, NL. Stantec File No. 121613435; Document No. 001-A-13FEB12.

APPENDIX A

Statement of General Conditions

STATEMENT OF GENERAL CONDITIONS

USE OF THIS REPORT: This report has been prepared for the sole benefit of the Client or its agent and may not be used by any third party without the express written consent of Stantec Consulting Ltd. and the Client. Any use which a third party makes of this report is the responsibility of such third party.

BASIS OF THE REPORT: The information, opinions, and/or recommendations made in this report are in accordance with Stantec Consulting Ltd.'s present understanding of the site specific project as described by the Client. The applicability of these is restricted to the site conditions encountered at the time of the investigation or study. If the proposed site specific project differs or is modified from what is described in this report or if the site conditions are altered, this report is no longer valid unless Stantec Consulting Ltd. is requested by the Client to review and revise the report to reflect the differing or modified project specifics and/or the altered site conditions.

STANDARD OF CARE: Preparation of this report, and all associated work, was carried out in accordance with the normally accepted standard of care in the state or province of execution for the specific professional service provided to the Client. No other warranty is made.

INTERPRETATION OF SITE CONDITIONS: Soil, rock, or other material descriptions, and statements regarding their condition, made in this report are based on site conditions encountered by Stantec Consulting Ltd. at the time of the work and at the specific testing and/or sampling locations. Classifications and statements of condition have been made in accordance with normally accepted practices which are judgmental in nature; no specific description should be considered exact, but rather reflective of the anticipated material behavior. Extrapolation of in situ conditions can only be made to some limited extent beyond the sampling or test points. The extent depends on variability of the soil, rock and groundwater conditions as influenced by geological processes, construction activity, and site use.

VARYING OR UNEXPECTED CONDITIONS: Should any site or subsurface conditions be encountered that are different from those described in this report or encountered at the test locations, Stantec Consulting Ltd. must be notified immediately to assess if the varying or unexpected conditions are substantial and if reassessments of the report conclusions or recommendations are required. Stantec Consulting Ltd. will not be responsible to any party for damages incurred as a result of failing to notify Stantec Consulting Ltd. that differing site or sub-surface conditions are present upon becoming aware of such conditions.

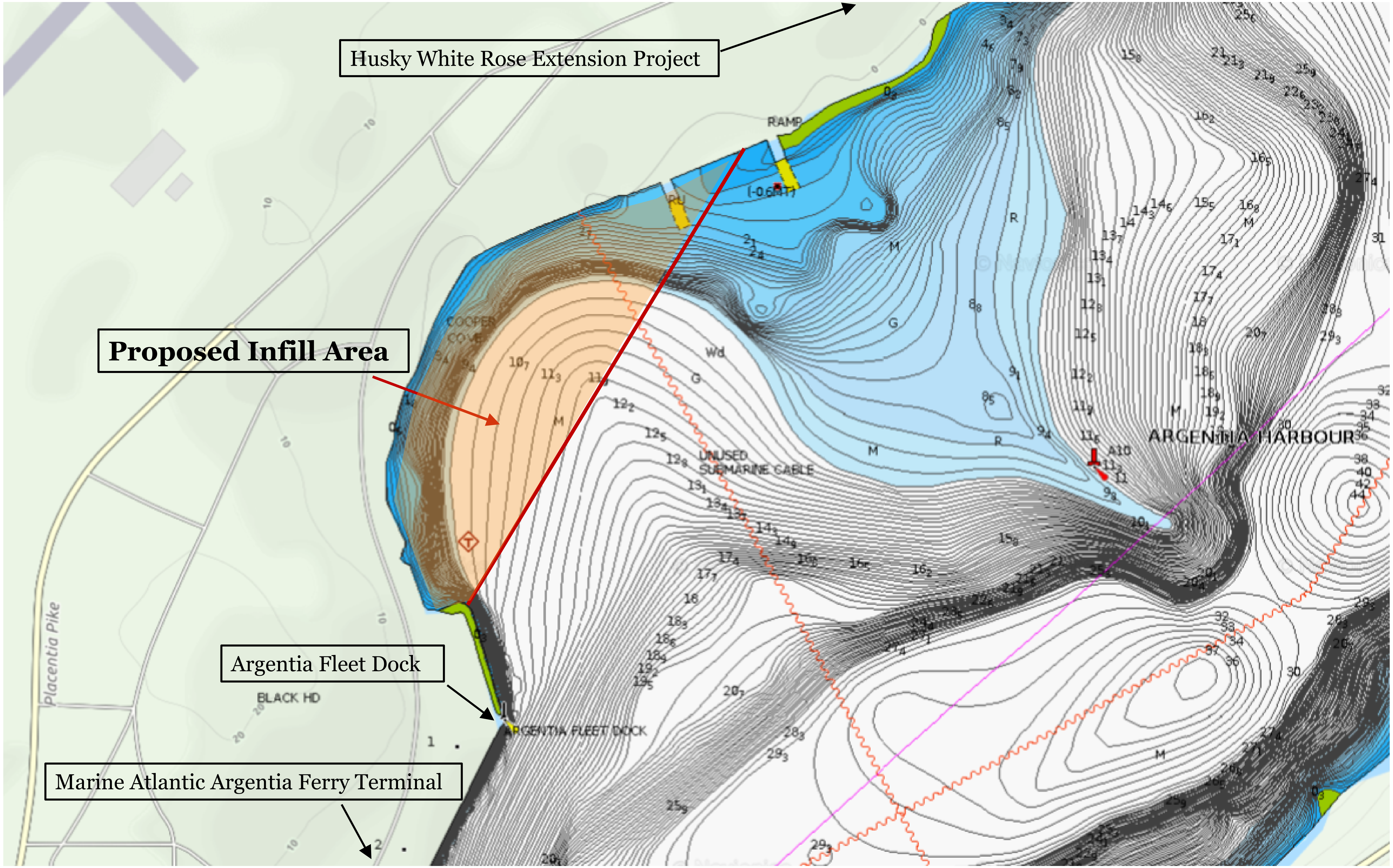
PLANNING, DESIGN, OR CONSTRUCTION: Development or design plans and specifications should be reviewed by Stantec Consulting Ltd., sufficiently ahead of initiating the next project stage (property acquisition, tender, construction, etc), to confirm that this report completely addresses the elaborated project specifics and that the contents of this report have been properly interpreted. Specialty quality assurance services (field observations and testing) during construction are a necessary part of the evaluation of sub-subsurface conditions and site preparation works. Site work relating to the recommendations included in this report should only be carried out in the presence of a qualified geotechnical engineer; Stantec Consulting Ltd. cannot be responsible for site work carried out without being present.

APPENDIX B

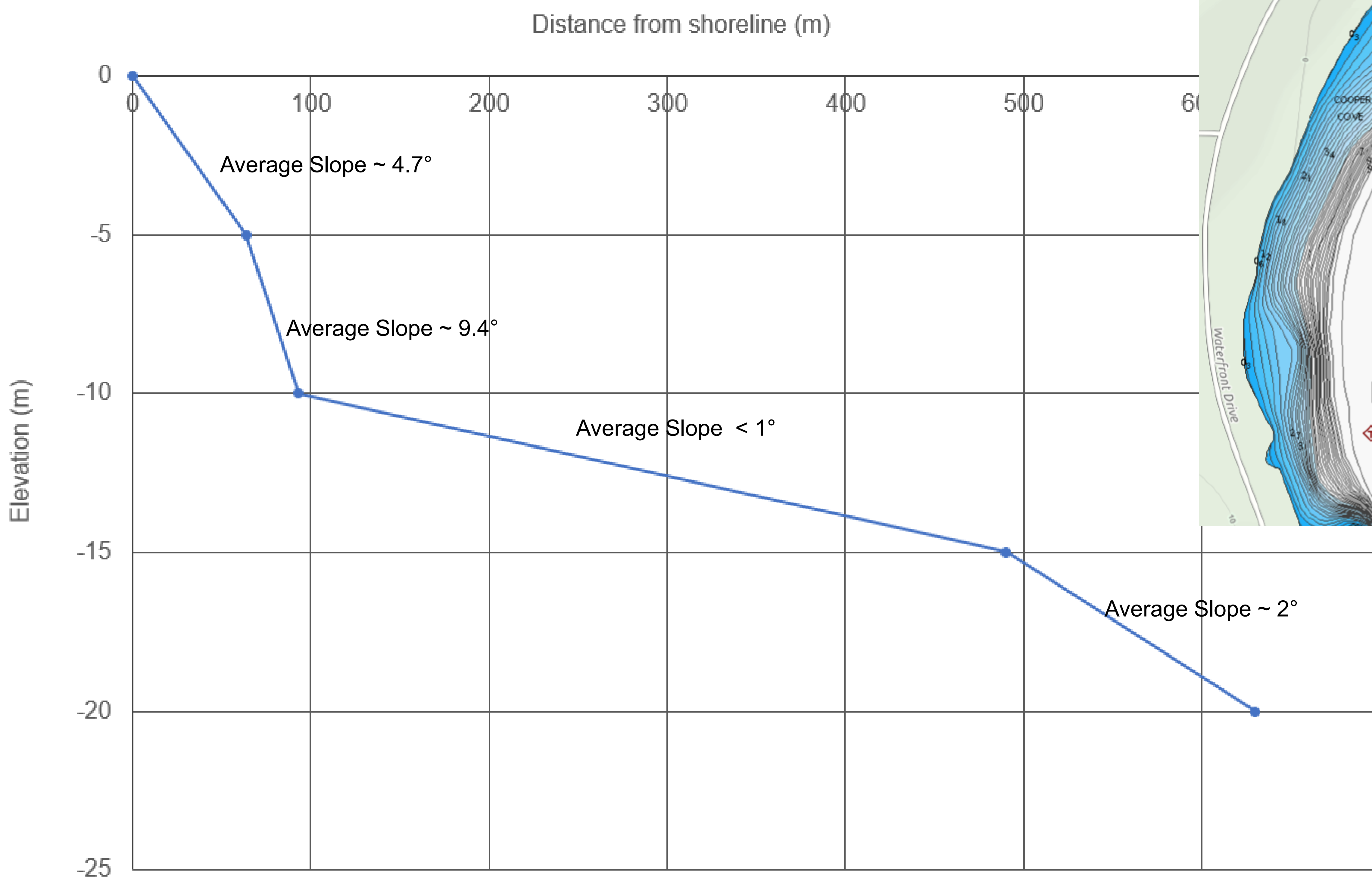
Figure 1 - General Area Plan, Cooper Cove
Figure 2 - Site Location Plan, Cooper Cove
Figure 3 - Approximate Seabed Profile, Cooper Cove

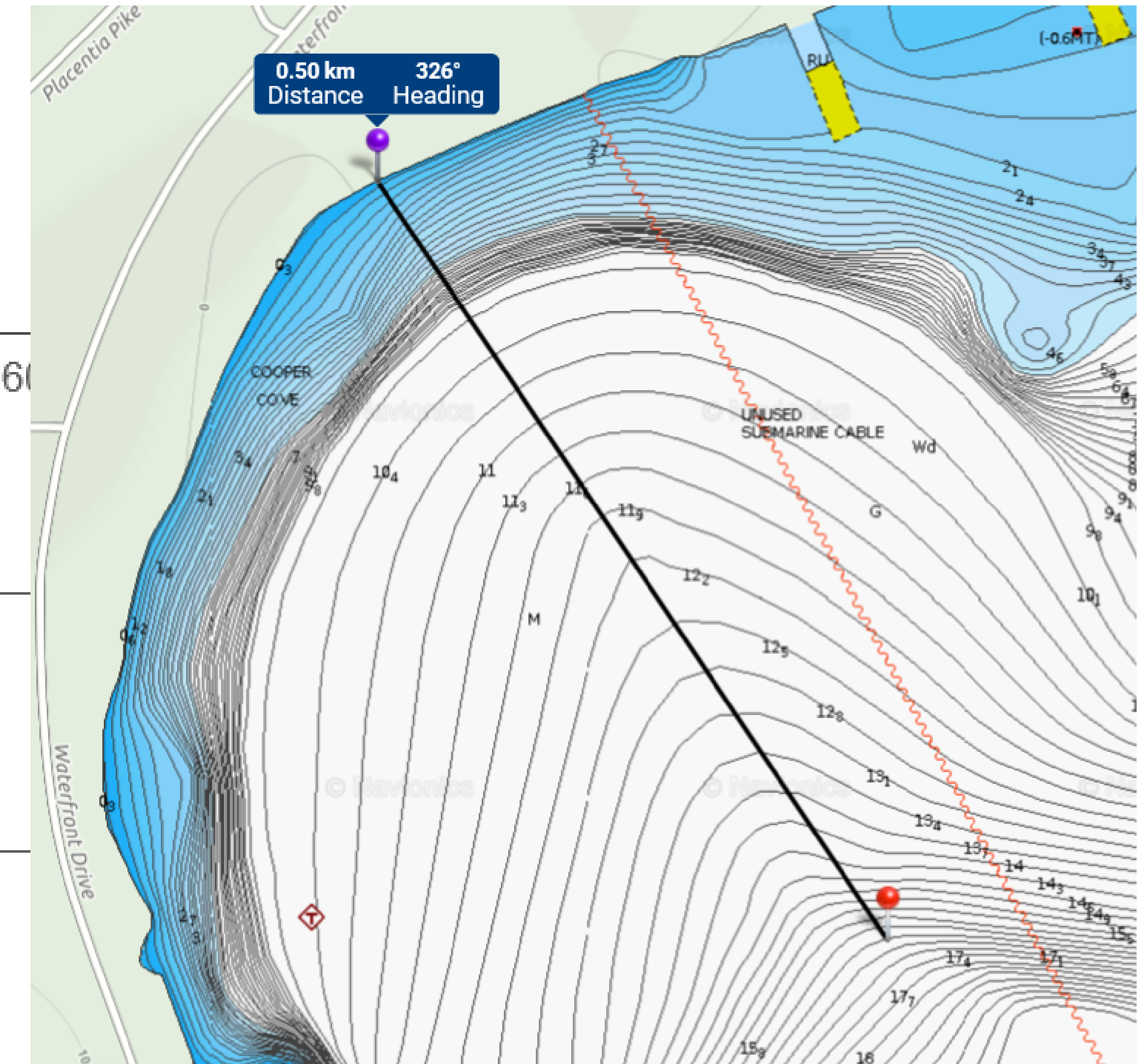
1. Marine Atlantic Argentia Ferry Terminal
2. Argentia Fleet Dock
3. Husky White Rose Extension Project
4. Approach Lighting System

CLIENT: Dillon Consulting Limited	**PROJECT TITLE:** Desktop Study of Marine Geotechnical Conditions, Cooper Cove, Argentia, NL	**FIGURE NO:** 1 **Rev:** NA
Stantec	**FIGURE TITLE:** General Area Plan, Cooper Cove **SCALE:** NOT IN SCALE **DATE:** 27 March 2019	**PREPARED BY:** RD **CHECKED BY:** LB



CLIENT: Dillon Consulting Limited	**PROJECT TITLE:** Desktop Study of Marine Geotechnical Conditions, Cooper Cove, Argentia, NL		**FIGURE NO: 2** **Rev:** NA
Stantec	**FIGURE TITLE:** Site Location Plan, Cooper Cove Source: https://webapp.navionics.com/?lang=en#boating/search@13&key=ylu_H%60jnhl	**SCALE:** AS SHOWN **DATE:** 27 March 2019	**PREPARED BY:** RD **CHECKED BY:** LB





NOTE: Average seabed slope estimated for the section as shown on the attached Bathymetry Chart

CLIENT: Dillon Consulting Limited	**PROJECT TITLE:** Desktop Study of Marine Geotechnical Conditions, Cooper Cove, Argentia, NL	**FIGURE NO:** 3 **Rev:** NA
Stantec	**FIGURE TITLE:** Approximate Seabed Profile, Cooper Cove Source: https://webapp.navionics.com/?lang=en#boating/search@13&key=ylu_H%60jnhl **SCALE:** NOT IN SCALE **DATE:** 27 March 2019	**PREPARED BY:** RD **CHECKED BY:** LB

Appendix B

Drawings

NOTES

1. ALL DIMENSION IN MILLIMETERS.
2. ALL CONTOURS AND SOUNDINGS ARE IN METERS. CONTOURS AND SOUNDING INFORMATION BASED ON 2008 SURVEY.

FILENAME: G:\CAD\BARRY SCAPLEN WORKING DRAWINGS\199401 – COOPER COVE INFILL FEASIBILITY STUDY\199401-C1-RA.DWG PLOTTED BY: SCAPLEN, BARRY
PLOT DATE: 2019-05-02 @ 3:06:02 PM PLOT SCALE: 1:25.4 PLOT STYLE: DILLON-STANDARD.CTB

Conditions of Use

Verify elevations and/or dimensions on drawing prior to use. Report any discrepancies to Dillon Consulting Limited.

Do not scale dimensions from drawing.

Do not modify drawing, re-use it, or use it for purposes other than those intended at the time of its preparation without prior written permission from Dillon Consulting Limited.

DILLON CONSULTING

No.	ISSUED FOR	DATE	BY
A	ISSUED FOR REPORT	03-05-19	BS

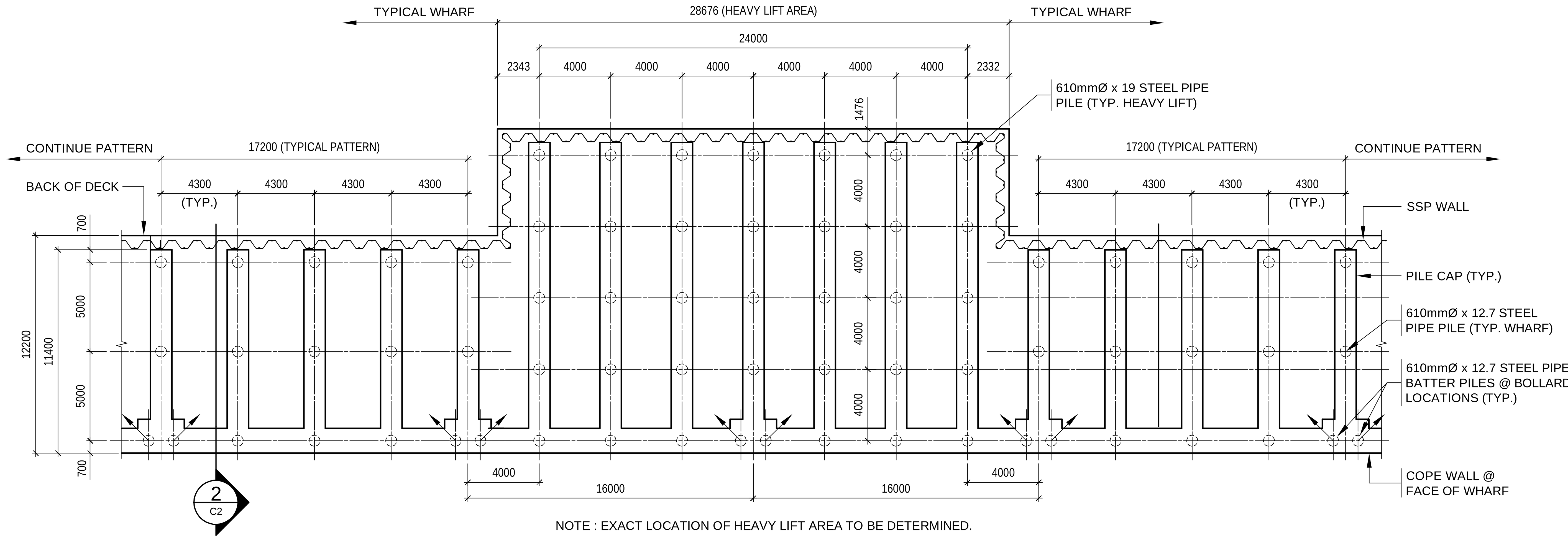
DESIGN: W. HAYHOE	REVIEWED BY: S. PEARCE
DRAWN: B. SCAPLEN	CHECKED BY: W. HAYHOE
DATE: MAY 2019	
SCALE: AS SHOWN	

COOPER COVE
INFILL FEASIBILITY STUDY

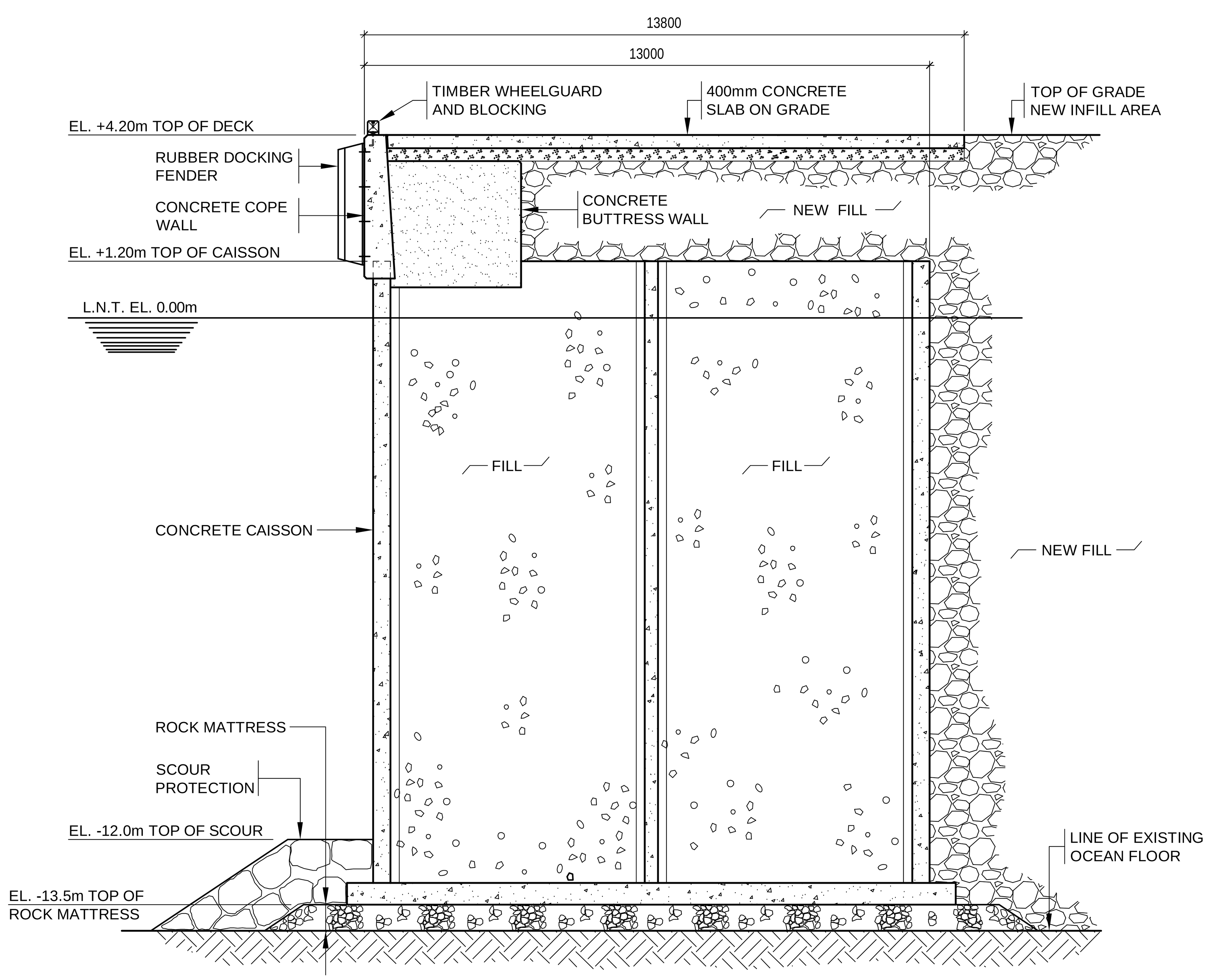
EXISTING SITE PLAN
PROPOSED NEW INFILL AND NEW FACE
OF WHARF - OPTIONS "A" AND "B"

PROJECT NO. 19-9401

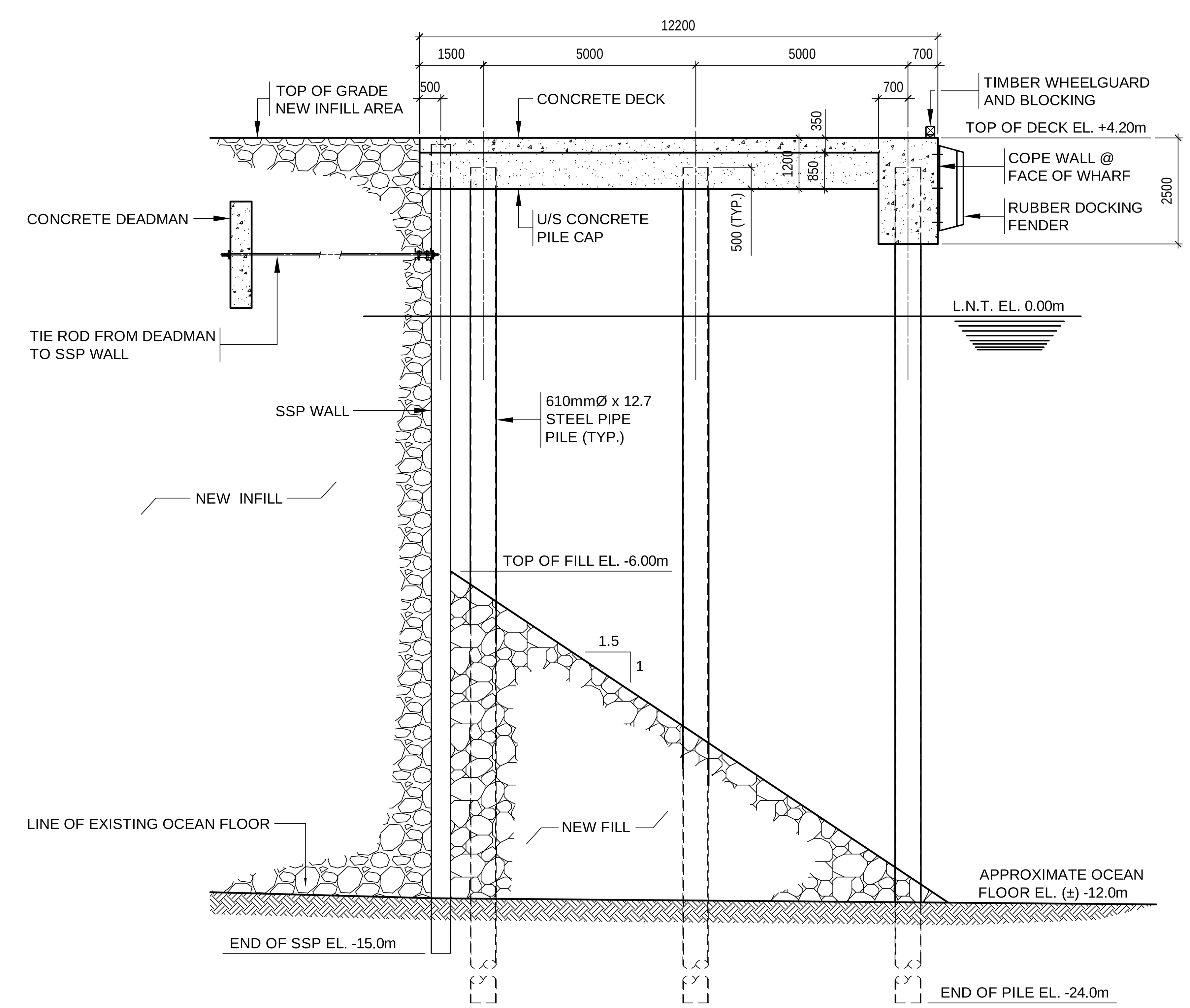
SHEET NO. C1



1 C2 PARTIAL PLAN @ TOP OF CONCRETE PILE CAPS - OPTION "1" (TYP.)
1:200



3 C2 SECTION - PROPOSED NEW CONCRETE CASSION WHARF - OPTION "2" (TYP.)
1:100



2 C2 SECTION - PROPOSED NEW PIPE PILE WHARF - OPTION "1" (TYP.)
1:100

ST. JOHN'S

FILENAME: G:\CAD\BARRY SCAPLEN WORKING DRAWINGS\199401 - COOPER COVE INFILL FEASIBILITY STUDY\199401-C2-RA.DWG PLOTTED BY: SCAPLEN, BARRY
PLOT DATE: 2019-05-03 @ 8:45:27 AM PLOT SCALE: 1:25.4 PLOT STYLE: DILLON-STANDARD.CTB

Conditions of Use

Verify elevations and/or dimensions on drawing prior to use. Report any discrepancies to Dillon Consulting Limited.

Do not scale dimensions from drawing.

Do not modify drawing, re-use it, or use it for purposes other than those intended at the time of its preparation without prior written permission from Dillon Consulting Limited.

DILLON CONSULTING

No.	ISSUED FOR	DATE	BY
A	ISSUED FOR REPORT	03-05-19	BS

DESIGN: W. HAYHOE	REVIEWED BY: S. PEARCE
DRAWN: B. SCAPLEN	CHECKED BY: W. HAYHOE
DATE: MAY 2019	
SCALE: AS SHOWN	

COOPER COVE
INFILL FEASIBILITY STUDY

PROPOSED NEW WHARF
PLAN AND SECTIONS - OPTIONS "1" AND "2"

PROJECT NO. 19-9401

SHEET NO. C2

Appendix C

Cost Tables

OPINION OF PROBABLE PROJECT COST **Cooper Cove Infill Feasibility Study** **Argentia, NL**	PREPARED FOR: **Port of Argentia** **Option 1 - Steel Pile Wharf**	DILLON CONSULTING Project Manager: W. Hayhoe Est. by: WH / Checked by: SP Dillon Project No.: 19-9401 UPDATED: April 29, 2019

ITEM DESCRIPTION	QUANTITY NUMBER	QUANTITY UNIT	UNIT COST	TOTAL INCL. O&P	EXTENDED TOTALS
ITEM No. 1 - Wharf					**$ 31,296,000.00**
a) Concrete Deck	2445	m^3	$1,000.00	$ 2,445,000.00	
b) Concrete Pile Caps	1570	m^3	$1,900.00	$ 2,983,000.00	
c) 610x12.7 mm Diameter Steel Piles	10835	m	$ 1,900.00	$ 20,586,500.00	
d) 610x19 mm Diameter Steel Piles	960	m	$ 2,100.00	$ 2,016,000.00	
e) Pile Shoes	429	Each	$ 3,500.00	$ 1,501,500.00	
f) Mooring Bollards	31	Each	$ 7,500.00	$ 232,500.00	
g) Electrical	1	LS	$ 500,000.00	$ 500,000.00	
h) Fendering	1	LS	$ 760,000.00	$ 760,000.00	
i) Wheelguard	34.0	m^3	$ 3,500.00	$ 119,000.00	
j) Armourstone	3050	Tonne	$ 50.00	$ 152,500.00	
ITEM No. 2 - Sheet Piling					**$ 5,657,500.00**
a) Sheet Piling	10,150	m^2	$ 450.00	$ 4,567,500.00	
b) Tieback System	545	m	$ 2,000.00	$ 1,090,000.00	
ITEM No. 3 - Lump Sum Items					**$ 500,000.00**
a) Mobilization and Demobilization	1	LS	$ 500,000.00	$ 500,000.00	
Subtotal					**$ 37,453,500.00**
				Contingency (20%)	$ 7,490,700.00
			PROJECT GRAND TOTAL	**$**	**44,940,000.00**

OPINION OF PROBABLE PROJECT COST **Cooper Cove Infill Feasibility Study** **Argentia, NL**	PREPARED FOR: **Port of Argentia** **Option 2 - Concrete Caisson Wharf**			DILLON CONSULTING Project Manager: W. Hayhoe Est. by: WH Checked by: SP Dillon Project No.: 19-9401 UPDATED: April 29, 2019	
ITEM DESCRIPTION	QUANTITY		UNIT COST	TOTAL INCL. O&P	EXTENDED TOTALS
	NUMBER	UNIT			
ITEM No. 1 - Wharf					**$ 46,645,500.00**
a) Concrete in Caissons	17850	m^3	$ 1,900.00	$ 33,915,000.00	
b) Concrete Cope Wall	955	m^3	$ 1,500.00	$ 1,432,500.00	
c) Concrete Buttress Walls	735	m^3	$ 1,500.00	$ 1,102,500.00	
d) Concrete Slab-on-grade	2970	m^3	$ 1,000.00	$ 2,970,000.00	
e) Fill within Caissons	103000	m^3	$ 40.00	$ 4,120,000.00	
f) Rock Mattress	18400	Tonne	$ 60.00	$ 1,104,000.00	
g) Scour Protection	8600	Tonne	$ 50.00	$ 430,000.00	
h) Electrical	1	LS	$ 500,000.00	$ 500,000.00	
i) Fendering	1	LS	$ 800,000.00	$ 800,000.00	
j) Wheelguard	34.0	m^3	$ 3,500.00	$ 119,000.00	
j) Armourstone	3050	Tonne	$ 50.00	$ 152,500.00	
ITEM No. 2 - Lump Sum Items					**$ 500,000.00**
a) Mobilization and Demobilization	1	LS	$500,000.00	$ 500,000.00	
Subtotal					**$ 47,145,500.00**
				Contingency (20%)	$ 9,429,100.00
	PROJECT GRAND TOTAL			**$**	**56,570,000.00**

References

Coastal Investigation References

Hurdle, D.P. and Stive, R.J.H., 1989. *"Revision of SPM 1984 Wave Hindcast Model to avoid inconsistencies in engineering applications."* Coastal Engineering, 12, 339-351.

Swail, V. R., et al. "The MSC50 wind and wave reanalysis." 9th International Wind and Wave Workshop. 2006.

Zhai L., B. Greenan, J. Hunter, T.S. James, G. Han, R. Thomson, and P. MacAulay 2014. Estimating Sea-level Allowances for the coasts of Canada and the adjacent United States using the Fifth Assessment Report of the IPCC. Can. Tech. Rep. Hydrogr. Ocean. Sci. 300: v + 146 pp.

Environmental References

Kelly et al. 2009. A System for Characterizing and Quantifying Coastal Marine Habitat in Newfoundland and Labrador. Fisheries and Oceans Canada and AMEC Earth & Environmental.

ARG (Argentia Remediation Group). 1995. Phase III/IV, Environmental Site Assessment, U.S. Naval Facility, Argentia, NF. Report 2: Site Characterization; Volume 3: Ponds and Outlying Sites. Report to Public Works and Government Services Canada.

Canadian Environmental Assessment Agency. 2008. Environmental Screening Report Commercial Nickel Processing Plant, Long Harbour, Placentia Bay. Available online at: http://www.acee-ceaa.gc.ca/050/documents/27933/27933E.pdf (Date modified: July 8, 2008; Date accessed: October 31, 2011).

Catto, N.R., R.G. Hooper, M.R. Anderson, D.A. Scruton, J.D. Meade, L.M.N. Ollerhead and U.P. Williams. 1999. Biological and geomorphological classification of Placentia Bay: A preliminary assessment. Canadian Technical Report of Fisheries and Aquatic Sciences, 2289: v + 35 pp.

DFO (Fisheries and Oceans Canada). 2010. Integrated Management Planning, Placentia Bay, Newfoundland and Labrador: Plants and Animals. http://www.nfl.dfo-mpo.gc.ca/e0007905

Environment Canada. 2019. Canadian Climate Normals 1981-2010 Station Data North Harbour, NFLD. Available online at: http://climate.weather.gc.ca/climate_normals/results_1981_2010_e.html?searchType=stnProx&txtRadius=200&selCity=&selPark=&optProxType=custom&txtCentralLatDeg=47&txtCentralLatMin=18&txtCentralLatSec=12&txtCentralLongDeg=53&txtCentralLongMin=59&txtCentralLongSec=1&stnID=6682&dispBack=0 (Date modified: February 20, 2019; Date accessed: March 14, 2019).

ExxonMobil Canada Properties. 2011. Hebron Project Comprehensive Study Report.

Husky Energy. 2012. White Rose Extension Project Environmental Assessment Registration WH-DWH-RP-0013.

Kelly, J., R. Power, L. Noble, J. Meade, K. Reid, S. Kuehnemund, C. Varley and C. Grant. 2009. A System for Characterizing and Quantifying Coastal Marine Habitat in Newfoundland and Labrador. Fisheries and Newfoundland and Labrador Department of Environment and Conservation. 2011. Cape St. Mary's Ecological Reserve. Available at: http://www.env.gov.nl.ca/env/ parks/wer/r_csme/index.html

Newfoundland and Labrador Department of Environment and Conservation. 2011. Cape St. Mary's Ecological Reserve. Available at: http://www.env.gov.nl.ca/env/parks/wer/r_csme/index.html

VBNC (Voisey's Bay Nickel Company). 2002. Argentia Hydrometallurgical Demonstration Plant Project Registration. vi + 93 pp. + Appendix.

Appendix G

Geotechnical Investigation Report

Stantec, 2023

Marine Geotechnical Investigation Report – Cooper Cove, Argentia, NL

Final Report

September 29, 2023

Prepared for:
Port of Argentia
P.O. Box 95
1 Augusta Avenue
Argentia, NL A0B 1O0

Prepared by:
Stantec Consulting Ltd.
141 Kelsey Drive
St. John's, NL A1B 0L2
Tel: (709) 576-1458

File: 121624742

Table of Contents

1.0 INTRODUCTION **1**

2.0 SITE AND GEOLOGY **2**

3.0 FIELD PROCEDURES **2**

4.0 LABORATORY TESTING **3**

5.0 SUBSURFACE CONDITIONS **4**
5.1 MARINE SEDIMENT 4
5.2 FILL 6
5.3 TILL 6
5.4 BEDROCK 8

6.0 DISCUSSIONS AND RECOMMENDATIONS **8**
6.1 CONCRETE CAISSON DESIGN FOR WHARF STRUCTURE 10

7.0 CLOSURE **14**

LIST OF TABLES

Table 4.1 Summary of Laboratory Testing 3
Table 5.1 Grain Size Analyses on Till 6
Table 6.1 Clear Stone Leveling Course Gradation 11
Table 6.2 Mattress Material Gradation 11
Table 6.3 Mattress Material Gradation 13

LIST OF FIGURES

Figure 5.1 Area with thicker deposits of Marine Sediments (Cross Hatched Area). 5
Figure 5.2 Area with very soft to soft clay within Till layer (Cross-Hatched Area). 7
Figure 6.1 Plan View of the Proposed Wharf Structure and Infill limits (Based on Drawing by Dillon) 9
Figure 6.2 Geometry of the Stabilizing Berms needed in localized area where soft clay zone occurs within the till layer. 12

LIST OF ATTACHMENTS/APPENDICES

Appendix A Statement of General Conditions
Appendix B Site Plan
Appendix C Borehole Records
Appendix D Laboratory Test Results
Appendix E Drawings
Appendix F Slope Stability Analysis

1.0 INTRODUCTION

Acting on the request and authorization of Port of Argentia (the Client), Stantec Consulting Ltd. (Stantec) completed supervision of forty-two (42) marine geotechnical boreholes between April 19, 2023, to May 29, 2023 at the proposed Cooper Cove location for a potential infill and dock extension construction project located in Argentia, NL.

The purpose of this geotechnical investigation was to determine the thickness of surface sediment soils and depth to bedrock (if encountered) so that recommendations may be made as to whether the area can support the proposed concrete caisson type gravity wharf structure, or whether alternative designs such as steel pile or a combination of these would be required.

The scope of work for this project included the following:

- Review available information on the geology and subsurface conditions and complete a reconnaissance of the study area to aid in the understanding of site conditions and any modifications to the field program.
- Complete a geotechnical field subsurface investigation consisting of forty-two (42) boreholes at the proposed infill and wharf extension location in Cooper Cove, Argentia, NL.
- Geotechnical laboratory testing program on representative soil/bedrock samples encountered.
- Provide a geotechnical report presenting the findings of the field investigation, including Borehole Records, laboratory results, soil classification in accordance with the ASTM “Unified Soil Classification system” for overburden soils as well as depth to bedrock, as well as engineering recommendations for geotechnical design. These recommendations will include (but not limited to):
  - Provide allowable ground bearing pressure to seat the structure, rock mattress requirements or dredging depths to suitable material.
  - Determine if any dredging is required prior to infilling site. Provide unit weight, saturated unit weight, angle of internal friction and shear friction angle of a suitable rock fill for infill behind concrete caisson structure. Provide similar values for all sub-surface materials encountered.
  - If an alternative option is proposed, provide all design parameters associated with the alternative solution.

This report has been prepared specifically and solely for the proposed development described herein and contains all the findings of this investigation.

2.0 SITE AND GEOLOGY

The proposed site is located immediately offshore and north of the existing Argentia Freezers & Terminals wharf structure within Cooper Cove in Argentia, NL as shown on the attached site plan in Appendix B. Based on nautical charts for the area (and confirmed by drilling), the seabed in the area is gently sloping downward toward the east and northeast (away from the existing wharf).

Based on previous experience in the area and available geology literature, the natural subsurface conditions in the area are understood to consist of a broad range of materials including clay, silt, sand, gravel, and cobbles, generally formed by fluvial and glaciofluvial erosion or marine wave action. The general soil profile encountered across the Argentia Peninsula range from surficial thick deposits of predominantly sand to sand and gravel with trace silt; underlain by mixtures of cobble and boulder rich sand and gravel; in turn underlain by clay and clay/silt/sand mixtures at depth. The soils within Placentia Bay are typically described as glaciomarine gravelly sand and silt with surficial post glacial mud and the seabed has been shaped and modified by ice sheet and glacier movement.[1]

3.0 FIELD PROCEDURES

The geotechnical investigation was completed between April 19 to May 29, 2023, and consisted of drilling forty-two (42) geotechnical boreholes; seven (7) deep boreholes (>9 m) and thirty-five (35) shallow boreholes (<9 m) at the locations shown on the attached Borehole Plan in Appendix B. The proposed borehole locations were established by Stantec in consultation with the Client. Initially, thirty-five (35) boreholes were proposed; with up to five (5) boreholes to be added at Stantec's discretion. As a clay layer was encountered in some boreholes, an additional two (2) boreholes were added bringing the total number of boreholes to forty-two (42).

All measurements reported herein are referenced relative to the Lowest Normal Tide (LNT) at the time of the investigation. Drilling services were provided by Logan Drilling Group using a Model ACKER AD2 drill rig.

The elevations of the boreholes ranged from -4.50 m to -16.73 m below the LNT. The work was supervised by geotechnical personnel from Stantec who kept detailed records of the subsurface conditions encountered in general accordance with ASTM D5434. Boreholes were advanced through overburden soils by diamond wet rotary drilling method in HQ-size (96 mm). Soils were sampled using a 50 mm outside diameter split spoon sampler during the performance of the Standard Penetration Test (SPT) and N-values were recorded in general accordance with ASTM D1586. In addition, four (4) 76 mm outer diameter thin-walled Shelby tube samples were taken for obtaining relatively undisturbed samples of the soft clays, according to ASTM D1587 and two (2) in-situ Vane Shear tests were also completed within cohesive soils according to ASTM D2573.

---

[1] Brushett, D., Bell, T., Batterson, M. J., and Shaw, J. (2007). Ice-Flow History of Placentia Bay, Newfoundland: Multibeam Seabed Mapping. Newfoundland and Labrador Department of Natural Resources, Geological Survey, Report 07-1, pages 215-228.

The retained soil samples were classified in general accordance with the Unified Soil Classification System (USCS - per ASTM D2487 and D2488) and with the procedures outlined in the attached explanatory key: Symbol and Terms Used on Borehole and Test Pit Records.

Details of the subsurface conditions encountered at the borehole locations, including in-situ test results, are presented on the attached Borehole Records in Appendix C.

Select soil samples obtained from the split-spoon sampler were returned to our St. John's, NL laboratory for subsequent index testing. Shelby tubes containing samples of clayey soils were sent to our laboratory in Dartmouth, NS for consolidation testing. The samples will be stored for a period of three (3) months at which time they will be discarded unless instructions to the contrary are received.

4.0 LABORATORY TESTING

Table 4.1 below provides a summary of the soil samples sent to the laboratories for their respective testing.

Table 4.1 Summary of Laboratory Testing

Borehole No.	Sample	Depth		Test Type
		From (m)	To (m)	
BH-01	SS2	0.61	1.22	Organic Content Analysis
BH-04	SS2	0.61	1.22	Organic Content Analysis
BH-04	SS4	1.96	2.57	Grain Size, Moisture Content
BH-07	SS4	3.45	4.06	Atterberg Limit, Moisture Content
BH-07	ST5	4.27	4.88	1D Consolidation, Atterberg Limit
BH-12	SS4	2.31	2.92	Grain Size, Moisture Content
BH-12	SS6	4.85	5.46	Atterberg Limit, Moisture Content
BH-15	SS6	3.73	4.34	Grain Size, Moisture Content
BH-17	SS5	3.53	4.14	Atterberg Limit, Moisture Content
BH-17	SS7	5.18	5.79	Grain Size, Moisture Content
BH-22	BS5	1.98	2.23	Grain Size, Moisture Content
BH-23	SS6	4.06	4.67	Grain Size, Moisture Content
BH-26	SS1	0.00	0.61	Organic Content Analysis
BH-29	SS5	4.50	5.11	Grain Size, Moisture Content
BH-32	SS1	0.20	0.81	Organic Content Analysis
BH-33	SS8	5.69	6.30	Grain Size, Moisture Content
BH-38	ST8	3.35	3.96	1D Consolidation, Atterberg Limit,Moisture Content
BH-39	ST7	4.29	4.90	1D Consolidation, Atterberg Limit, Moisture Content
BH-41	SS6	3.91	4.52	Grain Size, Moisture Content
BH-42	BS6	3.66	4.27	Grain Size, Moisture Content

The soil samples returned to Stantec's geotechnical laboratory in St. John's were subject to visual examination and classification. In total, ten (10) samples were submitted for grain size analysis, four (4) for organic matter content and six (6) samples were submitted for Atterberg limit testing. Note that the samples tested for soil gradation excluded over-size materials larger than 50 mm (2 inches).

Three (3) Shelby tube samples were submitted to Stantec's soil testing laboratory in Dartmouth, NS for one-dimensional (1D) consolidation testing. Supplementary testing including moisture content, grain size analysis, and Atterberg Limit tests were also completed on the Shelby tube samples.

Gradation curves, Atterberg limit plots, and results of the 1D Consolidation tests are provided in Appendix D.

5.0 SUBSURFACE CONDITIONS

Subsurface conditions observed in the boreholes are summarized in the subsections below and described in detail on the attached Borehole Records along with an accompanying explanatory key: Symbols and Terms used on Borehole and Test Pit Records.

5.1 MARINE SEDIMENT

Deposits of sandy silt (ML) were encountered at surface in all boreholes except for BH-02 and BH-05. No marine sediment was encountered in BH-05. In BH-02, the marine sediment was located below a surficial fill layer. Silt layers were 0.56 to 2.84 m thick and extended to the underlying till. The silt deposits were noted to have occasional gravel, occasional shells, and occasional organic smell. As noted in Figure 5.1 below, the marine sediments are thicker in the range of 1200 mm to 2400 mm in the southwest section of the infilled area. The typical thickness of the marine sediments in the rest of the infill and footprint of the wharf structure is typically 600 mm with SPT Index values of 0. A scaled drawing of Figure 5.1 is presented in Appendix E.

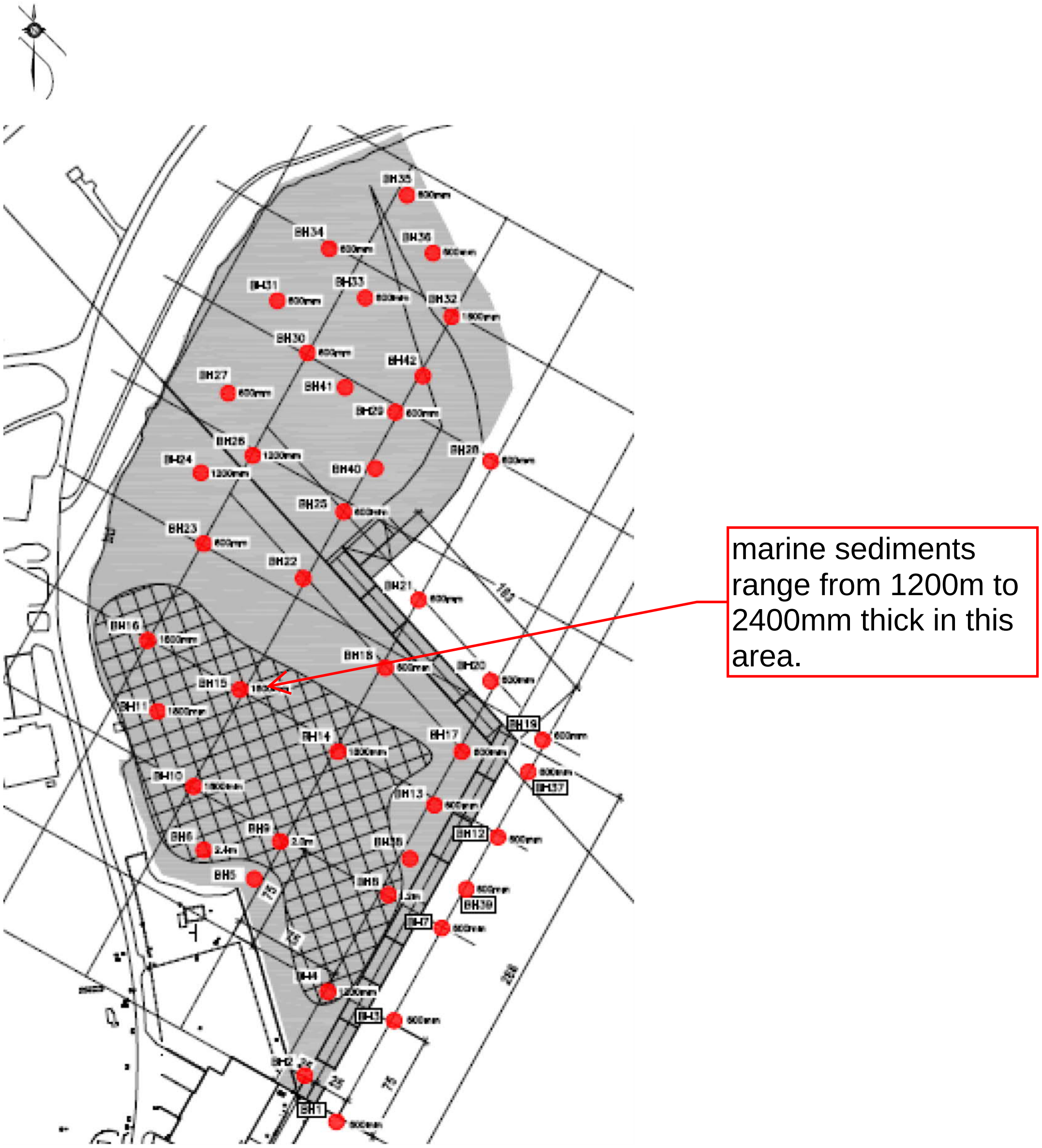


Figure 5.1 Area with thicker deposits of Marine Sediments (Cross Hatched Area)

Four (4) samples selected from BH-1, BH-4, BH-26 and BH-32 were sent to the laboratory for organic content analysis; the organic content ranged from 2.1% (BH-26) to 8.7% (BH-32); with an average organic content of 4.2%.

In terms of relative density, based on Standard Penetration Test N-Values, the silt material is generally classified as very loose to compact but in most cases very loose.

5.2 FILL

A surficial layer of fill material was encountered at the surface of BH-02 and BH-05, the fill extended to depths ranging from 5.38 to 6.15 m. Based on our field observations, the fill layer generally consisted of brown grey, poorly graded gravel with silt and sand (GP-GM) with occasional debris (i.e., concrete, wood) and occasional to some cobbles.

In terms of relative density, based on Standard Penetration Test N-Values, the fill material is generally classified as loose to compact.

5.3 TILL

Deposits of glacial till were encountered either below marine sediment or below the fill in the remaining boreholes. In the shallow boreholes (<9 m) till thickness ranged from 0.60 to 5.33 m, with an average thickness of 4.01 m, in the deeper boreholes (>9 m) BH-03, BH-07, BH-12, BH-18, BH-19, BH-20, and BH-25 till thickness ranged from 4.06 to 9.13 m thick, with an average thickness of 7.85 m. It should be noted that all boreholes were terminated in the till layer and the thickness values noted above are within the depth to which the boreholes were adavanced.

Six (6) samples of the deposit were selected for grain size analysis and moisture content testing. The laboratory results are presented in Table 5.1 and are included in Appendix D.

Table 5.1 Grain Size Analyses on Till

Borehole/ Sample	Depth (m)	Moisture Content (%)	Gravel (%)	Sand (%)	Fines: Silt and Clay (%)	Laboratory Classification
BH-04 / SS4	2.26	6.3	10.0	81.7	8.3	Well-graded SAND with silt (SW-SM)
BH-15 / SS6	4.03	14.5	13.7	79.1	7.2	Well-graded SAND with silt (SW-SM)
BH-17 / SS7	5.48	10.6	27.1	44.4	28.5	Silty SAND with gravel (SM)
BH-23 / SS6	4.36	8.0	37.0	56.7	6.3	Well-graded SAND with silt and gravel (SW-SM)
BH-33 / SS8	5.99	7.1	48.7	43.6	7.7	Poorly graded GRAVEL with silt and sand (GP-GM)
BH-42 / SS6	3.96	4.5	50.9	26.9	22.2	Silty GRAVEL with sand (GM)

The till was a variable mixture of gravel, sand, and silt. Based on the laboratory testing and Stantec's observations in the field, the till ranged from well-graded sand with silt and gravel/well-graded sand with silt (SW-SM), silty sand with gravel (SM), poorly graded gravel with silt and sand (GP-GM) to silty gravel with sand (GM). The gradation ranged from approximately 10.0 to 50.9% gravel, 26.9 to 81.7% sand, and 6.3 to 28.5% fines (silt/clay) with occasional to some cobbles and occasional boulders.

In terms of relative density, based on Standard Penetration Test N-Values, the till material is generally classified as compact to very dense.

A layer of clay was encountered within the till layer in BH-07, BH-08, BH-12, BH-13, BH-17, BH-19, BH-38, and BH-39. The thickness of the clay layer ranged from 1.22 m to 3.05 m. The consistency of clay in boreholes BH-07, BH-12, BH-38 and BH-39 varied from very soft to firm. In comparison, the consistency of clay in boreholes BH-08, BH-17, and BH-19 was very stiff to hard. The localized area where very soft to soft clay layer within till layer was encountered is shown in Figure 5.2 below.

Figure 5.2 Area with very soft to soft clay within till layer (Cross-Hatched Area)

A scaled drawing of Figure 5.2 is presented in Appendix E. In general, this unit consisted of grey to pink, lean clay (CL), sandy silt (ML) to silt with sand (ML) with, occasional gravel, occasional cobbles.

Gradation analyses completed on four (4) representative samples of the clay/silt consisted of 4.2 to 8.6% gravel, 10.4 to 26.9% sand, and 64.5 to 81.8% silt/clay. Atterberg limits completed on six (6) representative samples of the fine-grained soils indicated the clay/silt zones within till layer to have low to intermediate plasticity.

5.4 BEDROCK

Bedrock was not encountered at any of the borehole locations during drilling.

6.0 DISCUSSIONS AND RECOMMENDATIONS

The design concept for the proposed land reclamation and wharf project in Coopers Cove consists of concrete cribs supported on rock mattress as shown below:

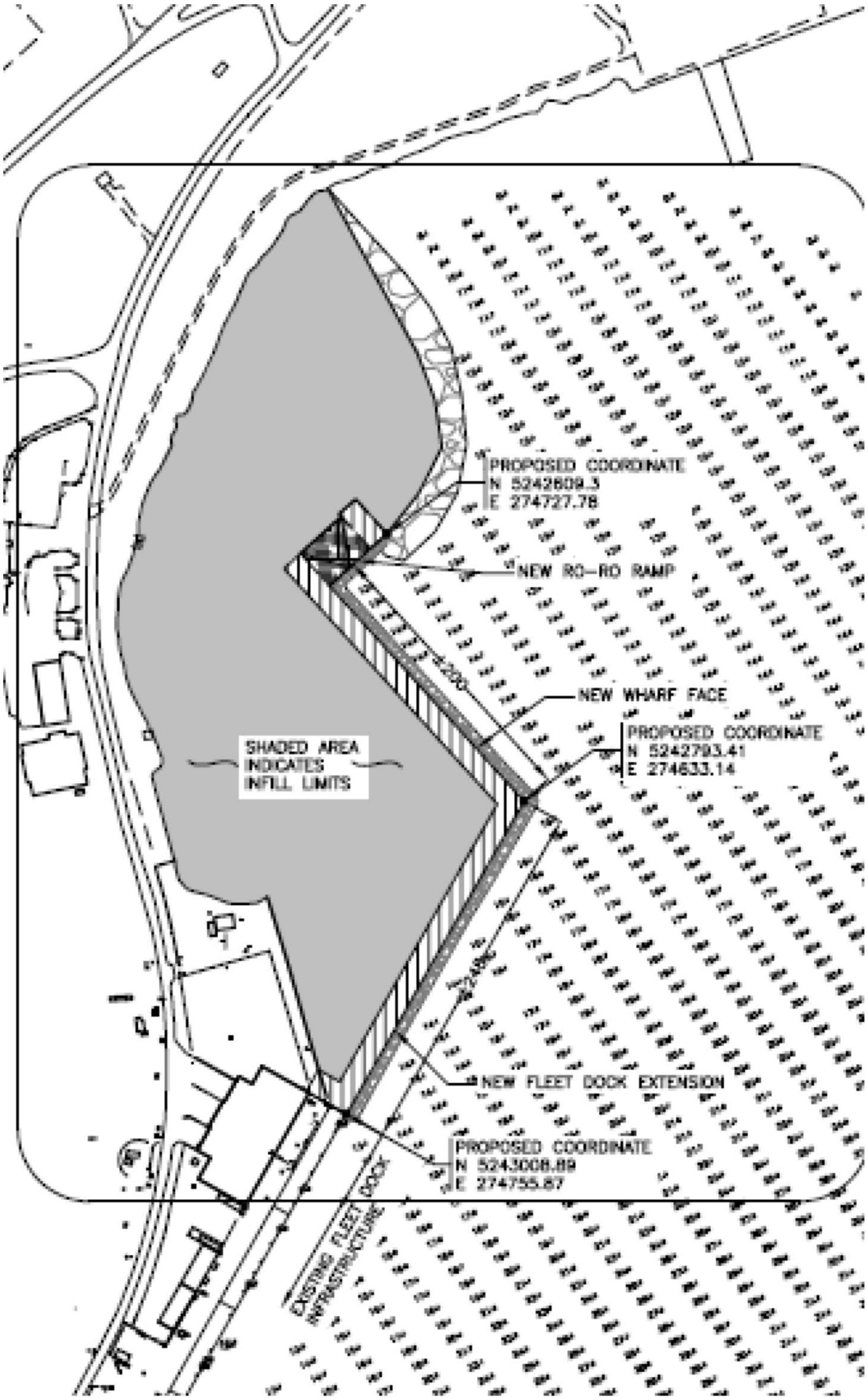


Figure 6.1 **Plan View of the Proposed Wharf Structure and Infill limits (Based on Drawing by Dillon)**

The proposed wharf structure is approximately L–shaped with North East–South West berthing wharf being 248 m long while North West-South East section of the wharf being approximately 200 m long. The ocean bottom elevation along the 248 m arm of the proposed wharf is estimated to be approximately -13.0 m to -16.0 m, LNT. The ocean bottom elevation will vary from around -13.0 m to -15.0 m, LNT, along the 200 m arm of the proposed wharf.

In addition to infilling behind the concrete cribs designated as laydown area (5.7 HA), the development also consists of land reclamation without any containment structure in the Northeast sector of the site (2.7 HA).

The top of the concrete cribs and the infill behind the cribs is proposed at + 4.2 m (LNT) with the cribs founded at elevation –12.8 m (LNT). The height of the crib structure will be about 17 m with approximate width of about 12 m.

The discussion and recommendations are presented in the following sub-sections for the proposed concrete crib structure and infill areas separately.

6.1 CONCRETE CAISSON DESIGN FOR WHARF STRUCTURE

Seventeen (17) boreholes (BH-1, BH-2, BH-3, BH-4, BH-7, BH-8, BH-12, BH-13, BH-17, BH-18, BH-19, BH-20, BH-21, BH-22, BH-37, BH-38 and BH-39) were drilled on either side of the proposed footprint of the wharf structure to determine sub-surface conditions for the design of wharf structure

The soil conditions for the proposed wharf footprint can be summarized as:

- Marine sediment, SILT, very loose to compact, varying in thickness from 0.6 m to 1.8 m was encountered as seabed surficial deposit, overlying
- Granular till, well-graded SAND with silt and gravel/ well-graded SAND with silt/ silty SAND with gravel/silty GRAVEL with sand/poorly-graded GRAVEL with silt and sand, occasional to some cobbles, occasional boulders, compact to very dense Till layer
- Layers of Clay/lean CLAY (CL) were encountered within the till layer in BH-07, BH-08, BH-12, BH-13, BH-17, BH-19, BH-38, and BH-39. The thickness of the clay layers ranged from 1.22 m to 3.05 m
- Bedrock was not encountered at any of the borehole locations.

6.1.1.1 Site Preparation and Mattress Materials

Based on the soil conditions encountered in the seventeen boreholes drilled in the proximity of the footprint of the proposed wharf structure, a concrete crib structure founded on rock mattress is feasible.

The thickness of very loose marine sediments in **the footprint** of the wharf structure is mostly 600 mm, except for the 140 m length at the South-West corner of the North-East/South-West wharf, where the thickness is 1200 to 1800 mm. The relative density of marine sediments is very loose and because of the variable thickness it is recommended that marine sediments be dredged within the footprint of the wharf structure, prior to construction of rock mattress. It is possible that where the thickness of marine sediments is 600 mm or less, the materials could be displaced without dredging. However, as noted in the subsequent section pertaining to site preparation for the infill area in the South-West section, dredging will be required for land reclamation and thus it would be prudent to dredge **all** near surface marine sediments below the wharf footprint as well as infill areas.

A minimum mattress thickness of 600 mm is recommended. The mattress material should consist of well graded, hard, durable quarried rock. At locations requiring the minimum mattress thickness or, as a top leveling course in other locations, a nominal 50 mm clear stone with the following gradation is recommended (Table 6.1). Where thicker mattress layers are required, the gradation in Table 6.2 is recommended.

Table 6.1 Clear Stone Leveling Course Gradation

Sieve Size (mm)	Percent Passing
60	100
50	90-100
38	35-70
25	0-5
12	0-5

Table 6.2 Mattress Material Gradation

Sieve Size (mm)	Percent Passing
300	100
200	75-100
100	55-85
50	25-55
25	15-30
5	0-8

The slope of the rockfill mattress should be at least 1.5H:1V. A minimum of 3 m offset is recommended from the toe and heel of the crib structure at the crest of rockfill mattress pad. Scour protection is recommended for the rockfill mattress slopes where erosion is anticipated.

6.1.1.2 Bearing Capacity and Settlement: Concrete Crib Structure

Assuming a 12.0 m wide crib, an ultimate limit states (ULS) factored bearing resistance of 800 kPa is estimated for the cribs founded on rockfill mattress overlying compact to dense till without any soft clay zones within the till layer. A resistance factor of 0.5 was used in estimating the factored resistance of 800 kPa. The factored resistance of 800 kPa does not account for load eccentricity or inclination and these effects need to be considered once the design details become available.

There is a small area as shown in Figure. 5.2, where the till layer contains zones of soft clay. The bearing capacity analysis assuming that the crib load will punch through the rock mattress and compact till above the soft clay, resulted in an estimated ultimate bearing capacity of 185 kPa, which is lower than the anticipated loading from the 17 m high cribs. A slope stability analysis was therefore undertaken to design the berms in this area to prevent punching type of failure. Figure. 6.2 below shows the geometry of the berm required in this area to achieve the required factor of safety against slope failure under the anticipated loading from the crib structure. The slope stability analysis results with and without the berm is presented in Appendix F.

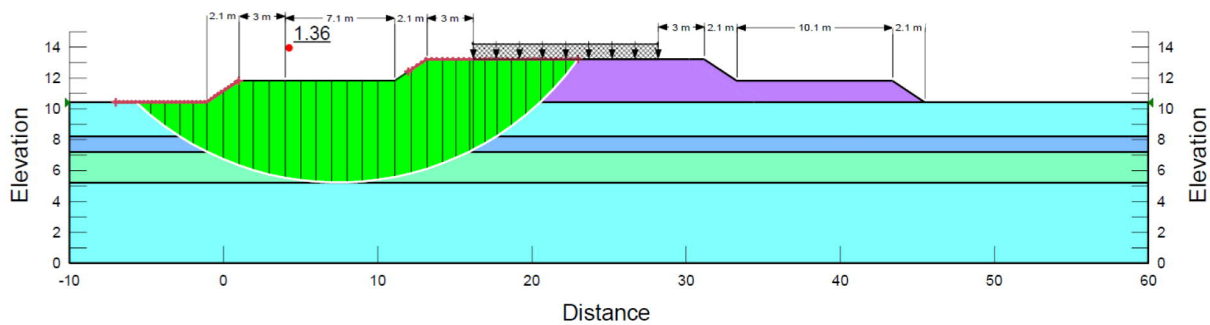


Figure 6.2 Geometry of the stabilizing Berms needed in localized area where soft clay zone occurs within the till layer.

Considering a crib height of 17 m, a contact pressure of 225 kPa was estimated at the crib base. Settlement were estimated to be 50 mm for the concrete cribs founded on approximately 2 m thick rock mattress resting on compact to dense till without any soft clay zones within the till layer. Most of these settlements will occur during the construction of crib structure and post construction settlements will be of the order of 25 mm.

Settlements of the order of 75 mm are estimated in the localized area where the till layer contains soft clay zone. Settlements of the order of 30 mm will occur during construction with post construction settlement of the order of 45 mm occurring over 2 to 3 years after the construction. Rockfill with maximum particle size of 300 mm in diameter can be used as ballast rock to fill concrete cribs. Properties of ballast rock are also provided in section 6.2.1.4. It should be noted that the load eccentricity and inclination was not considered in our settlement analysis.

6.1.1.3 Infill Areas

Free-draining granular material such as well-graded rock fill can be used to backfill the area behind the concrete cribs and land reclamation area in the north without any retaining structure. The maximum particle size should not exceed 200 mm in diameter. Properties of backfill materials are also provided in sub-section 6.2.1.4. Backfill rock materials above water should be placed in lifts and compacted with a vibratory roller. The lift thickness used during fill placement should be compatible with the compaction equipment and material type to ensure the required density throughout. Due to the particle size distribution of rock fill materials, verification of the field density by visual inspection during proof rolling by geotechnical personnel will be required.

As the near surface marine silt deposits will be dredged under the entire footprint of the infill area, post construction settlements will be in the range of 25 mm to 40 mm.

6.1.1.4 Geotechnical Design Parameters

Soil parameters used in the analysis are provided below in Table 6.3.

Table 6.3 Mattress Material Gradation

Parameters	Values
Rockfill Mattress (300 mm and 50 mm minus Blasted Rockfill)	
Bulk Unit Weight (γ)	20.0 kN/m³
Effective (Submerged) Unit Weight (γ')	10.2 kN/m³
Effective Angle of Friction (ϕ')	38º
Backfill Materials (200 mm minus Blasted Rockfill) above water	
Bulk Unit Weight (γ)	21.0.0 kN/m³
Effective (Submerged) Unit Weight (γ')	11.2 kN/m³
Effective Angle of Friction (ϕ')	36º
Backfill Materials (200 mm minus Blasted Rockfill) below water	
Bulk Unit Weight (γ)	20.0 kN/m³
Effective (Submerged) Unit Weight (γ')	10.2 kN/m³
Effective Angle of Friction (ϕ')	34º
Ballast Rock (Maximum 300 mm in Diameter)	
Bulk Unit Weight (γ)	19.0 kN/m³
Effective (Submerged) Unit Weight (γ')	9.2 kN/m³

7.0 CLOSURE

Use of this report is subject to the Statement of General Conditions, attached. It is the responsibility of Port of Argentia who is identified as “the Client” within the Statement of General Conditions, and its agents to review the conditions and to notify Stantec should any of these not be satisfied. The Statement of General Conditions addresses the following: use of the report; basis of the report; standard of care; interpretation of site conditions; varying or unexpected site conditions and planning, design, or construction.

We trust this report meets your present requirements. This report has been prepared by the undersigned with assistance and senior technical review by Dr. Arun Valsangkar, Ph.D., P.Eng. Should any additional information be required, please do not hesitate to contact our office at your convenience.

Regards,

Stantec Consulting Ltd.

Brian Walsh

Brian Walsh P.Geo
Geologist
Phone:1709-631-3790
Brian.Walsh@stantec.com

Lorne Boone.

Lorne Boone, M.Eng., P.Eng., P.Geo
Principal, Senior Geotechnical Engineer
Phone: 1709-576-1458
Lorne.Boone@stantec.com

REGISTERED PROFESSIONAL ENGINEER
LORNE C. BOONE
SIGNATURE
Sept 29, 2023
DATE
PROVINCE OF NEWFOUNDLAND

PROVINCE OF NEWFOUNDLAND AND LABRADOR
pegnl
ENGINEERING PERMIT J0291
STANTEC CONSULTING LTD.
Lorne Boone.
Signature or Member Number
(Member-in-Responsible Charge)

V:\1216\active\121624742\report\rpt_fin_121624742_Coopers_Cove_20230929.docx

APPENDIX A

Statement of General Conditions

STATEMENT OF GENERAL CONDITIONS

USE OF THIS REPORT: This report has been prepared for the sole benefit of the Client or its agent and may not be used by any third party without the express written consent of Stantec Consulting Ltd. and the Client. Any use which a third party makes of this report is the responsibility of such third party.

BASIS OF THE REPORT: The information, opinions, and/or recommendations made in this report are in accordance with Stantec Consulting Ltd.'s present understanding of the site specific project as described by the Client. The applicability of these is restricted to the site conditions encountered at the time of the investigation or study. If the proposed site specific project differs or is modified from what is described in this report or if the site conditions are altered, this report is no longer valid unless Stantec Consulting Ltd. is requested by the Client to review and revise the report to reflect the differing or modified project specifics and/or the altered site conditions.

STANDARD OF CARE: Preparation of this report, and all associated work, was carried out in accordance with the normally accepted standard of care in the state or province of execution for the specific professional service provided to the Client. No other warranty is made.

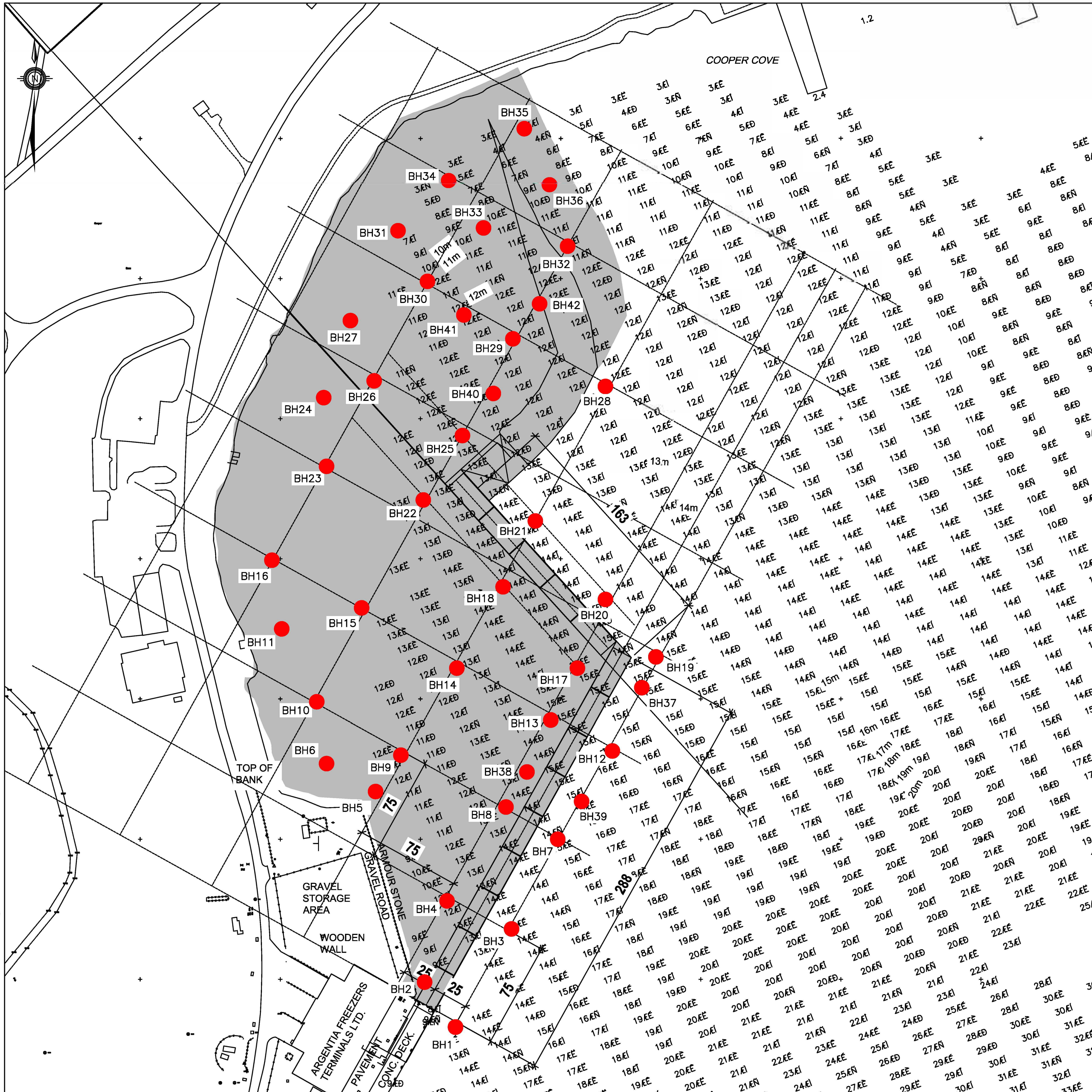
INTERPRETATION OF SITE CONDITIONS: Soil, rock, or other material descriptions, and statements regarding their condition, made in this report are based on site conditions encountered by Stantec Consulting Ltd. at the time of the work and at the specific testing and/or sampling locations. Classifications and statements of condition have been made in accordance with normally accepted practices which are judgmental in nature; no specific description should be considered exact, but rather reflective of the anticipated material behavior. Extrapolation of in situ conditions can only be made to some limited extent beyond the sampling or test points. The extent depends on variability of the soil, rock and groundwater conditions as influenced by geological processes, construction activity, and site use.

VARYING OR UNEXPECTED CONDITIONS: Should any site or subsurface conditions be encountered that are different from those described in this report or encountered at the test locations, Stantec Consulting Ltd. must be notified immediately to assess if the varying or unexpected conditions are substantial and if reassessments of the report conclusions or recommendations are required. Stantec Consulting Ltd. will not be responsible to any party for damages incurred as a result of failing to notify Stantec Consulting Ltd. that differing site or sub-surface conditions are present upon becoming aware of such conditions.

PLANNING, DESIGN, OR CONSTRUCTION: Development or design plans and specifications should be reviewed by Stantec Consulting Ltd., sufficiently ahead of initiating the next project stage (property acquisition, tender, construction, etc), to confirm that this report completely addresses the elaborated project specifics and that the contents of this report have been properly interpreted. Specialty quality assurance services (field observations and testing) during construction are a necessary part of the evaluation of sub-subsurface conditions and site preparation works. Site work relating to the recommendations included in this report should only be carried out in the presence of a qualified geotechnical engineer; Stantec Consulting Ltd. cannot be responsible for site work carried out without being present.

APPENDIX B

Site Plan



BOREHOLE LOCATIONS		
Borehole ID	Northing	Easting
BH-01	5242566	274525
BH-02	5242598	274503
BH-03	5242636	274565
BH-04	5242656	274519
BH-05	5242734	274468
BH-06	5242754	274433
BH-07	5242700	274598
BH-08	5242723	274561
BH-09	5242760	274486
BH-10	5242798	274426
BH-11	5242850	274401
BH-12	5242763	274637
BH-13	5242785	274593
BH-14	5242822	274526
BH-15	5242865	274458
BH-16	5242899	274394
BH-17	5242822	274612
BH-18	5242880	274559
BH-19	5242830	274668
BH-20	5242871	274632
BH-21	5242927	274582
BH-22	5242942	274502
BH-23	5242966	274433
BH-24	5243015	274431
BH-25	5242988	274530
BH-26	5243027	274467
BH-27	5243070	274450
BH-28	5243023	274632
BH-29	5243057	274566
BH-30	5243098	274505
BH-31	5243134	274484
BH-32	5243123	274605
BH-33	5243136	274545
BH-34	5243170	274520
BH-35	5243207	274574
BH-36	5243167	274592
BH-37	5242808	274658
BH-38	5242748	274576
BH-39	5242727	274615
BH-40	5243018	274552
BH-41	5243074	274531
BH-42	5243082	274585

LEGEND

BOREHOLE LOCATIONS

NOTES:

1) THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

CLIENT:

PORT OF ARGENTIA

PROJECT TITLE:

MARINE GEOTECHNICAL INVESTIGATION, COOPER COVE WHARF, COOPER COVE, NL

DRAWING TITLE:

BOREHOLE LOCATION PLAN

Stantec

SCALE:	1:3000	DATE:	JULY 18, 2023
DRAWN BY:	S.N.	CHECKED BY:	
EDITED BY:	-	REV. No.	0
DRAWING No:	121624742-GE-01		

T:\JOBS\121624742\121624742-GE-01.dwg

Stantec Consulting Ltd. © 2023

APPENDIX C

Symbols and Terms Used on Borehole Records

Borehole Records

SYMBOLS AND TERMS USED ON BOREHOLE AND TEST PIT RECORDS

SOIL DESCRIPTION

Terminology describing common soil genesis:

Rootmat	- vegetation, roots and moss with organic matter and topsoil typically forming a mattress at the ground surface
Topsoil	- mixture of soil and humus capable of supporting vegetative growth
Peat	- mixture of visible and invisible fragments of decayed organic matter
Till	- unstratified glacial deposit which may range from clay to boulders
Fill	- material below the surface identified as placed by humans (excluding buried services)

Terminology describing soil structure:

Desiccated	- having visible signs of weathering by oxidization of clay minerals, shrinkage cracks, etc.
Fissured	- having cracks, and hence a blocky structure
Varved	- composed of regular alternating layers of silt and clay
Stratified	- composed of alternating successions of different soil types, e.g. silt and sand
Layer	- > 75 mm in thickness
Seam	- 2 mm to 75 mm in thickness
Parting	- < 2 mm in thickness

Terminology describing soil types:
The classification of soil types are made on the basis of grain size and plasticity in accordance with the Unified Soil Classification System (USCS) (ASTM D 2487 or D 2488) which excludes particles larger than 75 mm. For particles larger than 75 mm, and for defining percent clay fraction in hydrometer results, definitions proposed by Canadian Foundation Engineering Manual, 4th Edition are used. The USCS provides a group symbol (e.g. SM) and group name (e.g. silty sand) for identification.

Terminology describing cobbles, boulders, and non-matrix materials (organic matter or debris):
Terminology describing materials outside the USCS, (e.g. particles larger than 75 mm, visible organic matter, and construction debris) is based upon the proportion of these materials present:

Trace, or occasional	Less than 10%
Some	10-20%
Frequent	> 20%

Terminology describing compactness of cohesionless soils:
The standard terminology to describe cohesionless soils includes compactness (formerly "relative density"), as determined by the Standard Penetration Test (SPT) N-Value - also known as N-Index. The SPT N-Value is described further on page 3. A relationship between compactness condition and N-Value is shown in the following table.

Compactness Condition	SPT N-Value
Very Loose	<4
Loose	4-10
Compact	10-30
Dense	30-50
Very Dense	>50

Terminology describing consistency of cohesive soils:
The standard terminology to describe cohesive soils includes the consistency, which is based on undrained shear strength as measured by *in situ* vane tests, penetrometer tests, or unconfined compression tests. Consistency may be crudely estimated from SPT N-Value based on the correlation shown in the following table (Terzaghi and Peck, 1967). The correlation to SPT N-Value is used with caution as it is only very approximate.

Consistency	Undrained Shear Strength		Approximate SPT N-Value
	kips/sq.ft.	kPa	
Very Soft	<0.25	<12.5	<2
Soft	0.25 - 0.5	12.5 - 25	2-4
Firm	0.5 - 1.0	25 - 50	4-8
Stiff	1.0 - 2.0	50 – 100	8-15
Very Stiff	2.0 - 4.0	100 - 200	15-30
Hard	>4.0	>200	>30

ROCK DESCRIPTION

Except where specified below, terminology for describing rock is as defined by the International Society for Rock Mechanics (ISRM) 2007 publication "The Complete ISRM Suggested Methods for Rock Characterization, Testing and Monitoring: 1974-2006"

Terminology describing rock quality:

RQD	Rock Mass Quality
0-25	*Very Poor Quality*
25-50	*Poor Quality*
50-75	*Fair Quality*
75-90	*Good Quality*
90-100	*Excellent Quality*

Alternate (Colloquial) Rock Mass Quality	
Very Severely Fractured	*Crushed*
Severely Fractured	*Shattered or Very Blocky*
Fractured	*Blocky*
Moderately Jointed	*Sound*
Intact	*Very Sound*

RQD (Rock Quality Designation) denotes the percentage of intact and sound rock retrieved from a borehole of any orientation. All pieces of intact and sound rock core equal to or greater than 100 mm (4 in.) long are summed and divided by the total length of the core run. RQD is determined in accordance with ASTM D6032.

SCR (Solid Core Recovery) denotes the percentage of solid core (cylindrical) retrieved from a borehole of any orientation. All pieces of solid (cylindrical) core are summed and divided by the total length of the core run (It excludes all portions of core pieces that are not fully cylindrical as well as crushed or rubble zones).

Fracture Index (FI) is defined as the number of naturally occurring fractures within a given length of core. The Fracture Index is reported as a simple count of natural occurring fractures.

Terminology describing rock with respect to discontinuity and bedding spacing:

Spacing (mm)	Discontinuities	Bedding
>6000	*Extremely Wide*	-
2000-6000	*Very Wide*	*Very Thick*
600-2000	*Wide*	*Thick*
200-600	*Moderate*	*Medium*
60-200	*Close*	*Thin*
20-60	*Very Close*	*Very Thin*
<20	*Extremely Close*	*Laminated*
<6	-	*Thinly Laminated*

Terminology describing rock strength:

Strength Classification	Grade	Unconfined Compressive Strength (MPa)
Extremely Weak	R0	<1
Very Weak	R1	1 – 5
Weak	R2	5 – 25
Medium Strong	R3	25 – 50
Strong	R4	50 – 100
Very Strong	R5	100 – 250
Extremely Strong	R6	>250

Terminology describing rock weathering:

Term	Symbol	Description
Fresh	W1	No visible signs of rock weathering. Slight discoloration along major discontinuities
Slightly	W2	Discoloration indicates weathering of rock on discontinuity surfaces. All the rock material may be discolored.
Moderately	W3	Less than half the rock is decomposed and/or disintegrated into soil.
Highly	W4	More than half the rock is decomposed and/or disintegrated into soil.
Completely	W5	All the rock material is decomposed and/or disintegrated into soil. The original mass structure is still largely intact.
Residual Soil	W6	All the rock converted to soil. Structure and fabric destroyed.

STRATA PLOT

Strata plots symbolize the soil or bedrock description. They are combinations of the following basic symbols. The dimensions within the strata symbols are not indicative of the particle size, layer thickness, etc.

Boulders Cobbles Gravel	Sand	Silt	Clay	Organics	Asphalt	Concrete	Fill	Igneous Bedrock	Meta-morphic Bedrock	Sedi-mentary Bedrock

SAMPLE TYPE

SS	Split spoon sample (obtained by performing the Standard Penetration Test)
ST	Shelby tube or thin wall tube
DP	Direct-Push sample (small diameter tube sampler hydraulically advanced)
PS	Piston sample
BS	Bulk sample
HQ, NQ, BQ, etc.	Rock core samples obtained with the use of standard size diamond coring bits.

WATER LEVEL MEASUREMENT

measured in standpipe, piezometer, or well

inferred

RECOVERY

For soil samples, the recovery is recorded as the length of the soil sample recovered. For rock core, recovery is defined as the total cumulative length of all core recovered in the core barrel divided by the length drilled and is recorded as a percentage on a per run basis.

N-VALUE

Numbers in this column are the field results of the Standard Penetration Test: the number of blows of a 140 pound (63.5 kg) hammer falling 30 inches (760 mm), required to drive a 2 inch (50.8 mm) O.D. split spoon sampler one foot (300 mm) into the soil. In accordance with ASTM D1586, the N-Value equals the sum of the number of blows (N) required to drive the sampler over the interval of 6 to 18 in. (150 to 450 mm). However, when a 24 in. (610 mm) sampler is used, the number of blows (N) required to drive the sampler over the interval of 12 to 24 in. (300 to 610 mm) may be reported if this value is lower. For split spoon samples where insufficient penetration was achieved and N-Values cannot be presented, the number of blows are reported over sampler penetration in millimetres (e.g. 50/75). Some design methods make use of N-values corrected for various factors such as overburden pressure, energy ratio, borehole diameter, etc. No corrections have been applied to the N-values presented on the log.

DYNAMIC CONE PENETRATION TEST (DCPT)

Dynamic cone penetration tests are performed using a standard 60 degree apex cone connected to 'A' size drill rods with the same standard fall height and weight as the Standard Penetration Test. The DCPT value is the number of blows of the hammer required to drive the cone one foot (300 mm) into the soil. The DCPT is used as a probe to assess soil variability.

OTHER TESTS

S	Sieve analysis
H	Hydrometer analysis
k	Laboratory permeability
γ	Unit weight
G_s	Specific gravity of soil particles
CD	Consolidated drained triaxial
CU	Consolidated undrained triaxial with pore pressure measurements
UU	Unconsolidated undrained triaxial
DS	Direct Shear
C	Consolidation
Q_U	Unconfined compression
I_p	Point Load Index (I_p on Borehole Record equals $I_p(50)$ in which the index is corrected to a reference diameter of 50 mm)

	Single packer permeability test; test interval from depth shown to bottom of borehole
	Double packer permeability test; test interval as indicated
	Falling head permeability test using casing
	Falling head permeability test using well point or piezometer

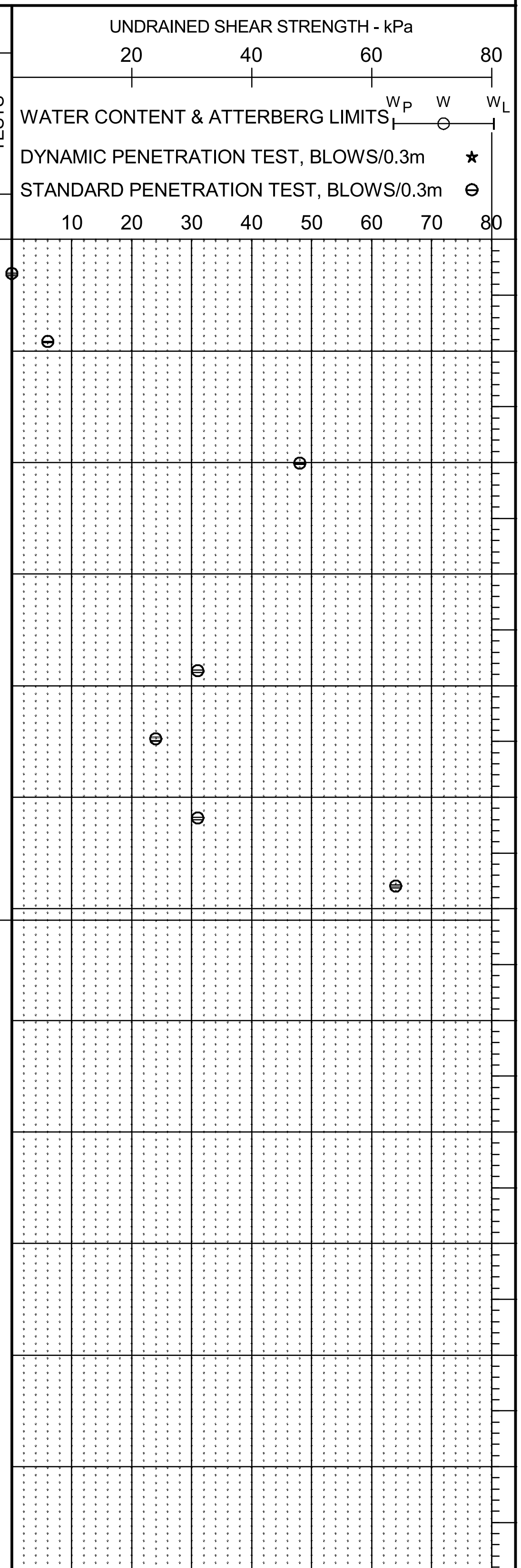
Stantec

BOREHOLE RECORD

BOREHOLE No. **BH-01**
PAGE **1** of **1**
PROJECT No. **121624742**
DRILLING METHOD **Wash Bore**
SIZE **HWT/HQ**
DATUM **LNT**

CLIENT **Port of Argentia**
PROJECT **Marine Geotechnical Investigation - Cooper Cove Wharf**
LOCATION **Cooper Cove, NL**
DATES (mm-dd-yy): BORING **5-13-23** WATER LEVEL **N/A**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	TYPE	NUMBER	RECOVERY OR TCR(%) (mm)	N-VALUE OR RQD (%)	OTHER TESTS
0	-14.03	Very loose to loose, dark grey to grey, sandy SILT (ML); occasional gravel: MARINE SEDIMENT			SS	1	0	0	
					SS	2	325	6	
	-15.73	Dense to very dense, brown to grey, well-graded SAND with silt and gravel (SW-SM); occasional to some cobbles: TILL			SS	3	300	48	
					SS	4	0	82/250	
	-17.59	Compact to dense, pinkish grey, well-graded SAND with silt and gravel (SW-SM); occasional cobbles: TILL			SS	5	75	31	
					SS	6	175	24	
					SS	7	250	31	
	-20.13				SS	8	450	64	
		End of Borehole							



△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ⊠ Torvane

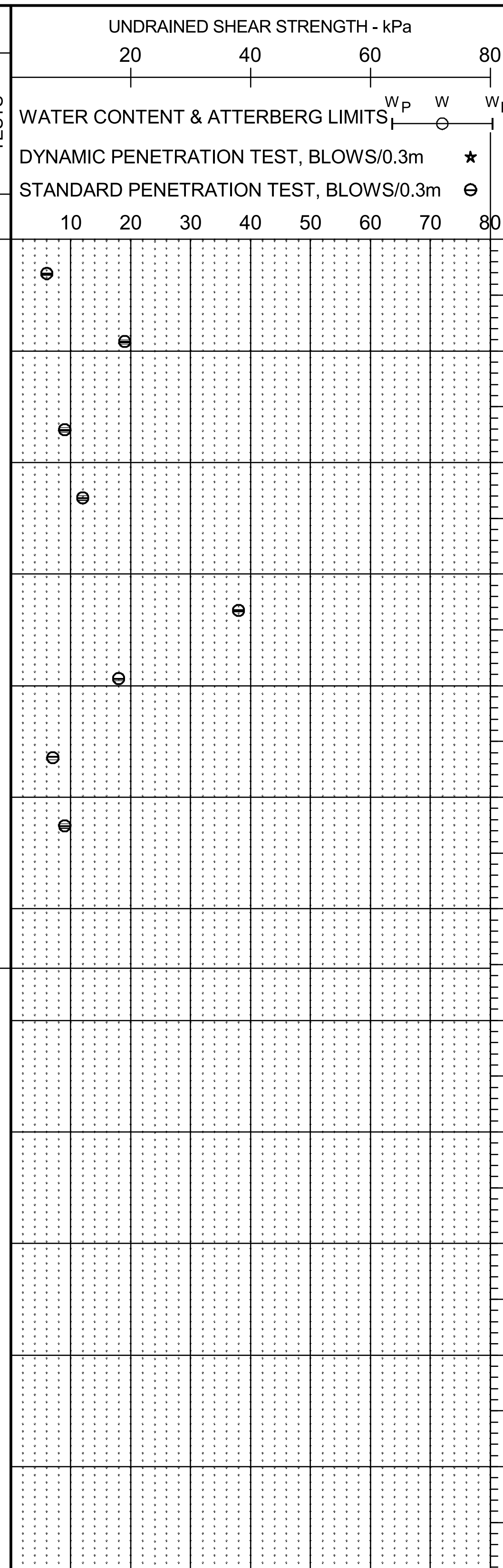
Stantec — BOREHOLE RECORD

BOREHOLE No. BH-02
PAGE 1 of 1

CLIENT: Port of Argentia
PROJECT: Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION: Cooper Cove, NL
DATES (mm-dd-yy): BORING 5-14-23 WATER LEVEL N/A

PROJECT No. 121624742
DRILLING METHOD Wash Bore
SIZE HWT/HQ
DATUM LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION	TYPE	NUMBER	RECOVERY OR TCR(%) (mm)	N-VALUE OR RQD (%)	OTHER TESTS
0	-7.94	Loose to dense, brown to grey, poorly-graded GRAVEL with silt and sand (GW-GM); occasional cobbles: FILL	SS	1	0	6	
			SS	2	100	19	
			SS	3	50	9	
			SS	4	150	12	
			SS	5	100	38	
			SS	6	200	18	
			SS	7	0	7	
			SS	8	125	9	
	-13.32	Loose, dark grey to grey, sandy SILT (ML); occasional gravel, occasional organic smell: MARINE SEDIMENT					
	-13.88		SS	9	175	102/575	
	-14.47	Very dense, grey, well-graded SAND with silt and gravel (SW-SM); occasional cobbles: TILL					
		End of Borehole					



Unconfined Compression Test
Field Vane Test (Remolded)
Fall Cone Test (Remolded)
Hand Penetrometer Test Torvane

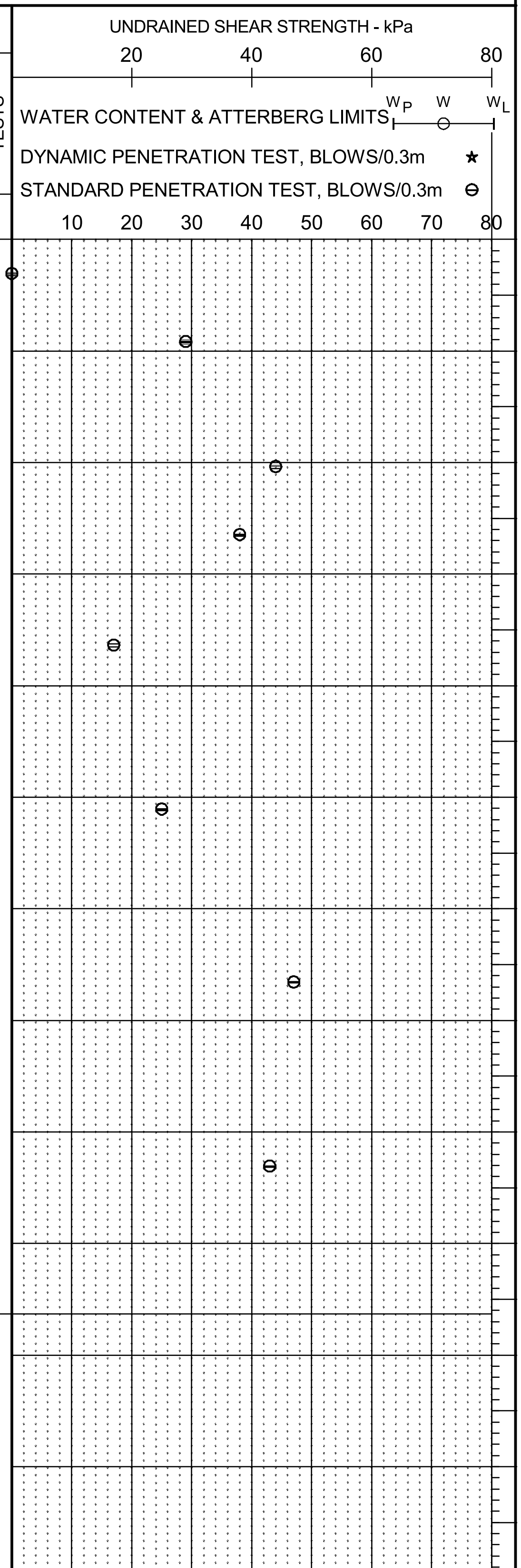
Stantec BOREHOLE RECORD

CLIENT	Port of Argentia
PROJECT	Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION	Cooper Cove, NL
DATES (mm-dd-yy): BORING	5-9-23
WATER LEVEL	N/A
BOREHOLE No.	BH-03
PAGE	1 of 1
PROJECT No.	121624742
DRILLING METHOD	Wash Bore
SIZE	HWT/HQ
DATUM	LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION
0	-14.81	Very loose to compact, dark grey, sandy SILT (ML); occasional gravel, occasional shells, occasional organic smell: MARINE SEDIMENT
	-15.72	Dense, pinkish grey to grey, silty GRAVEL with sand (GM) to silty SAND with gravel (SM); occasional cobbles: TILL
	-18.14	- below 3.20 m artesian conditions noted.
		Compact to dense, grey, well-graded SAND with silt and gravel (SP-SM); occasional cobbles: TILL
	-22.81	Dense to very dense, pinkish grey to grey to brown, silty SAND with gravel (SM); occasional cobbles: TILL
	-24.44	End of Borehole

SAMPLES

TYPE	NUMBER	RECOVERY OR TCR(%) (mm)	N-VALUE OR RQD (%)	OTHER TESTS
SS	1	275	0	
SS	2	325	29	
SS	3	200	44	
SS	4	400	38	
SS	5	200	17	
SS	6	225	25	
SS	7	0	47	
SS	8	300	43	
SS	9	300	126/175	



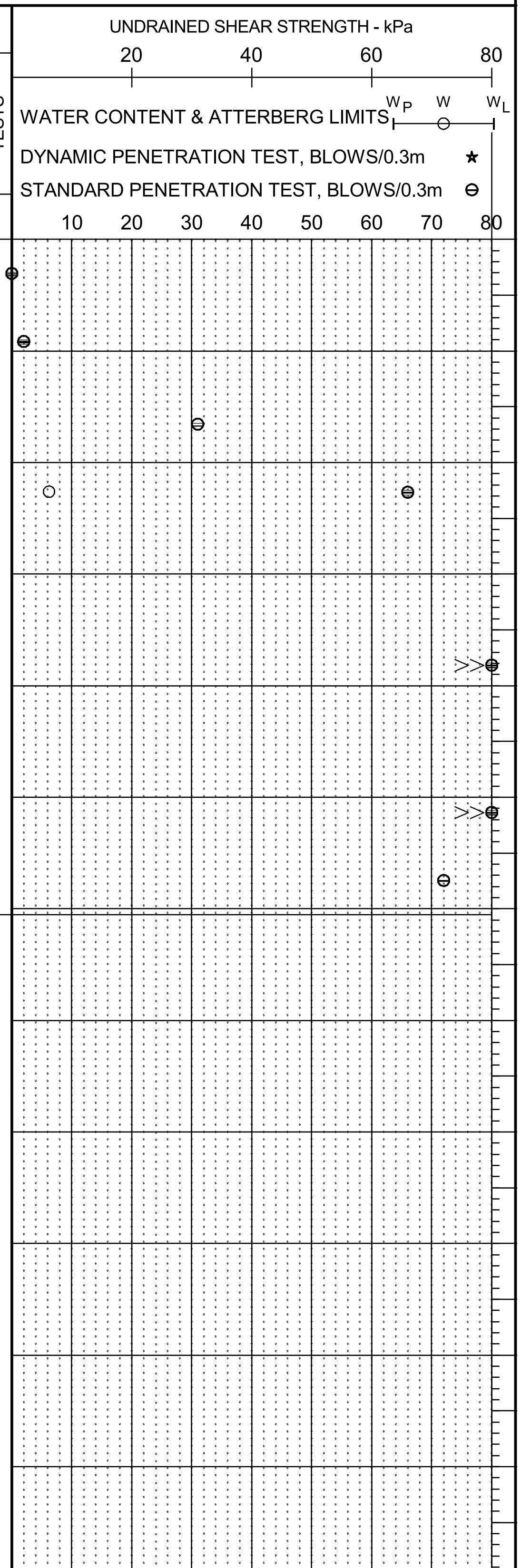
Unconfined Compression Test
Field Vane Test (Remolded)
Fall Cone Test (Remolded)
Hand Penetrometer Test Torvane

BOREHOLE RECORD

Stantec

CLIENT	Port of Argentia	BOREHOLE No.	BH-04
PROJECT	Marine Geotechnical Investigation - Cooper Cove Wharf	PAGE	1 of 1
LOCATION	Cooper Cove, NL	PROJECT No.	121624742
DATES (mm-dd-yy): BORING	5-15-23	DRILLING METHOD	Wash Bore
WATER LEVEL	N/A	SIZE	HWT/HQ
		DATUM	LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY OR TCR(%) mm	N-VALUE OR RQD (%)	OTHER TESTS
0	-13.58	Very loose, dark grey, sandy SILT (ML); occasional gravel, occasional organic smell: MARINE SEDIMENT			SS	1	100	0	
					SS	2	300	2	
1.35	-14.93	Dense to very dense, grey to pinkish grey, well-graded SAND with silt (SW-SM); occasional to some gravel, occasional cobbles: TILL			SS	3	50	31	
					SS	4	450	66	S
					SS	5	250	119	
					SS	6	150	162/375	
					SS	7	100	81	
					SS	8	125	72	
6.05	-19.63	End of Borehole							



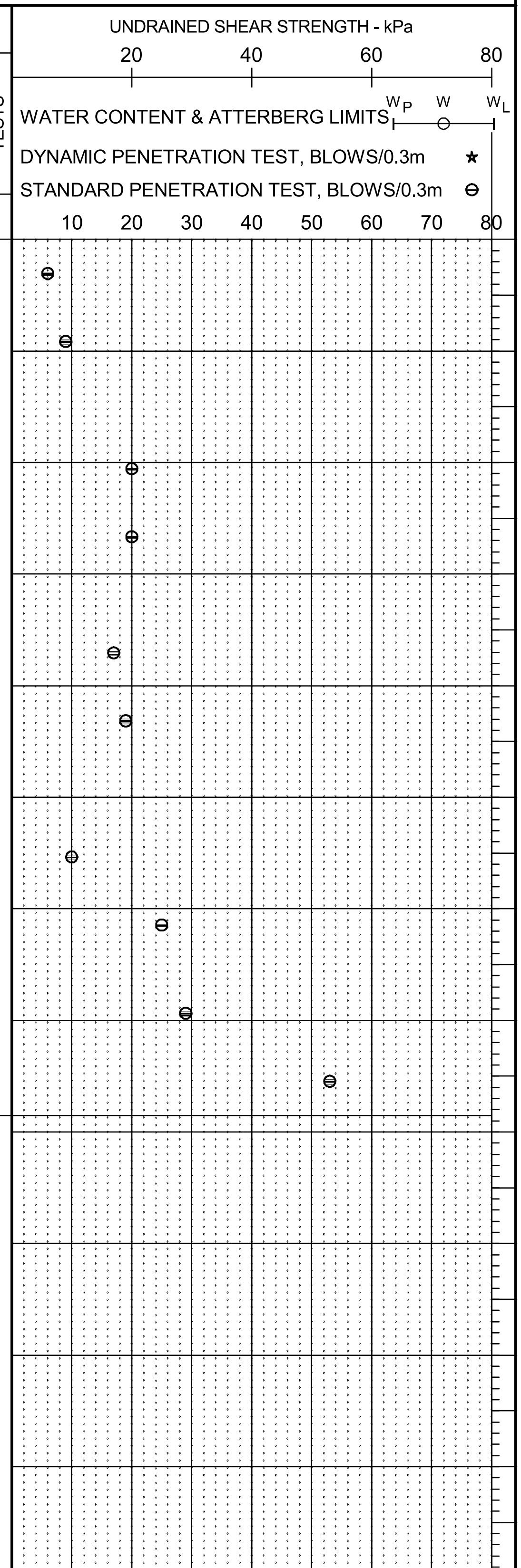
△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ⊠ Torvane

BOREHOLE RECORD

Stantec

CLIENT	Port of Argentia
PROJECT	Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION	Cooper Cove, NL
DATES (mm-dd-yy): BORING	5-16-23
WATER LEVEL	N/A
BOREHOLE No.	BH-05
PAGE	1 of 1
PROJECT No.	121624742
DRILLING METHOD	Wash Bore
SIZE	HWT/HQ
DATUM	LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	RECOVERY OR TCR(%) mm	N-VALUE OR RQD (%)	OTHER TESTS
0	-5.10	Loose to compact, brown, poorly-graded GRAVEL with silt and sand (GP-GM); occasional to some cobbles, occasional shells, occasional debris (i.e. concrete, wood): FILL			SS	1	0	6	
					SS	2	100	9	
					SS	3	50	20	
					SS	4	300	20	
					SS	5	75	17	
					SS	6	200	19	
					SS	7	25	10	
6.15	-11.25	Compact to very dense, grey, well-graded SAND with silt and gravel (SW-SM); occasional cobbles: TILL			SS	8	375	25	
					SS	9	225	29	
7.85	-12.95	End of Borehole			SS	10	300	53	



Unconfined Compression Test
Field Vane Test (Remolded)
Fall Cone Test (Remolded)
Hand Penetrometer Test Torvane

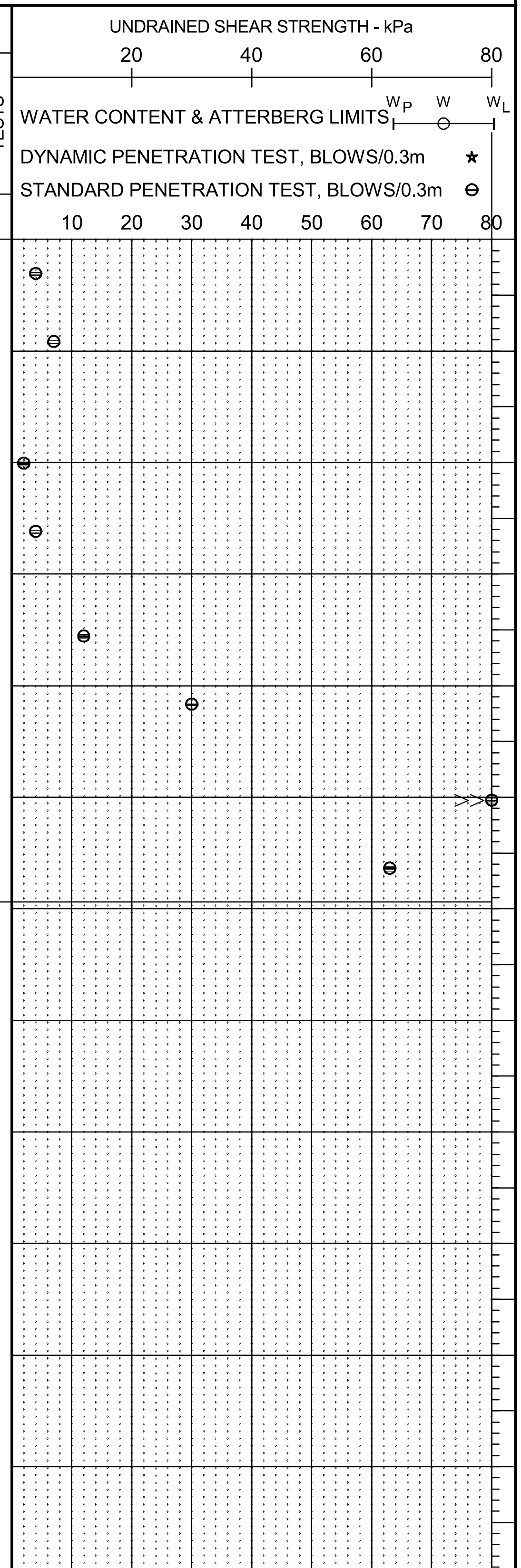
BOREHOLE RECORD

Stantec

CLIENT: Port of Argentia
PROJECT: Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION: Cooper Cove, NL
DATES (mm-dd-yy): BORING 5-17-23 WATER LEVEL N/A

BOREHOLE No. BH-06
PAGE 1 of 1
PROJECT No. 121624742
DRILLING METHOD Wash Bore
SIZE HWT/HQ
DATUM LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY OR TCR(%) (mm)	N-VALUE OR RQD (%)	OTHER TESTS
0	-5.92	Very loose to loose, dark grey to black, sandy SILT (ML); occasional gravel, occasional shells, occasional organic smell: MARINE SEDIMENT			SS	1	125	4	
					SS	2	100	7	
					SS	3	0	2	
					SS	4	200	4	
2.84	-8.76	Compact to very dense, brown to pinkish grey to grey, well-graded SAND with silt and gravel (SW-SM); occasional cobbles: TILL			SS	5	100	12	
					SS	6	450	30	
					SS	7	200	84	
					SS	8	150	63	
5.94	-11.86	End of Borehole							



△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ⊠ Torvane

Stantec

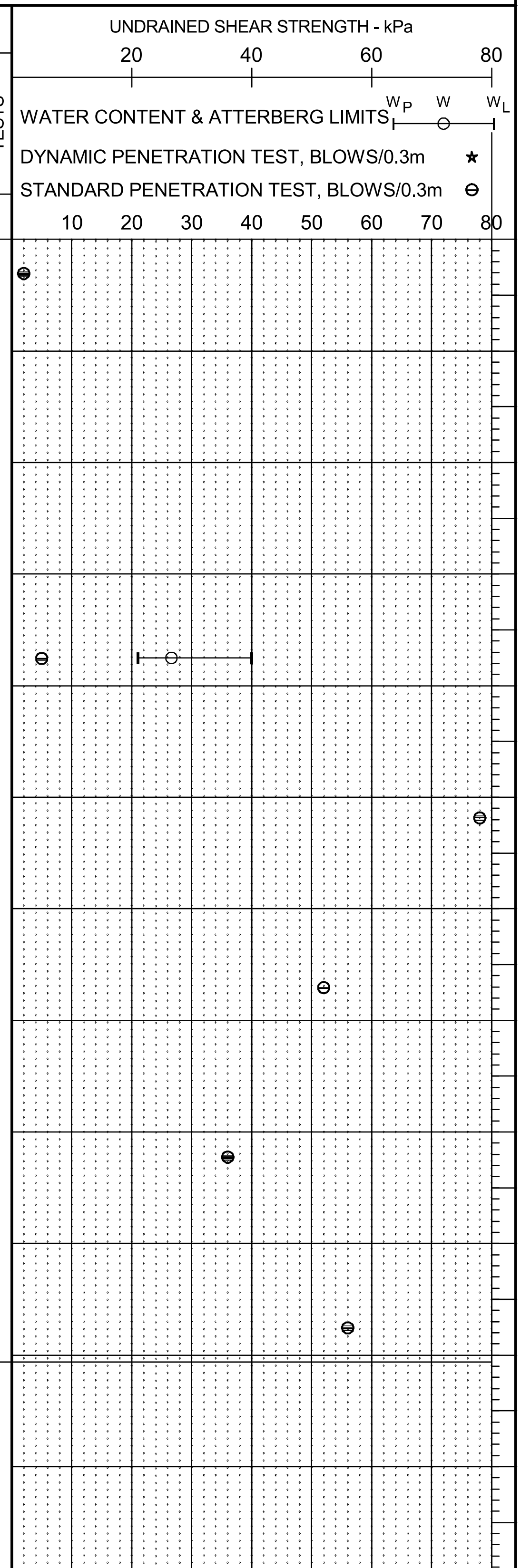
BOREHOLE RECORD

BOREHOLE No. BH-07
PAGE 1 of 1

CLIENT: Port of Argentia
PROJECT: Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION: Cooper Cove, NL
DATES (mm-dd-yy): BORING 5-8-23 WATER LEVEL N/A

PROJECT No. 121624742
DRILLING METHOD Wash Bore
SIZE HWT/HQ
DATUM LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY OR TCR(%) (mm)	N-VALUE OR RQD (%)	OTHER TESTS
0	-16.18	Very loose, dark grey, sandy SILT (ML); occasional gravel, occasional shells, occasional organic smell: MARINE SEDIMENT			SS	1	125	2	
	-16.79	Very dense, grey, silty SAND with gravel (SM); occasional cobbles: TILL			SS	2	200	97/250	
					SS	3	75	72/275	
	-19.63	Firm, blackish grey, sandy lean CLAY (CL); occasional gravel - laboratory consolidation test performed at 4.27 m depth.			SS	4	600	5	A
					ST	5	600	-	
	-21.06	Dense to very dense, grey, silty SAND with gravel (SM); occasional cobbles: TILL			SS	6	250	78	
					SS	7	150	52	
					SS	8	175	36	
					SS	9	200	56	
10	-26.24	End of Borehole							



△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ⧅ Torvane

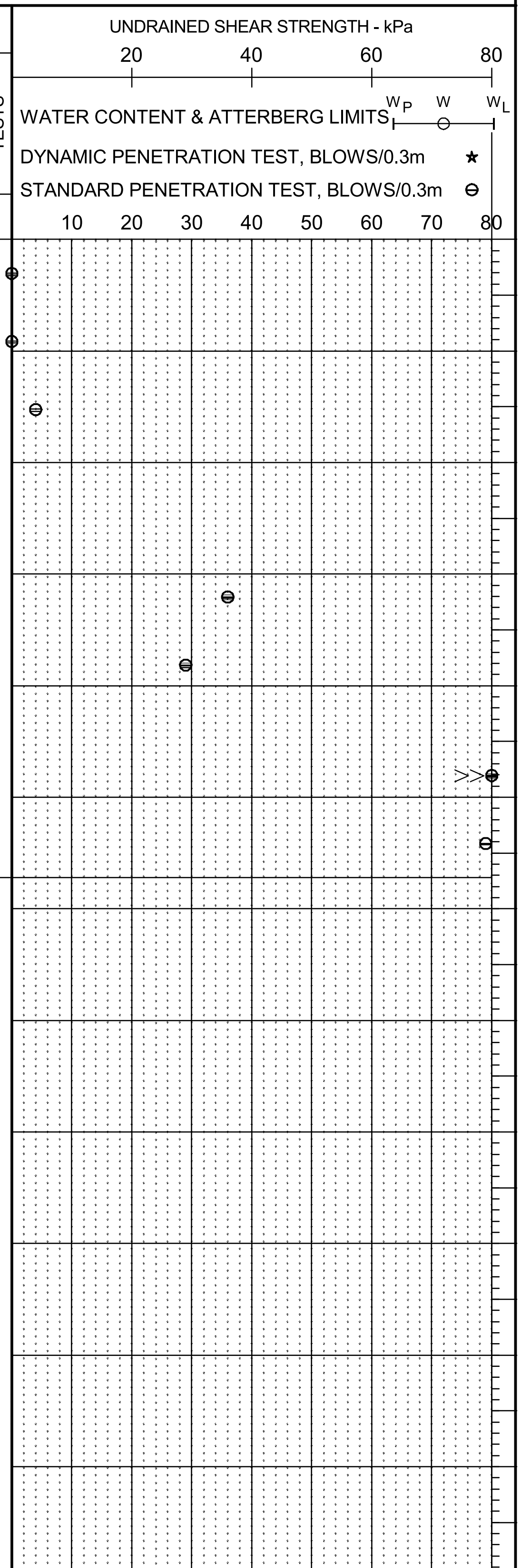
BOREHOLE RECORD

Stantec

CLIENT	Port of Argentia
PROJECT	Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION	Cooper Cove, NL
DATES (mm-dd-yy): BORING	5-11-23
WATER LEVEL	N/A
BOREHOLE No.	BH-08
PAGE	1 of 1
PROJECT No.	121624742
DRILLING METHOD	Wash Bore
SIZE	HWT/HQ
DATUM	LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY OR TCR(%) (mm)	N-VALUE OR RQD (%)	OTHER TESTS
0	-14.05	Very loose to loose, dark grey, sandy SILT (ML); occasional gravel, occasional organic smell: MARINE SEDIMENT			SS	1	150	0	
					SS	2	125	0	
					SS	3	150	4	
	-15.93	Dense to very dense, grey, silty SAND with gravel (SM); occasional cobbles: TILL			SS	4	200	110/350	
					SS	5	150	137/250	
	-17.25	Very stiff, grey, sandy lean CLAY (CL) with gravel			SS	6	150	36	
					SS	7	300	29	
					BS	8	375	-	
	-18.55	Very dense, grey to brown, silty SAND with gravel (SM); occasional cobbles: TILL			SS	9	250	99	
					SS	10	175	79	
	-19.77	End of Borehole							

DEPTH (m): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12



△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ⊠ Torvane

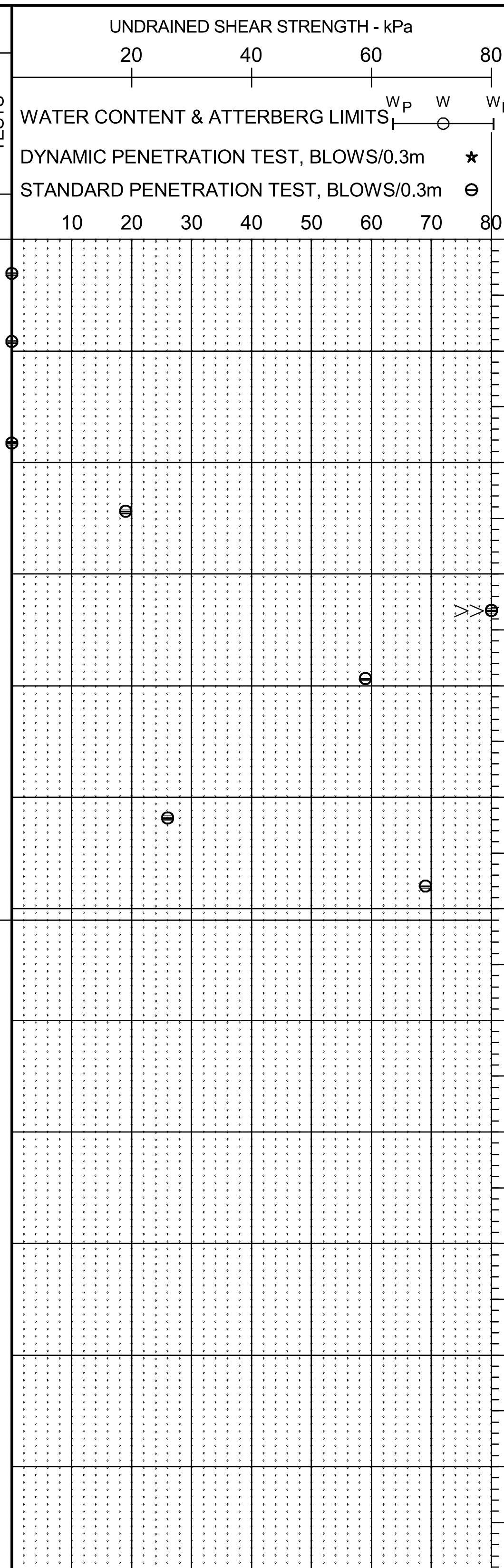
BOREHOLE RECORD

Stantec

BOREHOLE No. BH-09
PAGE 1 of 1
PROJECT No. 121624742
DRILLING METHOD Wash Bore
SIZE HWT/HQ
DATUM LNT

CLIENT Port of Argentia
PROJECT Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION Cooper Cove, NL
DATES (mm-dd-yy): BORING 5-10-23 WATER LEVEL N/A

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY OR TCR(%) (mm)	N-VALUE OR RQD (%)	OTHER TESTS
0	-12.47	Very loose to loose, dark grey, sandy SILT (ML); occasional gravel, occasional shells, occasional organic smell: MARINE SEDIMENT			SS	1	375	0	
					SS	2	550	0	
					SS	3	350	0	
	-14.91	Compact to very dense, pinkish grey to grey, well-graded SAND with silt and gravel (SP-SM) to silty GRAVEL with sand (GM); occasional cobbles: TILL - below 4.42 m artesian conditions noted.			SS	4	200	19	
					SS	5	450	89	
					SS	6	525	59	
					SS	7	100	26	
	-18.57				SS	8	250	69	
6.1		End of Borehole							



△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ⊠ Torvane

Stantec

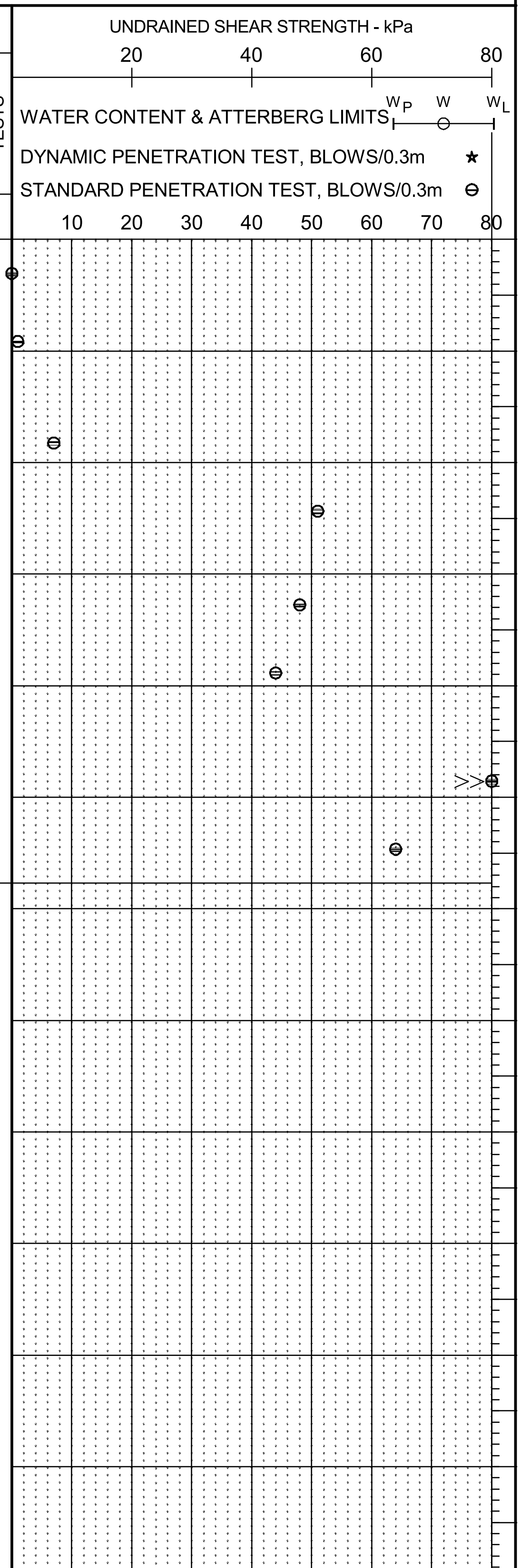
BOREHOLE RECORD

BOREHOLE No. BH-10
PAGE 1 of 1

CLIENT Port of Argentia
PROJECT Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION Cooper Cove, NL
DATES (mm-dd-yy): BORING 5-11-23 WATER LEVEL N/A

PROJECT No. 121624742
DRILLING METHOD Wash Bore
SIZE HWT/HQ
DATUM LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION	SAMPLE TYPE	NUMBER	RECOVERY OR TCR(%) mm	N-VALUE OR RQD (%)	OTHER TESTS
0	-8.04	Very loose to loose, dark grey, sandy SILT (ML); occasional gravel, occasional organic smell: MARINE SEDIMENT BASED ON LIMITED SAMPLE RECOVERY	SS	1	50	0	
			SS	2	0	1	
1.83	-9.87	Dense to very dense, grey to pinkish grey, well-graded SAND with silt and gravel (SW-SM); occasional cobbles: TILL	SS	3	25	7	
			SS	4	225	51	
			SS	5	250	48	
			SS	6	325	44	
			SS	7	350	93	
			SS	8	300	64	
5.77	-13.81	End of Borehole					

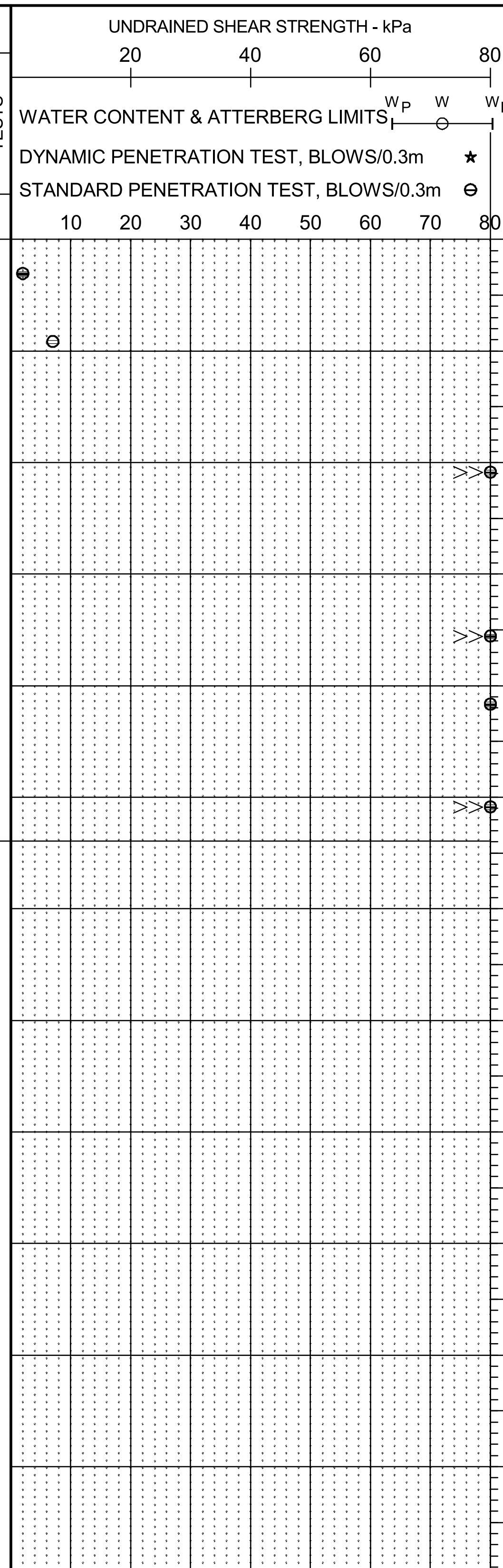


△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ⊠ Torvane

Stantec BOREHOLE RECORD

CLIENT	Port of Argentia	BOREHOLE No.	BH-11
PROJECT	Marine Geotechnical Investigation - Cooper Cove Wharf	PAGE	1 of 1
LOCATION	Cooper Cove, NL	PROJECT No.	121624742
DATES (mm-dd-yy): BORING	5-17-23	DRILLING METHOD	Wash Bore
WATER LEVEL	N/A	SIZE	HWT/HQ
		DATUM	LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY OR TCR(%) (mm)	N-VALUE OR RQD (%)	OTHER TESTS
0	-9.10	Very loose to loose, dark grey to black, sandy SILT (ML); occasional gravel, occasional organic smell: MARINE SEDIMENT BASED ON LIMITED SAMPLE RECOVERY			SS	1	75	2	
					SS	2	50	7	
	-10.88	Very dense, brown, well-graded SAND with silt and gravel (SW-SM) to silty SAND with gravel (SM): TILL			SS	3	275	100	
					SS	4	100	119/275	
					SS	5	100	116	
					SS	6	125	80	
					SS	7	150	114	
	-14.49	End of Borehole							



Unconfined Compression Test
Field Vane Test (Remolded)
Fall Cone Test (Remolded)
Hand Penetrometer Test Torvane

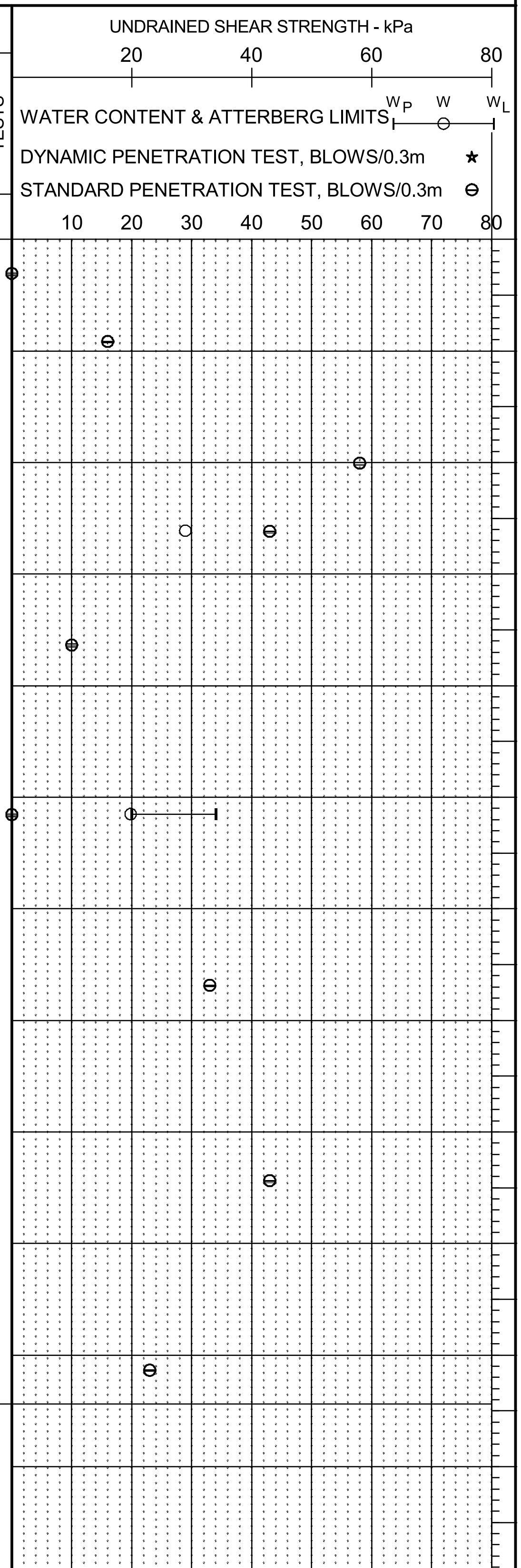
BOREHOLE RECORD

Stantec

BOREHOLE No. BH-12
PAGE 1 of 1
PROJECT No. 121624742
DRILLING METHOD Wash Bore
SIZE HWT/HQ
DATUM LNT

CLIENT Port of Argentia
PROJECT Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION Cooper Cove, NL
DATES (mm-dd-yy): BORING 5-7-23 WATER LEVEL N/A

DEPTH (m)	ELEVATION (m)	DESCRIPTION	TYPE	NUMBER	RECOVERY OR TCR(%) (mm)	N-VALUE OR RQD (%)	OTHER TESTS
0	-16.39	Very loose to compact, dark grey, sandy SILT (ML); occasional gravel, occasional shells, occasional organic smell: MARINE SEDIMENT	SS	1	250	0	
			SS	2	200	16	
1	-17.46	Dense to very dense, grey, SILT with sand (ML); occasional cobbles: TILL	SS	3	300	58	
			SS	4	350	43	S
	-19.72	Very soft to stiff, grey, sandy lean CLAY (CL); occasional gravel	SS	5	500	10	
			SS	6	525	0	A
			ST	7	75	-	
	-22.77	Compact to dense, pinkish grey, silty SAND with gravel (SM); occasional cobbles: TILL	SS	8	250	33	
			SS	9	50	43	
			SS	10	200	23	
	-26.83	End of Borehole					



△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ⧅ Torvane

Stantec

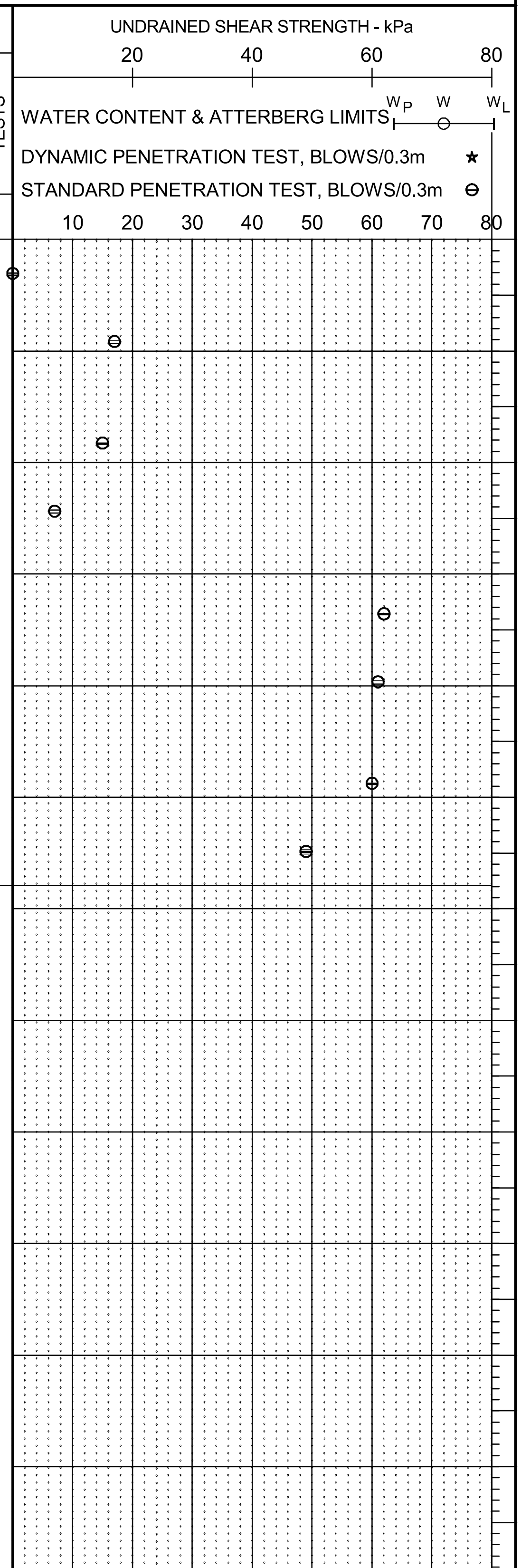
BOREHOLE RECORD

BOREHOLE No. BH-13
PAGE 1 of 1

CLIENT: Port of Argentia
PROJECT: Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION: Cooper Cove, NL
DATES (mm-dd-yy): BORING 5-3-23 WATER LEVEL N/A

PROJECT No. 121624742
DRILLING METHOD Wash Bore
SIZE HWT/HQ
DATUM LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY OR TCR(%) mm	N-VALUE OR RQD (%)	OTHER TESTS
0	-15.61	Very loose, dark grey, sandy SILT (ML); occasional gravel, occasional organic smell: MARINE SEDIEMNT			SS	1	200	0	
	-16.37	Compact, grey, silty GRAVEL with sand (GM): TILL			SS	2	350	17	
	-17.44	Firm to very stiff, grey, sandy lean CLAY (CL), occasional gravel			SS	3	450	15	
					SS	4	500	7	
	-18.66	Dense to very dense, grey, silty SAND with gravel (SM) to well-graded SAND with silt and gravel (SW-SM); occasional cobbles: TILL			SS	5	150	62	
					SS	6	175	61	
					SS	7	200	60	
					SS	8	200	49	
	-21.40	End of Borehole							



Unconfined Compression Test
Field Vane Test (Remolded)
Fall Cone Test (Remolded)
Hand Penetrometer Test Torvane

Stantec

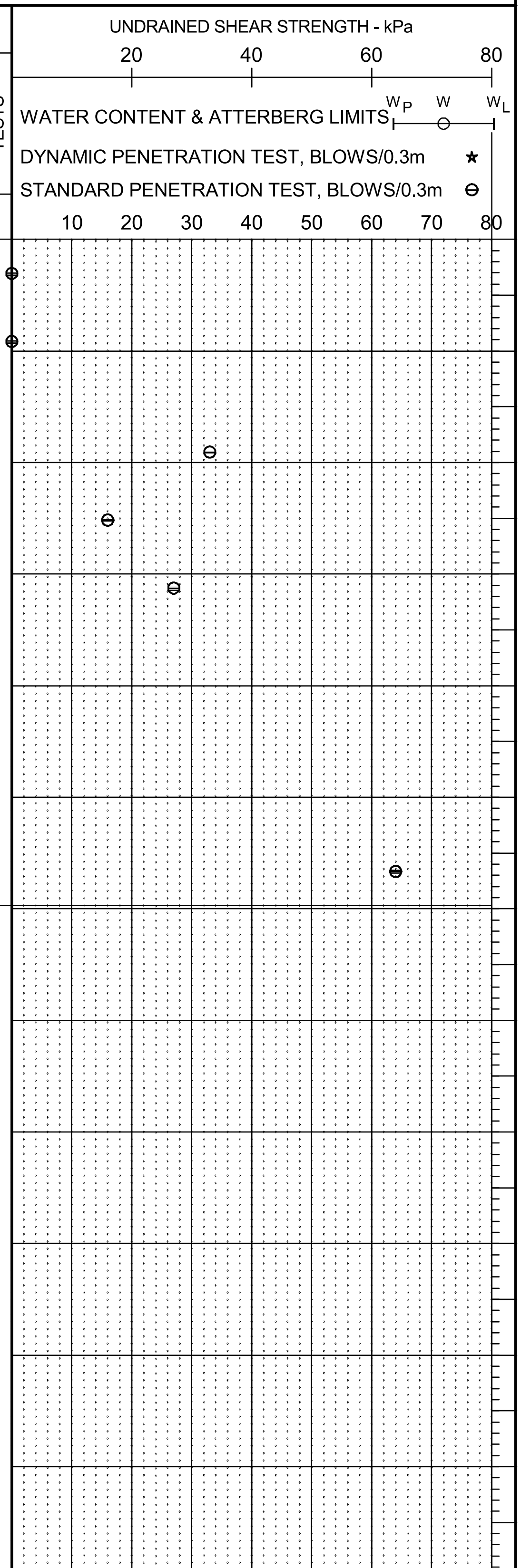
BOREHOLE RECORD

BOREHOLE No. BH-14
PAGE 1 of 1

CLIENT Port of Argentia
PROJECT Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION Cooper Cove, NL
DATES (mm-dd-yy): BORING 5-2-23 WATER LEVEL N/A

PROJECT No. 121624742
DRILLING METHOD Wash Bore
SIZE HWT/HQ
DATUM LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY OR TCR(%) (mm)	N-VALUE OR RQD (%)	OTHER TESTS
0	-13.91	Very loose, dark grey, sandy SILT (ML); occasional gravel, occasional organic smell: MARINE SEDIEMNT			SS	1	150	0	
					SS	2	250	0	
1.83	-15.74	Compact to very dense, grey, well-graded SAND with silt (SW-SM); occasional gravel, occasional cobbles: TILL			SS	3	175	33	
					SS	4	275	16	
					SS	5	450	27	
					SS	6	125	191/500	
		- below 4.57 m artesian conditions noted.							
					SS	7	450	64	
5.97	-19.88	End of Borehole							



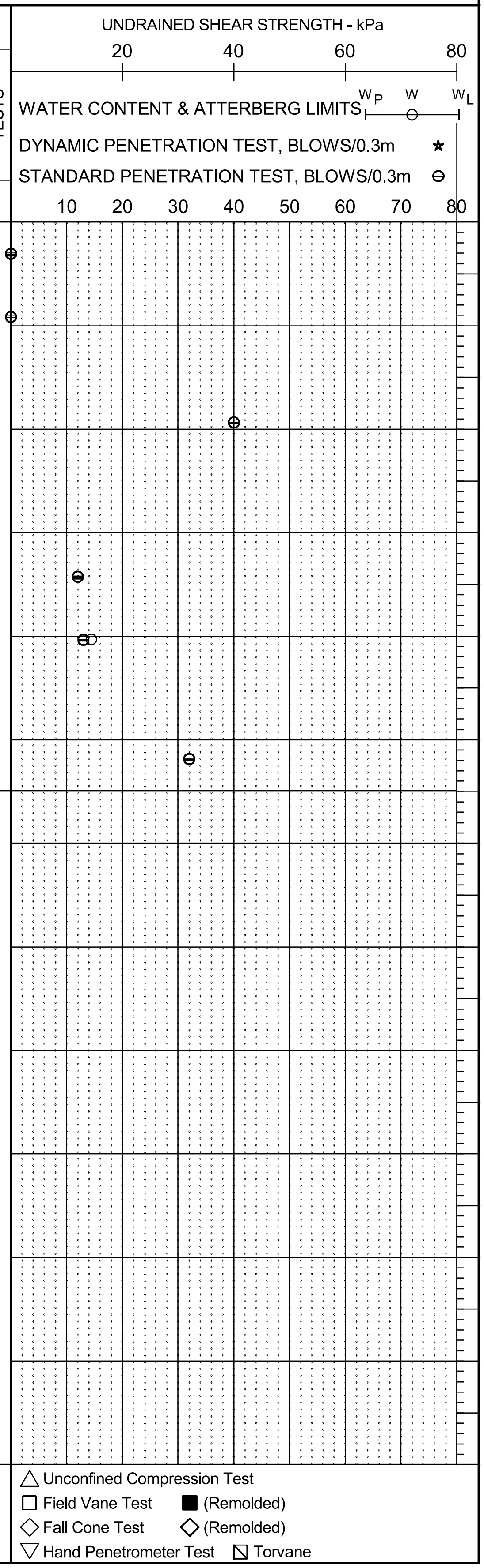
△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ⧅ Torvane

Stantec BOREHOLE RECORD

BOREHOLE No. BH-15
PAGE 1 of 1

CLIENT	Port of Argentia
PROJECT	Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION	Cooper Cove, NL
DATES (mm-dd-yy): BORING	5-1-23
WATER LEVEL	N/A
PROJECT No.	121624742
DRILLING METHOD	Wash Bore
SIZE	HWT/HQ
DATUM	LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION	SAMPLES TYPE	NUMBER	RECOVERY OR TCR(%) (mm)	N-VALUE OR RQD (%)	OTHER TESTS
0	-13.20	Very loose, dark grey, sandy SILT (ML); occasional gravel, occasional organic smell: MARINE SEDIEMNT	SS	1	0	0	
			SS	2	150	0	
1.63	-14.83	Dense to very dense, grey, silty SAND with gravel (SM); occasional cobbles: TILL	SS	3	150	40	
			SS	4	150	141/350	
3.12	-16.32	Compact to dense, grey, well-graded SAND with silt (SW-SM); occasional gravel: TILL - below 3.12 m artesian conditions noted.	SS	5	425	12	
			SS	6	450	13	S
			SS	7	250	32	
5.49	-18.69	End of Borehole					



Stantec BOREHOLE RECORD

BOREHOLE No. BH-16
PAGE 1 of 1

CLIENT Port of Argentia
PROJECT Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION Cooper Cove, NL
DATES (mm-dd-yy): BORING 5-18-23 WATER LEVEL N/A

PROJECT No. 121624742
DRILLING METHOD Wash Bore
SIZE HWT/HQ
DATUM LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION	SAMPLE TYPE	NUMBER	RECOVERY OR TCR(%) (mm)	N-VALUE OR RQD (%)	OTHER TESTS
0	-5.44	Very loose to loose, dark grey to black, sandy SILT (ML); occasional gravel, occasional organic smell: MARINE SEDIMENT	SS	1	25	3	
			SS	2	200	7	
	-7.37	Compact to very dense, brown, well-graded SAND with silt and gravel (SW-SM); occasional cobbles: TILL	SS	3	0	28	
			SS	4	350	30	
			SS	5	75	48	
	-10.65		SS	6	225	55	
		End of Borehole					

UNDRAINED SHEAR STRENGTH - kPa: 20, 40, 60, 80
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ⊖
10 20 30 40 50 60 70 80

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ⊠ Torvane

Stantec BOREHOLE RECORD

BOREHOLE No. BH-17
PAGE 1 of 1

CLIENT Port of Argentia
PROJECT Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION Cooper Cove, NL
DATES (mm-dd-yy): BORING 5-3-23 WATER LEVEL N/A

PROJECT No. 121624742
DRILLING METHOD Wash Bore
SIZE HWT/HQ
DATUM LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY OR TCR(%) mm	N-VALUE OR RQD (%)	OTHER TESTS
0	-15.57	Very loose, dark grey, sandy SILT (ML); occasional gravel, occasional shells, occasional organic smell: MARINE SEDIMENT			SS	1	400	0	
	-16.18	Compact to very dense, grey, silty SAND with gravel (SM); occasional cobbles: TILL			SS	2	200	50	
					SS	3	400	20	
	-17.83	Very stiff to hard, grey to pink, sandy lean CLAY (CL); occasional gravel			SS	4	400	28	
					SS	5	450	118	
					SS	6	450	68	
	-20.75	Very dense, pinkish grey, silty SAND with gravel (SM), occasional cobbles: TILL			SS	7	150	74	S
	-21.36	End of Borehole							

UNDRAINED SHEAR STRENGTH - kPa: 20, 40, 60, 80

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ⊖

10 20 30 40 50 60 70 80

Depth scale: 0 1 2 3 4 5 6 7 8 9 10 11 12

>>

△ Unconfined Compression Test
☐ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ⊠ Torvane

Stantec

BOREHOLE RECORD

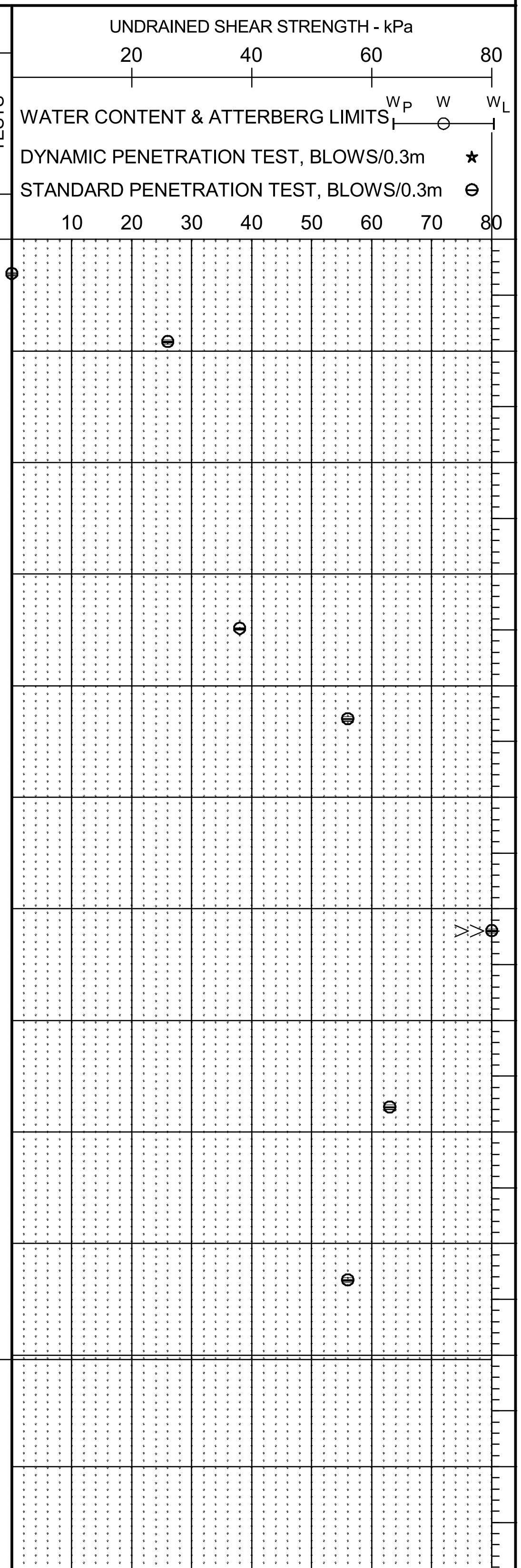
BOREHOLE No. BH-18
PAGE 1 of 1

CLIENT Port of Argentia
PROJECT Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION Cooper Cove, NL
DATES (mm-dd-yy): BORING 4-28-23 WATER LEVEL N/A

PROJECT No. 121624742
DRILLING METHOD Wash Bore
SIZE HWT/HQ
DATUM LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	TYPE	NUMBER	RECOVERY OR TCR(%)	N-VALUE OR RQD (%)	OTHER TESTS
							mm		
0	-15.15	Very loose to compact, dark grey, sandy SILT (ML); occasional gravel, occasional organic smell: MARINE SEDIMENT			SS	1	300	0	
	-16.06				SS	2	250	26	
		Comapct to very dense, grey, well-graded SAND with silt (SW-SM); occasional cobbles: TILL			SS	3	350	249/550	
	-18.33	Dense to very dense, pinkish grey to grey, well-graded SAND with silt and gravel (SW-SM); occasional cobbles: TILL			SS	4	50	38	
					SS	5	200	56	
					SS	6	100	240/525	
					SS	7	125	94	
					SS	8	100	63	
					SS	9	225	56	
					SS	10	100	200/400	
10	-25.19	End of Borehole							

Depth scale (m): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12



△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ⊠ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. BH-19
PAGE 1 of 1

CLIENT Port of Argentia
PROJECT Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION Cooper Cove, NL
DATES (mm-dd-yy): BORING 5-6-23 WATER LEVEL N/A

PROJECT No. 121624742
DRILLING METHOD Wash Bore
SIZE HWT/HQ
DATUM LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION	SAMPLES TYPE	NUMBER	RECOVERY OR TCR(%) (mm)	N-VALUE OR RQD (%)	OTHER TESTS	SPT (blows/0.3m)
0	-15.63	Very loose, dark grey, sandy SILT (ML); occasional gravel, occasional shells, occasional organic smell: MARINE SEDIMENT	SS	1	150	0		0
0.76	-16.39	Very dense, grey, silty GRAVEL with sand (GM): TILL	SS	2	300	52		52
1.75	-17.38	Very stiff to hard, grey, sandy lean CLAY (CL); occasional gravel	SS	3	250	24		24
			SS	4	175	122/250		
			BS	5	225	-		
3.28	-18.91	Compact to very dense, grey to pinkish grey, well-graded SAND with silt and gravel (SW-SM); with occasional lenses of SILT with sand (ML), occasional cobbles: TILL	SS	6	250	151/375		
			SS	7	150	39		39
			SS	8	250	42		42
			SS	9	225	27		27
			SS	10	250	57		57
10.36	-25.99	End of Borehole						

UNDRAINED SHEAR STRENGTH - kPa: 20 40 60 80

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ⊖

10 20 30 40 50 60 70 80

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ⊠ Torvane

BOREHOLE RECORD

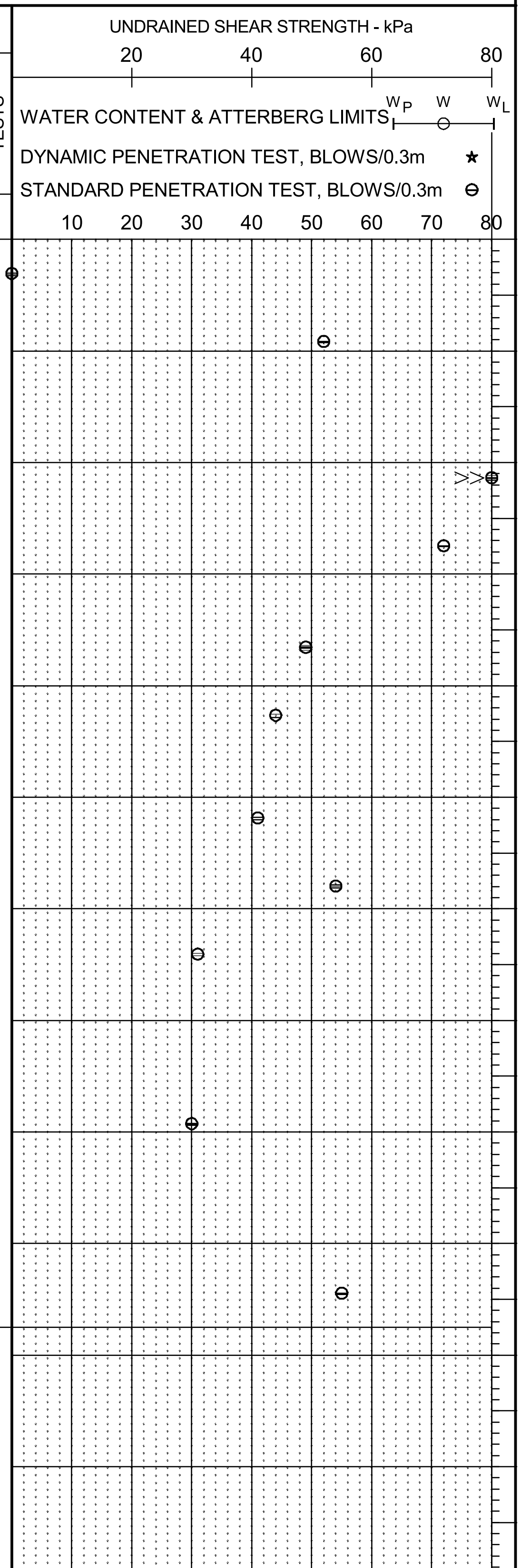
Stantec

BOREHOLE No. BH-20
PAGE 1 of 1

CLIENT Port of Argentia
PROJECT Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION Cooper Cove, NL
DATES (mm-dd-yy): BORING 4-30-23 WATER LEVEL N/A

PROJECT No. 121624742
DRILLING METHOD Wash Bore
SIZE HWT/HQ
DATUM LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY OR TCR(%) (mm)	N-VALUE OR RQD (%)	OTHER TESTS
0	-15.23	Very loose to dense, dark grey, sandy SILT (ML); occasional gravel, occasional organic smell: MARINE SEDIMENT			SS	1	125	0	
					SS	2	125	52	
1	-16.40	Dense to very dense, grey to pinkish grey, well-graded SAND with silt and gravel (SW-SM); occasional cobbles: TILL							
2					SS	3	350	89	
					SS	4	350	72	
3					SS	5	125	49	
4					SS	6	350	44	
5					SS	7	200	41	
6					SS	8	300	54	
					SS	9	150	31	
8					SS	10	300	30	
9	-24.98				SS	11	150	55	
10		End of Borehole							
11									
12									



△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ⊠ Torvane

BOREHOLE RECORD

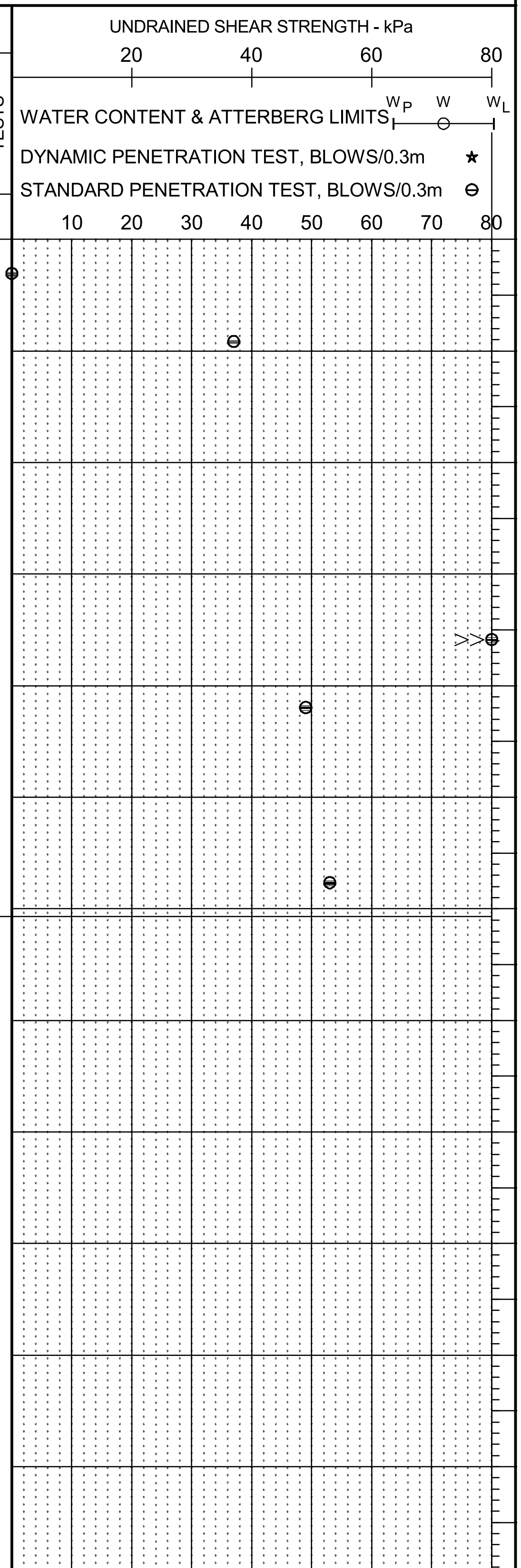
Stantec

BOREHOLE No. BH-21
PAGE 1 of 1

CLIENT Port of Argentia
PROJECT Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION Cooper Cove, NL
DATES (mm-dd-yy): BORING 4-27-23 WATER LEVEL N/A

PROJECT No. 121624742
DRILLING METHOD Wash Bore
SIZE HWT/HQ
DATUM LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY OR TCR(%) (mm)	N-VALUE OR RQD (%)	OTHER TESTS
0	-14.60	Very loose, dark grey, sandy SILT (ML); occasional gravel, occasional organic smell: MARINE SEDIMENT			SS	1	200	0	
0.76	-15.36	Dense to very dense, grey, well-graded SAND with silt and gravel (SW-SM); occasional to some cobbles: TILL			SS	2	200	37	
					SS	3	225	126/425	
					SS	4	100	82	
					SS	5	300	49	
					SS	6	225	53	
6.07	-20.67	End of Borehole							



△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ⧅ Torvane

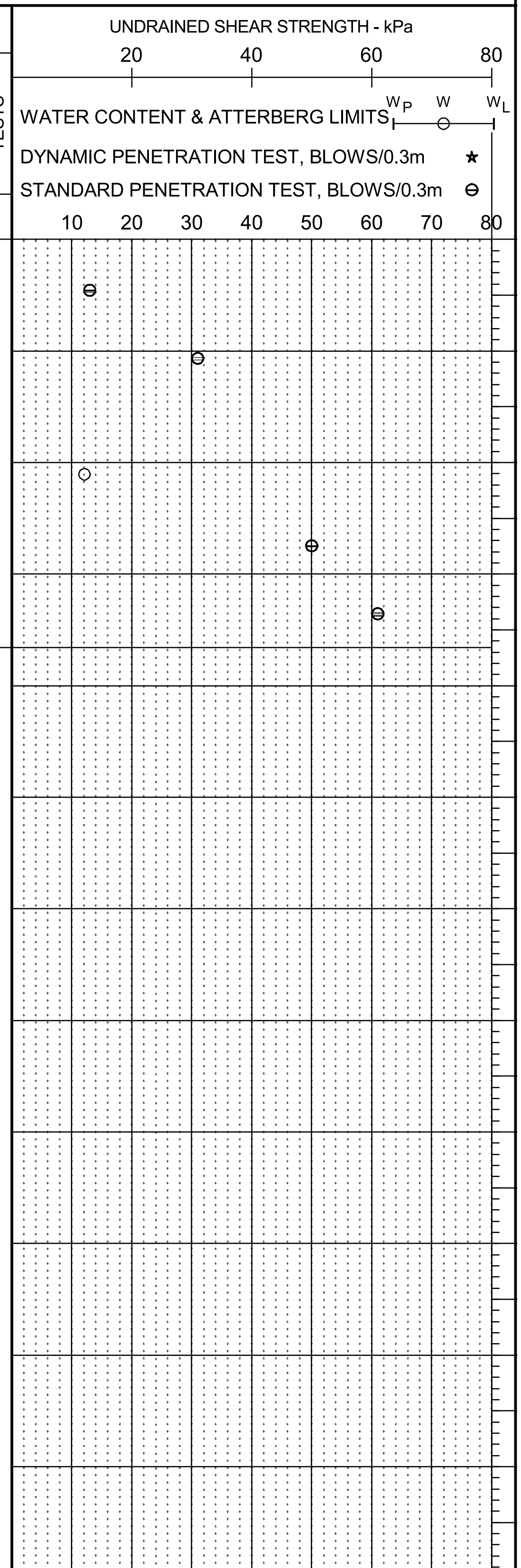
BOREHOLE RECORD

Stantec

BOREHOLE No. BH-22
PAGE 1 of 1
PROJECT No. 121624742
DRILLING METHOD Wash Bore
SIZE HWT/HQ
DATUM LNT

CLIENT Port of Argentia
PROJECT Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION Cooper Cove, NL
DATES (mm-dd-yy): BORING 4-20-23 WATER LEVEL N/A

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY OR TCR(%) (mm)	N-VALUE OR RQD (%)	OTHER TESTS
0	-14.99	Loose to compact, dark grey to black, sandy SILT (ML); occasional gravel, occasional shells, occasional organic smell: MARINE SEDIMENT			SS	1	175	13	
	-15.83	Dense to very dense, pinkish grey, well-graded SAND with silt and gravel (SP-SM); occasional cobbles: TILL - from 2.0 m to 2.3 m lense of SILT with sand (ML) encountered.			SS	2	300	31	
					SS	3	75	50/100	
					SS	4	0	82/225	
					BS	5	250	-	S
					SS	6	225	50	
	-18.65				SS	7	300	61	
		End of Borehole							



△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ⊠ Torvane

Stantec

BOREHOLE RECORD

BOREHOLE No. BH-23
PAGE 1 of 1

CLIENT Port of Argentia
PROJECT Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION Cooper Cove, NL
DATES (mm-dd-yy): BORING 5-1-23 WATER LEVEL N/A

PROJECT No. 121624742
DRILLING METHOD Wash Bore
SIZE HWT/HQ
DATUM LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY OR TCR(%) (mm)	N-VALUE OR RQD (%)	OTHER TESTS
0	-11.42	Very loose to loose, dark grey, sandy SILT (ML); occasional gravel, occasional organic smell: MARINE SEDIMENT			SS	1	100	0	
					SS	2	350	13	
0.91	-12.33	Compact to very dense, grey to pinkish grey, well-graded SAND with silt and gravel (SW-SM); occasional cobbles: TILL			SS	3	225	90	
					SS	4	400	62	
					SS	5	400	78	
					SS	6	400	97	S
					SS	7	225	74	
5.49	-16.91	End of Borehole							

UNDRAINED SHEAR STRENGTH - kPa: 20, 40, 60, 80

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ⊖

10 20 30 40 50 60 70 80

>>

>>

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ⊠ Torvane

Stantec

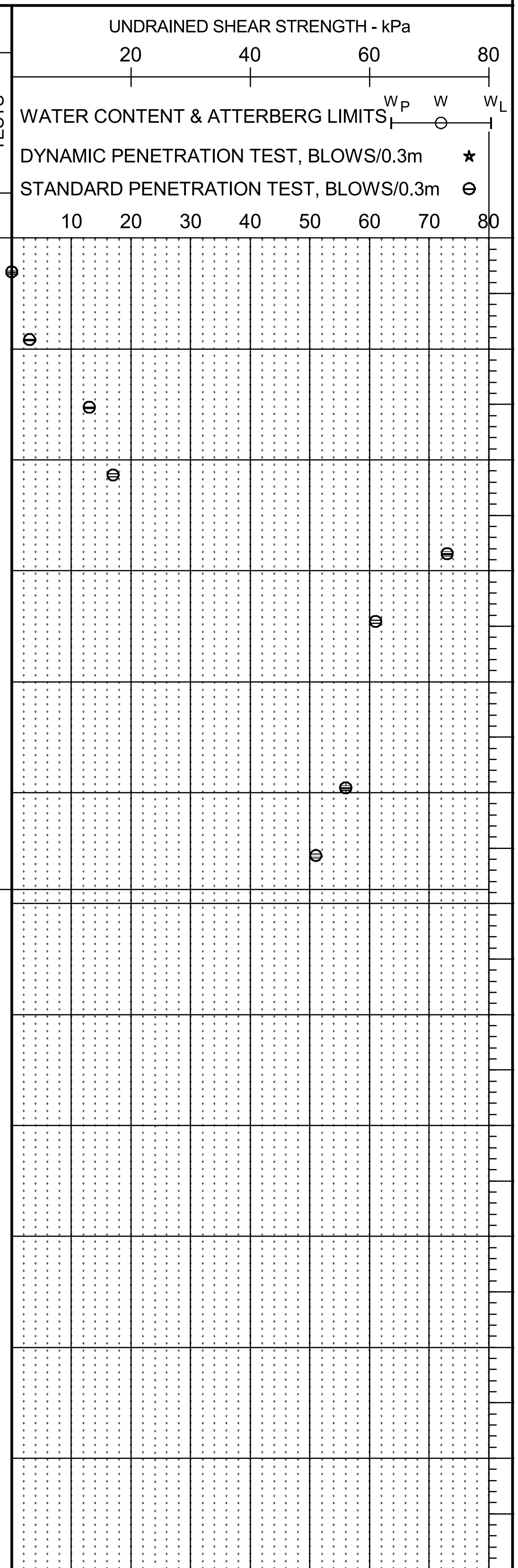
BOREHOLE RECORD

BOREHOLE No. BH-24
PAGE 1 of 1

CLIENT Port of Argentia
PROJECT Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION Cooper Cove, NL
DATES (mm-dd-yy): BORING 5-18-23 WATER LEVEL N/A

PROJECT No. 121624742
DRILLING METHOD Wash Bore
SIZE HWT/HQ
DATUM LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY OR TCR(%) mm	N-VALUE OR RQD (%)	OTHER TESTS
0	-9.08	Very loose, dark grey to black, sandy SILT (ML); occasional gravel, occasional organic smell: MARINE SEDIMENT			SS	1	75	0	
					SS	2	225	3	
1.22	-10.30	Compact, grey, well-graded SAND with silt (SW-SM); occasional cobbles: TILL			SS	3	75	13	
					SS	4	325	17	
2.69	-11.77	Very dense, pinkish grey, well-graded SAND with silt and gravel (SW-SM); occasional cobbles: TILL			SS	5	325	73	
					SS	6	150	61	
					SS	7	150	56	
					SS	8	100	51	
5.87	-14.95	End of Borehole							



△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ⊠ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. BH-25
PAGE 1 of 1

CLIENT Port of Argentia
PROJECT Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION Cooper Cove, NL
DATES (mm-dd-yy): BORING 4-22-23 WATER LEVEL N/A

PROJECT No. 121624742
DRILLING METHOD Wash Bore
SIZE HWT/HQ
DATUM LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION	SAMPLES TYPE	NUMBER	RECOVERY OR TCR(%) (mm)	N-VALUE OR RQD (%)	OTHER TESTS
0	-13.06	Very loose to compact, dark grey, sandy SILT (ML); occasional gravel, occasional shells, occasional organic smell: MARINE SEDIMENT	SS	1	50	0	
1	-14.03	Dense to very dense, grey to pinkish grey to grey, well-graded SAND with silt and gravel (SW-SM); occasional cobbles: TILL	SS	2	300	38	
			SS	3	200	74	
			SS	4	300	105	
		- below 3.76 m artesian conditions noted.					
			SS	5	200	51	
			SS	6	50	67/125	
			SS	7	150	42	
9.52	-22.58		SS	8	75	77/225	
		End of Borehole					

UNDRAINED SHEAR STRENGTH - kPa: 20, 40, 60, 80

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ⊖

10 20 30 40 50 60 70 80

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ⊠ Torvane

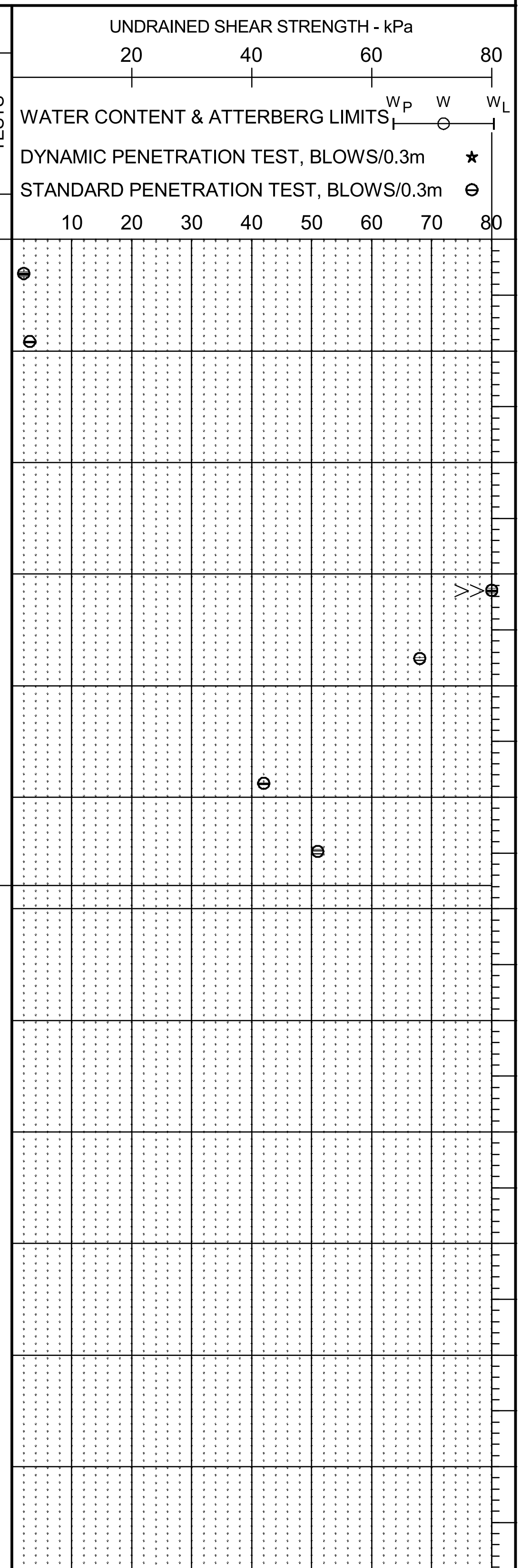
BOREHOLE RECORD

Stantec

BOREHOLE No. BH-26
PAGE 1 of 1
PROJECT No. 121624742
DRILLING METHOD Wash Bore
SIZE HWT/HQ
DATUM LNT

CLIENT Port of Argentia
PROJECT Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION Cooper Cove, NL
DATES (mm-dd-yy): BORING 4-29-23 WATER LEVEL N/A

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY OR TCR(%) (mm)	N-VALUE OR RQD (%)	OTHER TESTS
0	-11.65	Very loose, dark grey, sandy SILT (ML); occasional gravel, occasional shells, occasional organic smell: MARINE SEDIMENT			SS	1	225	2	
					SS	2	275	3	
1.12	-12.77	Dense to very dense, brown to pinkish grey to grey, silty SAND with gravel (SM) to silty GRAVEL with sand (GM); occasional cobbles: TILL			SS	3	150	140/525	
					SS	4	275	84	
					SS	5	475	68	
					SS	6	275	42	
					SS	7	450	51	
5.79	-17.44	End of Borehole							



△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ⊠ Torvane

BOREHOLE RECORD

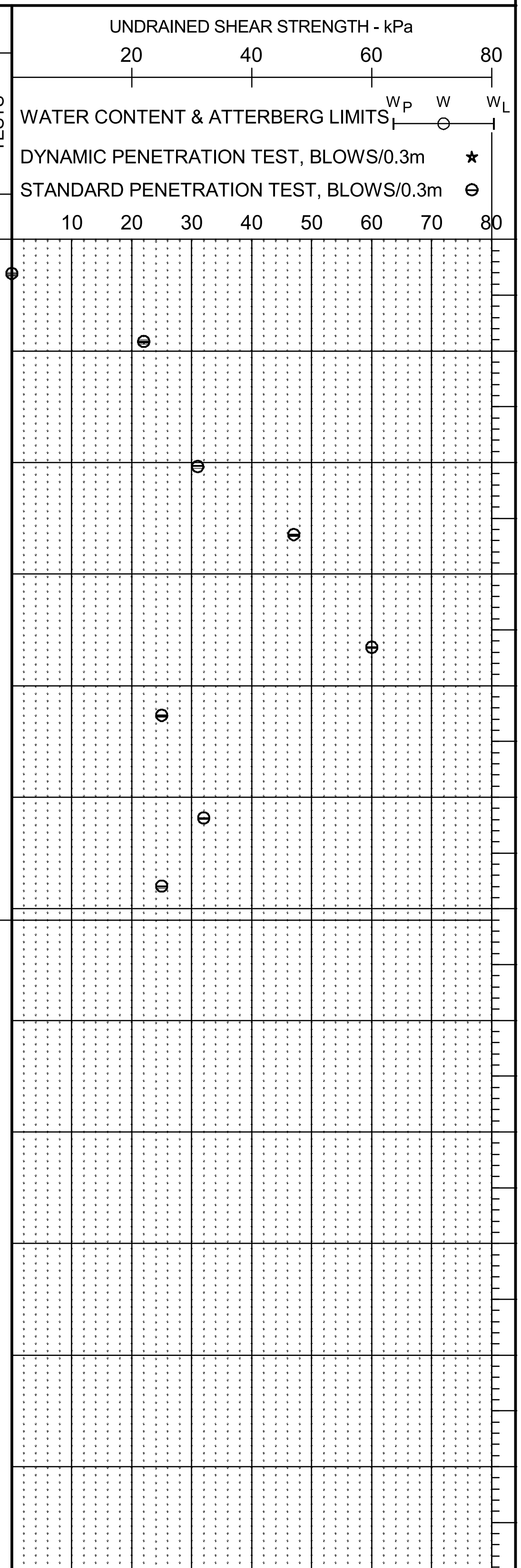
Stantec

BOREHOLE No. BH-27
PAGE 1 of 1

CLIENT: Port of Argentia
PROJECT: Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION: Cooper Cove, NL
DATES (mm-dd-yy): BORING 5-19-23 WATER LEVEL N/A

PROJECT No. 121624742
DRILLING METHOD Wash Bore
SIZE HWT/HQ
DATUM LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	TYPE	NUMBER	RECOVERY OR TCR(%) (mm)	N-VALUE OR RQD (%)	OTHER TESTS
0	-7.50	Very loose to compact, dark grey to black, sandy SILT (ML); occasional gravel, occasional organic smell: MARINE SEDIMENT			SS	1	150	0	
	-8.41	Compact to very dense, pinkish grey to grey, well-graded SAND with silt and gravel (SW-SM); occasional cobbles: TILL			SS	2	200	22	
					SS	3	100	31	
					SS	4	150	47	
					SS	5	200	60	
					SS	6	100	25	
					SS	7	200	32	
					SS	8	100	25	
6	-13.60	End of Borehole							



△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ⧄ Torvane

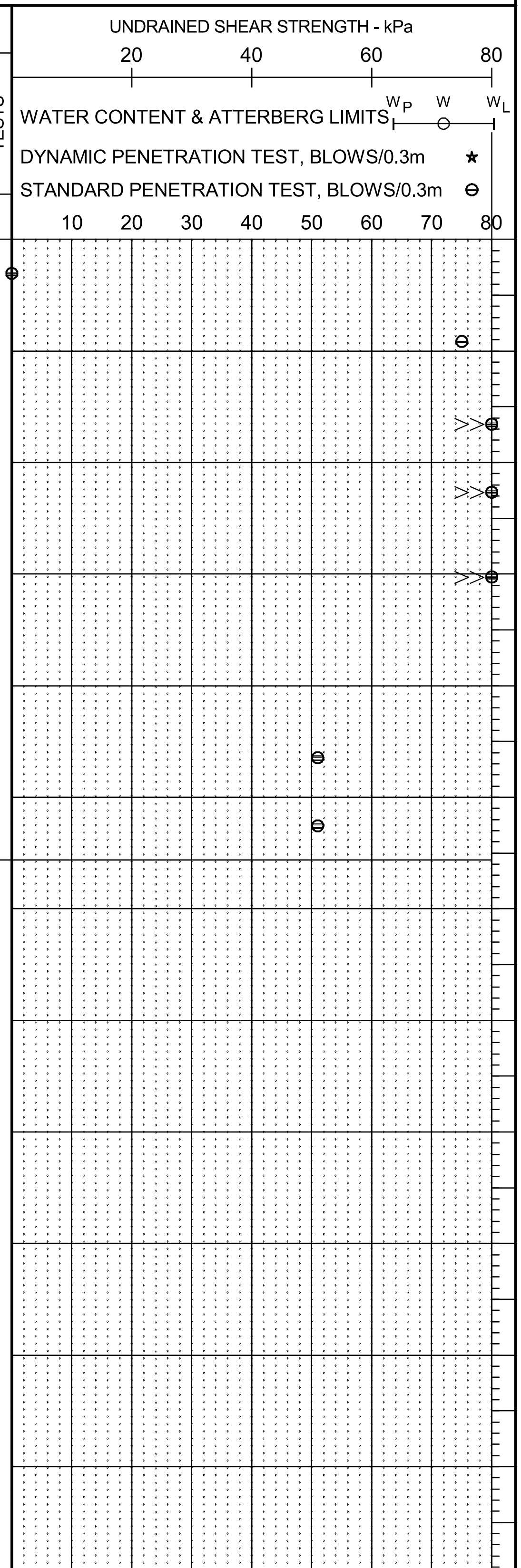
Stantec

BOREHOLE RECORD

BOREHOLE No. BH-28
PAGE 1 of 1

CLIENT: Port of Argentia
PROJECT: Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION: Cooper Cove, NL
DATES (mm-dd-yy): BORING 4-27-23 WATER LEVEL N/A
PROJECT No. 121624742
DRILLING METHOD Wash Bore
SIZE HWT/HQ
DATUM LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES: TYPE	NUMBER	RECOVERY OR TCR(%) (mm)	N-VALUE OR RQD (%)	OTHER TESTS
0	-12.74	Very loose, dark grey, sandy SILT (ML); occasional gravel, occasional organic smell: MARINE SEDIMENT			SS	1	50	0	
	-13.35	Very dense, pinkish grey, silty SAND with gravel (SM) to well-graded SAND with silt and gravel (SW-SM); occasional cobbles: TILL			SS	2	350	75	
					SS	3	200	107	
					SS	4	125	111	
					SS	5	125	91	
					SS	6	175	129/275	
					SS	7	175	51	
					SS	8	175	51	
	-18.30	End of Borehole							



△ Unconfined Compression Test
☐ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ☒ Torvane

Stantec

BOREHOLE RECORD

BOREHOLE No. BH-29
PAGE 1 of 1

CLIENT Port of Argentia
PROJECT Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION Cooper Cove, NL
DATES (mm-dd-yy): BORING 4-26-23 WATER LEVEL N/A

PROJECT No. 121624742
DRILLING METHOD Wash Bore
SIZE HWT/HQ
DATUM LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION	SAMPLES TYPE	NUMBER	RECOVERY OR TCR(%) (mm)	N-VALUE OR RQD (%)	OTHER TESTS
0	-12.67	Very loose, grey, sandy SILT (ML); occasional gravel, occasional shells, occasional organic smell: MARINE SEDIMENT	SS	1	225	0	
	-13.30	Dense to very dense, pinkish grey to grey, silty SAND with gravel (SM); occasional sandy SILT (ML) lenses, occasional cobbles: TILL	SS	2	300	39	
			SS	3	225	173/375	
			SS	4	275	175/275	
	-17.17	Hard, pink, sandy SILT (ML); occasional gravel: TILL	SS	5	350	41	S
			SS	6	100	66	
	-18.39	End of Borehole					

UNDRAINED SHEAR STRENGTH - kPa: 20 40 60 80

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ⊖

10 20 30 40 50 60 70 80

Depth scale: 0 1 2 3 4 5 6 7 8 9 10 11 12

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ⊠ Torvane

Stantec

BOREHOLE RECORD

BOREHOLE No. BH-30
PAGE 1 of 1

CLIENT Port of Argentia
PROJECT Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION Cooper Cove, NL
DATES (mm-dd-yy): BORING 4-25-23 WATER LEVEL N/A

PROJECT No. 121624742
DRILLING METHOD Wash Bore
SIZE HWT/HQ
DATUM LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY OR TCR(%) mm	N-VALUE OR RQD (%)	OTHER TESTS	SPT, BLOWS/0.3m
0	-12.11	Very loose to loose, dark grey, sandy SILT (ML); occasional gravel, occasional shells, occasional organic smell: MARINE SEDIMENT			SS	1	50	0		0
					SS	2	225	6		6
1.22	-13.33	Dense to very dense, grey, well-graded SAND with silt (SW-SM): TILL - below 1.83 m artesian conditions noted.			SS	3	100	66		66
					SS	4	450	47		47
2.97	-15.08	Dense to very dense, grey to pinkish grey, well-graded SAND with silt and gravel (SW-SM); occasional cobbles: TILL			SS	5	175	83		>>80
					SS	6	450	89		>>80
					SS	7	300	88		>>80
					SS	8	325	53		53
					SS	9	125	55		55
5.79	-17.90	End of Borehole								

UNDRAINED SHEAR STRENGTH - kPa: 20, 40, 60, 80

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ⊖

10 20 30 40 50 60 70 80

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ⊠ Torvane

Stantec

BOREHOLE RECORD

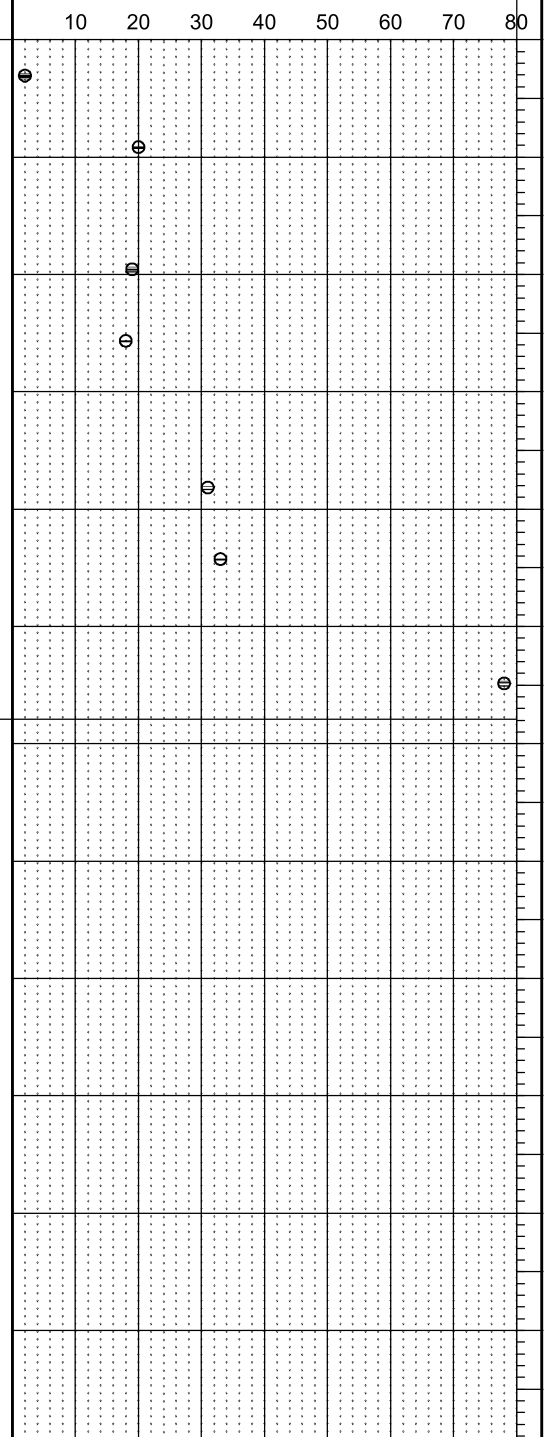
BOREHOLE No. BH-31
PAGE 1 of 1

CLIENT Port of Argentia
PROJECT Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION Cooper Cove, NL
DATES (mm-dd-yy): BORING 5-20-23 WATER LEVEL N/A

PROJECT No. 121624742
DRILLING METHOD Wash Bore
SIZE HWT/HQ
DATUM LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY OR TCR(%) (mm)	N-VALUE OR RQD (%)	OTHER TESTS
0	-6.46	Very loose to compact, dark grey to black, sandy SILT (ML); occasional gravel, occasional organic smell: MARINE SEDIMENT			SS	1	50	2	
	-7.37				SS	2	275	20	
		Compact to very dense, grey, well-graded SAND with silt and gravel (SW-SM); occasional cobbles: TILL - below 1.83 m artesian conditions noted.			SS	3	175	19	
					SS	4	250	18	
					SS	5	250	31	
					SS	6	200	33	
	-12.25				SS	7	150	78	
		End of Borehole							

UNDRAINED SHEAR STRENGTH - kPa: 20, 40, 60, 80
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ⊖



△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ⊠ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. BH-32
PAGE 1 of 1

CLIENT: Port of Argentia
PROJECT: Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION: Cooper Cove, NL
DATES (mm-dd-yy): BORING 4-23-23 WATER LEVEL N/A

PROJECT No. 121624742
DRILLING METHOD Wash Bore
SIZE HWT/HQ
DATUM LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION	SAMPLES: TYPE	NUMBER	RECOVERY OR TCR(%) (mm)	N-VALUE OR RQD (%)	OTHER TESTS
0	-12.17	Very loose, grey, sandy SILT (ML); occasional gravel, occasional shells, occasional organic smell: MARINE SEDIMENT	SS	1	300	0	
			SS	2	275	0	
	-13.80	Loose to compact, grey, well-graded SAND with silt and gravel (SW-SM): TILL	SS	3	200	4	
			SS	4	350	24	
	-15.24	Very dense, pinkish grey to grey, silty SAND with gravel (SM); occasional cobbles: TILL	SS	5	225	117/550	
			SS	6	50	97/225	
			SS	7	150	81	
6	-18.16		SS	8	300	74	
		End of Borehole					

UNDRAINED SHEAR STRENGTH - kPa: 20, 40, 60, 80

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ⊖

10 20 30 40 50 60 70 80

>>

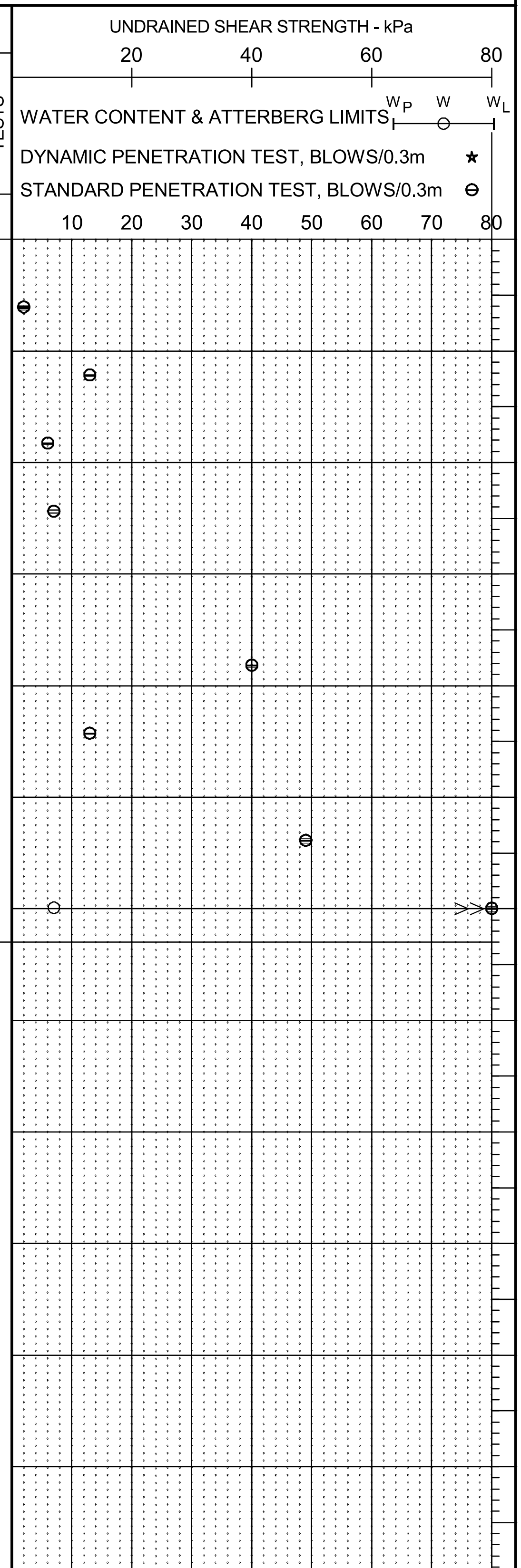
△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ⊠ Torvane

BOREHOLE RECORD

Stantec

CLIENT	Port of Argentia
PROJECT	Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION	Cooper Cove, NL
DATES (mm-dd-yy): BORING	4-24-23
WATER LEVEL	N/A
BOREHOLE No.	BH-33
PAGE	1 of 1
PROJECT No.	121624742
DRILLING METHOD	Wash Bore
SIZE	HWT/HQ
DATUM	LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION	SAMPLE TYPE	NUMBER	RECOVERY OR TCR(%) (mm)	N-VALUE OR RQD (%)	OTHER TESTS
0	-7.80	Very loose, dark grey, sandy SILT (ML); occasional gravel, occasional shells, occasional organic smell: MARINE SEDIMENT	SS	1	125	2	
0.91	-8.71	Loose to dense, grey, well-graded SAND with silt and gravel (SW-SM): TILL - below 1.83 m artesian conditions noted.	SS	2	0	13	
			SS	3	75	6	
			SS	4	300	7	
			SS	5	225	40	
			SS	6	300	13	
			SS	7	325	49	
5.69	-13.49	Very dense, pinkish grey to grey, poorly-graded GRAVEL with silt and sand (GP-GM); occasional cobbles: TILL	SS	8	400	89	S
6.30	-14.10	End of Borehole					



△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ⊠ Torvane

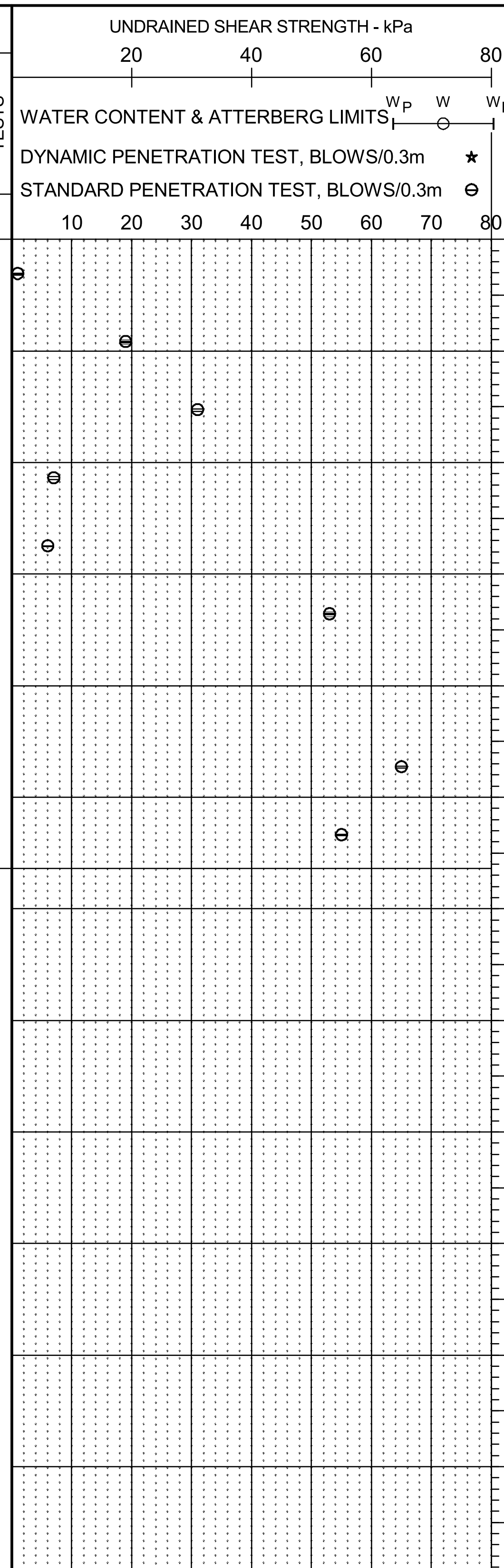
BOREHOLE RECORD

Stantec

BOREHOLE No. BH-34
PAGE 1 of 1

CLIENT: Port of Argentia
PROJECT: Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION: Cooper Cove, NL
DATES (mm-dd-yy): BORING 5-22-23 WATER LEVEL N/A
PROJECT No. 121624742
DRILLING METHOD Wash Bore
SIZE HWT/HQ
DATUM LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY OR TCR(%) mm	N-VALUE OR RQD (%)	OTHER TESTS
0	-5.81	Very loose to loose, dark grey to black, sandy SILT (ML); occasional gravel, occasional organic smell: MARINE SEDIMENT			SS	1	125	1	
	-6.57	Loose to compact, grey, well-graded SAND with silt (SW-SM); occasional gravel: TILL - below 1.52 m artesian conditions noted.			SS	2	175	19	
					SS	3	150	31	
					SS	4	175	7	
					SS	5	100	6	
	-8.86	Very dense, grey to pinkish grey, silty SAND with gravel (SM); occasional cobbles: TILL			SS	6	150	53	
					~~SS~~	~~7~~	~~0~~	~~50/100~~	
					SS	8	150	65	
					SS	9	100	55	
	-11.45	End of Borehole							



△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ⊠ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. BH-35
PAGE 1 of 1

CLIENT: Port of Argentia
PROJECT: Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION: Cooper Cove, NL
DATES (mm-dd-yy): BORING 5-21-23 WATER LEVEL N/A

PROJECT No. 121624742
DRILLING METHOD Wash Bore
SIZE HWT/HQ
DATUM LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION	SAMPLE TYPE	NUMBER	RECOVERY OR TCR(%) (mm)	N-VALUE OR RQD (%)	OTHER TESTS
0	-4.50	Very loose to loose, dark grey to black, sandy SILT (ML); occasional gravel, occasional organic smell: MARINE SEDIMENT	SS	1	75	0	
0.76	-5.26	Compact, grey, well-graded SAND with silt (SW-SM): TILL - below 2.13 m artesian conditions noted.	SS	2	125	15	
			SS	3	150	17	
			SS	4	100	14	
			SS	5	125	14	
			SS	6	75	12	
3.81	-8.31	Very dense, grey to pinkish grey, silty SAND with gravel (SM); occasional cobbles: TILL	SS	7	250	91	
			SS	8	375	67	
			SS	9	25	130/225	
5.67	-10.17	End of Borehole					

UNDRAINED SHEAR STRENGTH - kPa (20, 40, 60, 80)

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ⊖ (10, 20, 30, 40, 50, 60, 70, 80)

>>

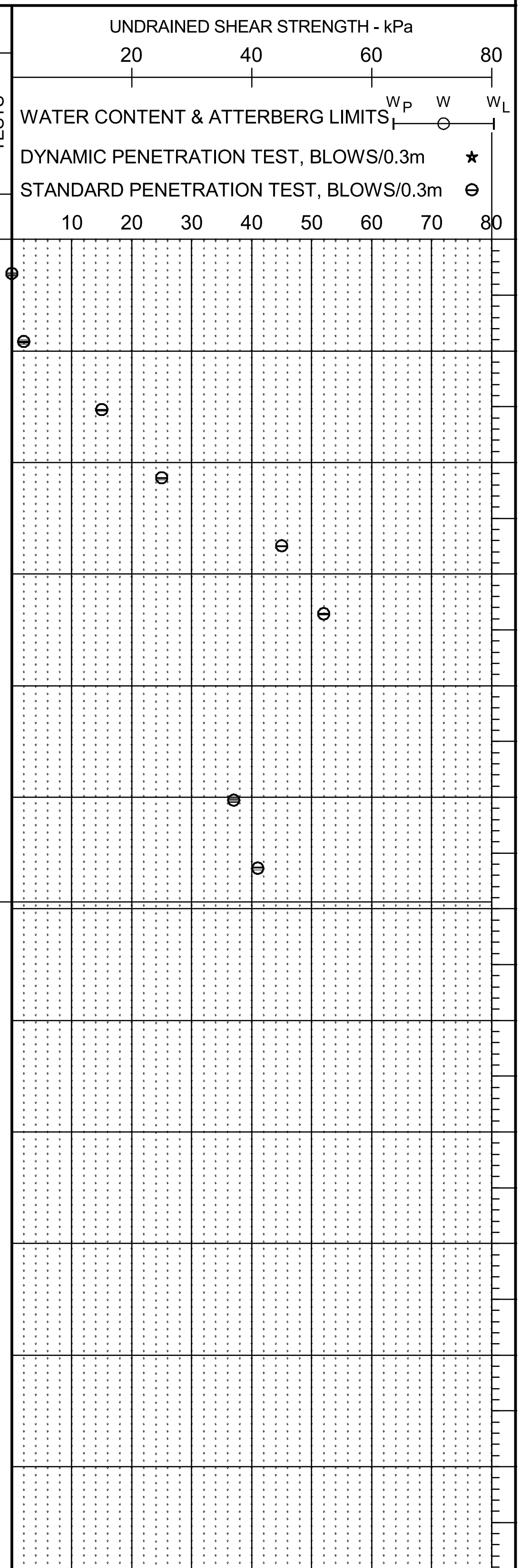
△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ⊠ Torvane

BOREHOLE RECORD

Stantec

CLIENT	Port of Argentia
PROJECT	Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION	Cooper Cove, NL
DATES (mm-dd-yy): BORING	5-22-23
WATER LEVEL	N/A
BOREHOLE No.	BH-36
PAGE	1 of 1
PROJECT No.	121624742
DRILLING METHOD	Wash Bore
SIZE	HWT/HQ
DATUM	LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY OR TCR(%) (mm)	N-VALUE OR RQD (%)	OTHER TESTS
0	-8.01	Very loose, dark grey to black, sandy SILT (ML); occasional gravel, occasional shells, occasional organic smell: MARINE SEDIMENT			SS	1	75	0	
					SS	2	125	2	
1.37	-9.38	Compact, grey, well-graded SAND with silt and gravel (SW-SM): TILL - below 1.67 m artesian conditions noted.			SS	3	150	15	
					SS	4	100	25	
2.74	-10.75	Dense to very dense, grey to pinkish grey, silty SAND with gravel (SM); occasional cobbles: TILL			SS	5	125	45	
					SS	6	75	52	
					SS	7	100	111/400	
					SS	8	175	37	
					SS	9	300	41	
5.94	-13.95	End of Borehole							



△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ⊠ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. BH-37
PAGE 1 of 1
PROJECT No. 121624742
DRILLING METHOD Wash Bore
SIZE HWT/HQ
DATUM LNT

CLIENT Port of Argentia
PROJECT Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION Cooper Cove, NL
DATES (mm-dd-yy): BORING 5-24-23 WATER LEVEL N/A

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY OR TCR(%) mm	N-VALUE OR RQD (%)	OTHER TESTS
0	-15.54	Loose, dark grey, sandy SILT (ML); occasional gravel, occasional organic smell: MARINE SEDIMENT			SS	1	150	6	
	-16.38				SS	2	450	66	
		Very dense, pinkish grey to grey, silty SAND with gravel (SM) to well-graded SAND with silt and gravel (SW-SM); occasional cobbles: TILL			SS	3	300	105	
					SS	4	300	106	
					SS	5	50	122/200	
					SS	6	225	85	
	-20.95				SS	7	400	88	
		End of Borehole							

UNDRAINED SHEAR STRENGTH - kPa: 20, 40, 60, 80

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ⊖

10 20 30 40 50 60 70 80

Depth axis: 0 1 2 3 4 5 6 7 8 9 10 11 12

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ⊠ Torvane

Stantec BOREHOLE RECORD

BOREHOLE No. **BH-38**
PAGE **1** of **1**

CLIENT **Port of Argentia**
PROJECT **Marine Geotechnical Investigation - Cooper Cove Wharf**
LOCATION **Cooper Cove, NL**
DATES (mm-dd-yy): BORING **5-25-23** WATER LEVEL **N/A**
PROJECT No. **121624742**
DRILLING METHOD **Wash Bore**
SIZE **HWT/HQ**
DATUM **LNT**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	TYPE	NUMBER	RECOVERY OR TCR(%) (mm)	N-VALUE OR RQD (%)	OTHER TESTS
0	-15.21	Very loose to loose, dark grey, sandy SILT (ML); occasional gravel, occasional shells, occasional organic smell: MARINE SEDIMENT			SS	1	250	0	
	-15.97				SS	2	125	14	
		Compact to very dense, grey, well-graded SAND with silt (SW-SM); occasional gravel, occasional cobbles: TILL			SS	3	225	89	
					SS	4	475	29	
	-17.78	Firm, grey, sandy lean CLAY (CL) with occasional gravel - laboratory consolidation test performed at 3.35 m depth.			SS	5	75	4	
					ST	6	500	-	
					SV	7	-	-	
	-19.93	Very dense, grey to pinkish grey, silty SAND with gravel (SM); occasional cobbles: TILL			SS	8	125	77	
					SS	9	100	66	
	-21.15	End of Borehole							

UNDRAINED SHEAR STRENGTH - kPa: 20, 40, 60, 80
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ⊖
10 20 30 40 50 60 70 80

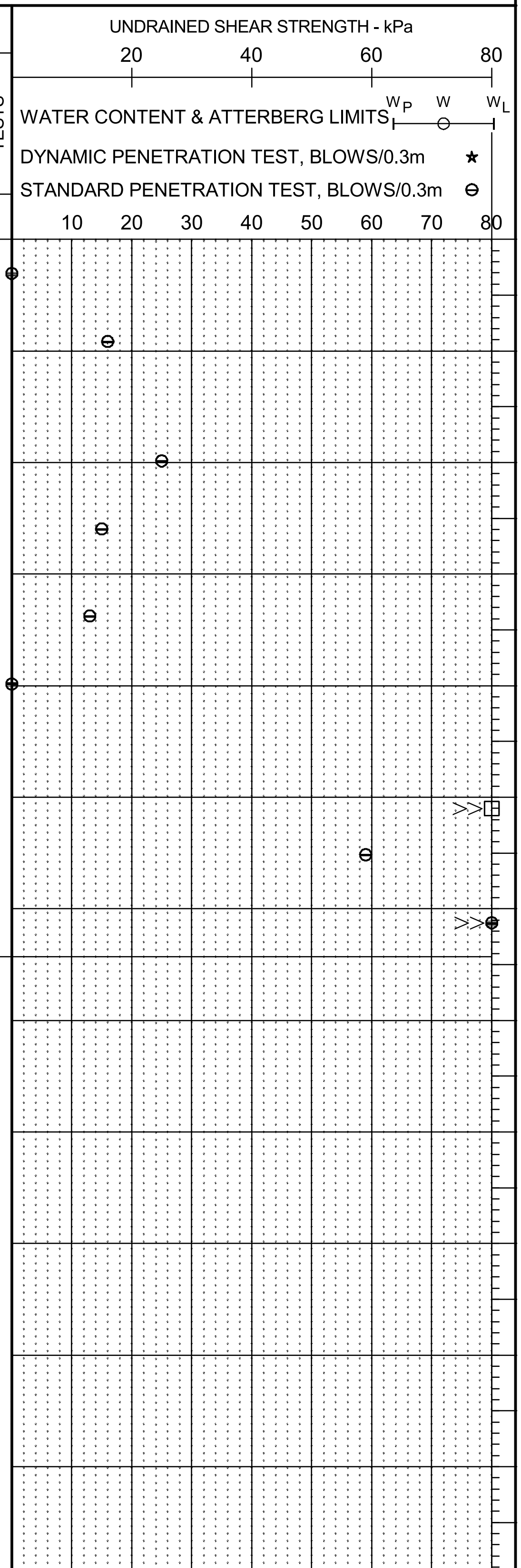
△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ⊠ Torvane

BOREHOLE RECORD

Stantec

CLIENT	Port of Argentia
PROJECT	Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION	Cooper Cove, NL
DATES (mm-dd-yy): BORING	5-26-23
WATER LEVEL	N/A
BOREHOLE No.	BH-39
PAGE	1 of 1
PROJECT No.	121624742
DRILLING METHOD	Wash Bore
SIZE	HWT/HQ
DATUM	LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION	SAMPLES TYPE	NUMBER	RECOVERY OR TCR(%) mm	N-VALUE OR RQD (%)	OTHER TESTS
0	-16.73	Very loose to loose, dark grey, sandy SILT (ML); occasional gravel, occasional organic smell: MARINE SEDIMENT	SS	1	150	0	
			SS	2	200	16	
	-17.64	Compact, grey, well-graded SAND with silt and gravel (SW-SM): TILL	SS	3	150	25	
			SS	4	150	15	
			SS	5	200	13	
	-20.29	Very soft to soft, grey, sandy lean CLAY (CL) with occasional gravel - laboratory consolidation test performed at 4.29 m depth.	SS	6	450	0	
			ST	7	600	-	
			SV	8	-	-	
	-21.99	Very dense, grey to pinkish grey, silty SAND with gravel (SM); occasional cobbles: TILL	SS	9	175	59	
			SS	10	100	89	
	-23.16	End of Borehole					



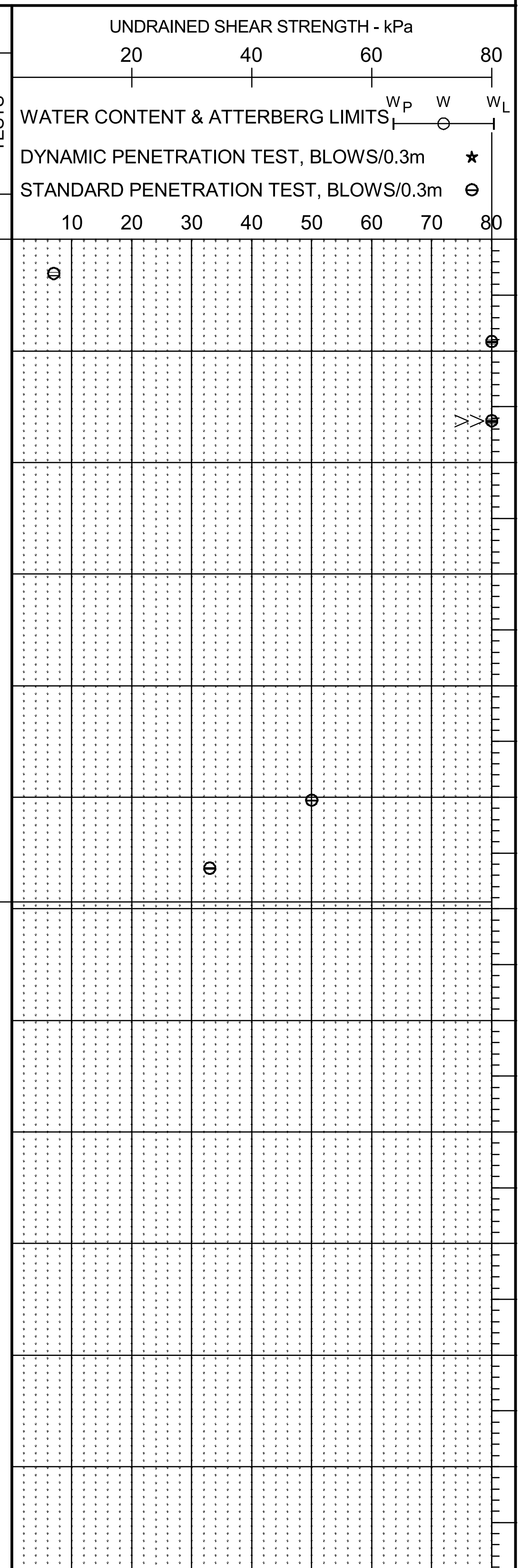
△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ⊠ Torvane

Stantec BOREHOLE RECORD

BOREHOLE No. BH-40
PAGE 1 of 1
PROJECT No. 121624742
DRILLING METHOD Wash Bore
SIZE HWT/HQ
DATUM LNT

CLIENT Port of Argentia
PROJECT Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION Cooper Cove, NL
DATES (mm-dd-yy): BORING 5-27-23 WATER LEVEL N/A

DEPTH (m)	ELEVATION (m)	DESCRIPTION	TYPE	NUMBER	RECOVERY OR TCR(%) (mm)	N-VALUE OR RQD (%)	OTHER TESTS
0	-13.02	Very loose to loose, dark grey, sandy SILT (ML); occasional gravel, occasional organic smell: MARINE SEDIMENT	SS	1	50	7	
	-13.93	Very dense, grey, well-graded SAND with silt and gravel (SW-SM); occasional cobbles: TILL	SS	2	250	80	
			SS	3	300	87	
			SS	4	125	70/125	
	-15.79	Dense to very dense, grey to pinkish grey, silty SAND with gravel (SM); occasional sandy SILT (ML) lenses, occasional cobbles: TILL - from 4.0 m to 4.3 m boulder noted.	SS	5	150	140/250	
			SS	6	150	162/175	
			SS	7	50	142/200	
			SS	8	250	50	
			SS	9	225	33	
6	-18.96	End of Borehole					

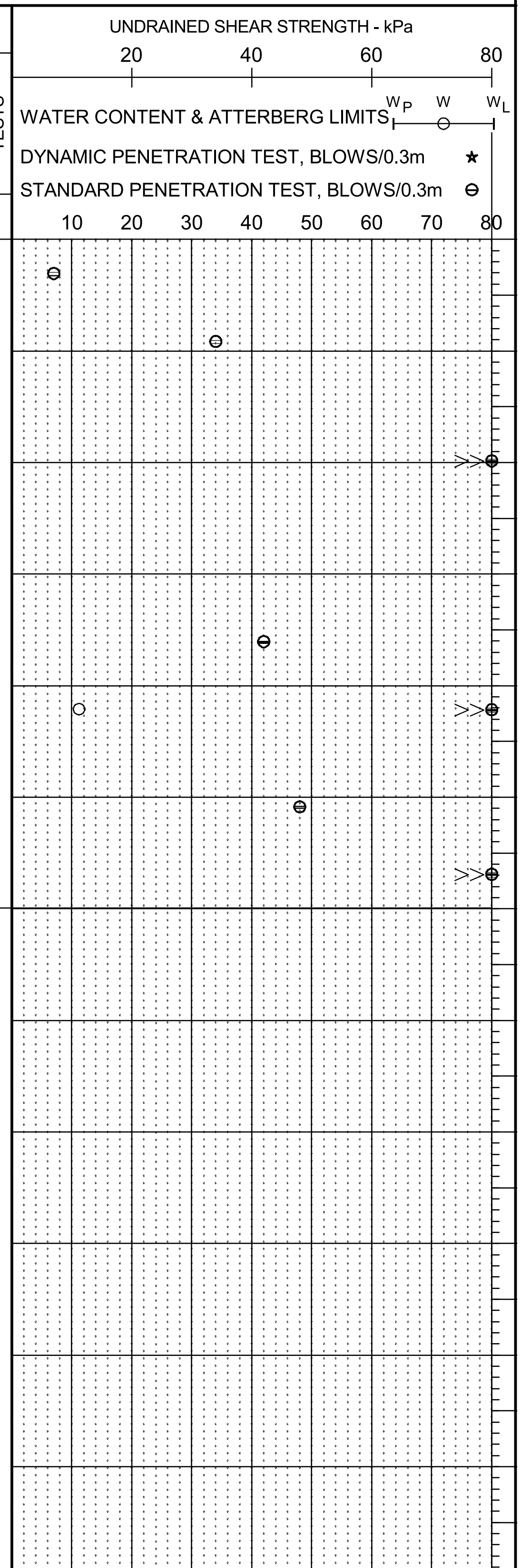


△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ⊠ Torvane

Stantec BOREHOLE RECORD

BOREHOLE No. BH-41
PAGE 1 of 1
CLIENT Port of Argentia
PROJECT Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION Cooper Cove, NL
DATES (mm-dd-yy): BORING 5-28-23 WATER LEVEL N/A
PROJECT No. 121624742
DRILLING METHOD Wash Bore
SIZE HWT/HQ
DATUM LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY OR TCR(%) mm	N-VALUE OR RQD (%)	OTHER TESTS
0	-12.61	Very loose to compact, dark grey, sandy SILT (ML); occasional gravel, occasional organic smell: MARINE SEDIMENT			SS	1	150	7	
0.76	-13.37	Compact to very dense, grey, well-graded SAND with silt and gravel (SW-SM); occasional cobbles: TILL			SS	2	125	34	
					SS	3	300	87	
					SS	4	100	139/275	
3.30	-15.91	Hard, greyish pink, sandy SILT (ML); occasional gravel: TILL			SS	5	150	42	
					SS	6	400	106	S
					SS	7	375	48	
5.33	-17.94	Very dense, grey to pinkish grey, silty SAND with gravel (SM); occasional cobbles: TILL			SS	8	350	132	
5.99	-18.60	End of Borehole							



△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ⊠ Torvane

STANTEC GEOTECHNICAL BOREHOLE 7/20/23 11:59:35 AM

BOREHOLE RECORD

Stantec

BOREHOLE No. BH-42
PAGE 1 of 1

CLIENT: Port of Argentia
PROJECT: Marine Geotechnical Investigation - Cooper Cove Wharf
LOCATION: Cooper Cove, NL
DATES (mm-dd-yy): BORING 5-29-23 WATER LEVEL N/A
PROJECT No. 121624742
DRILLING METHOD Wash Bore
SIZE HWT/HQ
DATUM LNT

DEPTH (m)	ELEVATION (m)	DESCRIPTION	TYPE	NUMBER	RECOVERY OR TCR(%) (mm)	N-VALUE OR RQD (%)	OTHER TESTS
0	-12.61	Very loose to loose, dark grey, sandy SILT (ML); occasional gravel, occasional organic smell: MARINE SEDIMENT	SS	1	175	0	
	-13.45		SS	2	500	31	
		Compact to very dense, pinkish grey to grey, silty GRAVEL with sand (GM); occasional sandy SILT (ML) lenses, occasional cobbles: TILL	SS	3	75	201/325	
			SS	4	75	137/225	
			SS	5	50	90/125	
			BS	6	600	-	S
	-17.18	Compact to very dense, grey, well-graded SAND with silt and gravel (SW-SM); occasional cobbles: TILL	SS	7	0	19	
	-18.35		SS	8	450	136	
		End of Borehole					

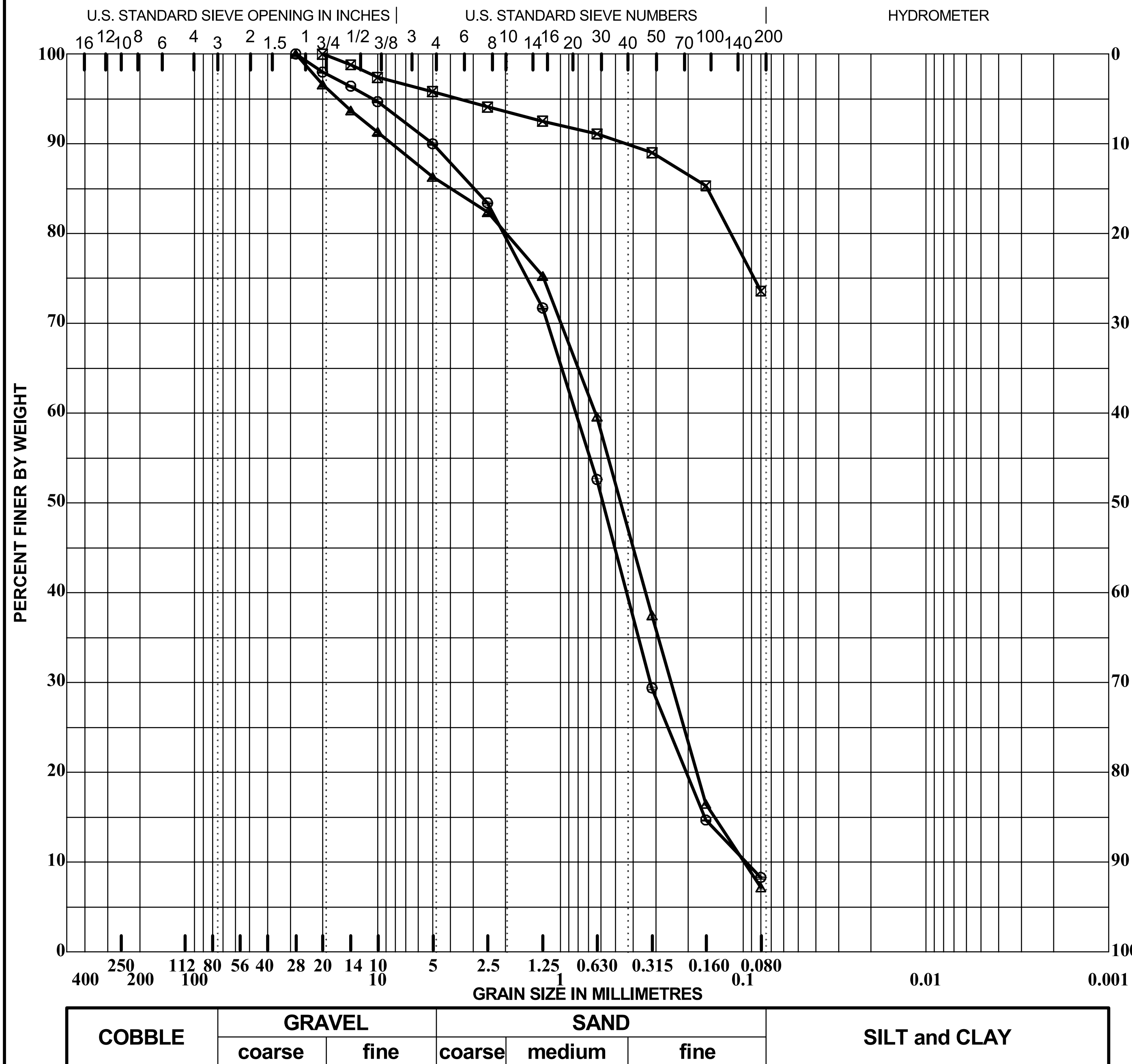
UNDRAINED SHEAR STRENGTH - kPa: 20, 40, 60, 80
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ⊖
10 20 30 40 50 60 70 80

>>

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◇ (Remolded)
▽ Hand Penetrometer Test ⊠ Torvane

APPENDIX D

Laboratory Test Results



	Sample	Depth (m)	Description	W%	W_L	W_P	I_P
⊖	BH-04 SS4	2.26	Well-graded SAND with silt (SP-SM)	6.3			
⊠	BH-12 SS4	2.61	SILT with sand (ML)	29.0			
△	BH-15 SS6	4.03	Well-graded SAND with silt (SW-SM)	14.5			

	Sample	Depth (m)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
⊖	BH-04 SS4	2.26	28.00	0.82	0.321	0.0962	10.0	81.7	8.3	
⊠	BH-12 SS4	2.61	20.00				4.2	22.2	73.6	
△	BH-15 SS6	4.03	28.00	0.64	0.247	0.0986	13.7	79.1	7.2	

REMARKS:

Stantec

Client: **Port of Argentia**

Project: **Marine Geotechnical Investigation - Cooper Cove Wharf**

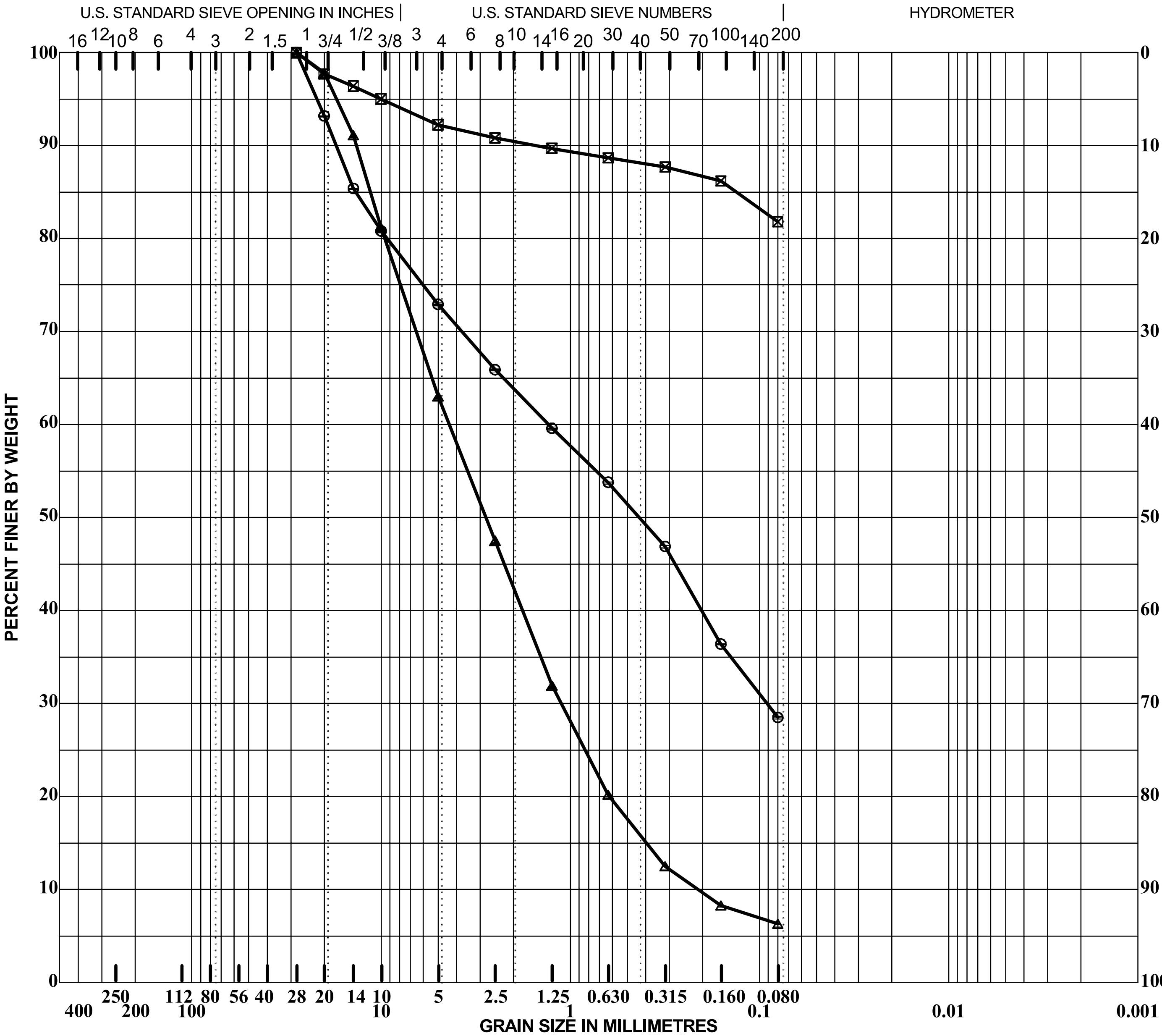
Project No.: **121624742**

Location: **Cooper Cove, NL**

FIGURE 1

GRADATION CURVES

STANTEC GRAIN SIZE 7/10/23 9:31:21 AM



COBBLE	GRAVEL		SAND			SILT and CLAY
	coarse	fine	coarse	medium	fine	

	Sample	Depth (m)	Description	W%	W_L	W_P	I_P
⊖	BH-17 SS7	5.48	SIlty SAND with gravel (SM)	10.6			
⊠	BH-22 SS5	2.11	SILT with sand (ML)	12.2			
△	BH-23 SS6	4.36	Well-graded SAND with silt and gravel (SW-SM)	8.0			

	Sample	Depth (m)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
⊖	BH-17 SS7	5.48	28.00	1.31	0.091		27.1	44.4	28.5	
⊠	BH-22 SS5	2.11	28.00				7.8	10.4	81.8	
△	BH-23 SS6	4.36	28.00	4.37	1.118	0.2105	37.0	56.7	6.3	

REMARKS:

Stantec

Client: **Port of Argentia**

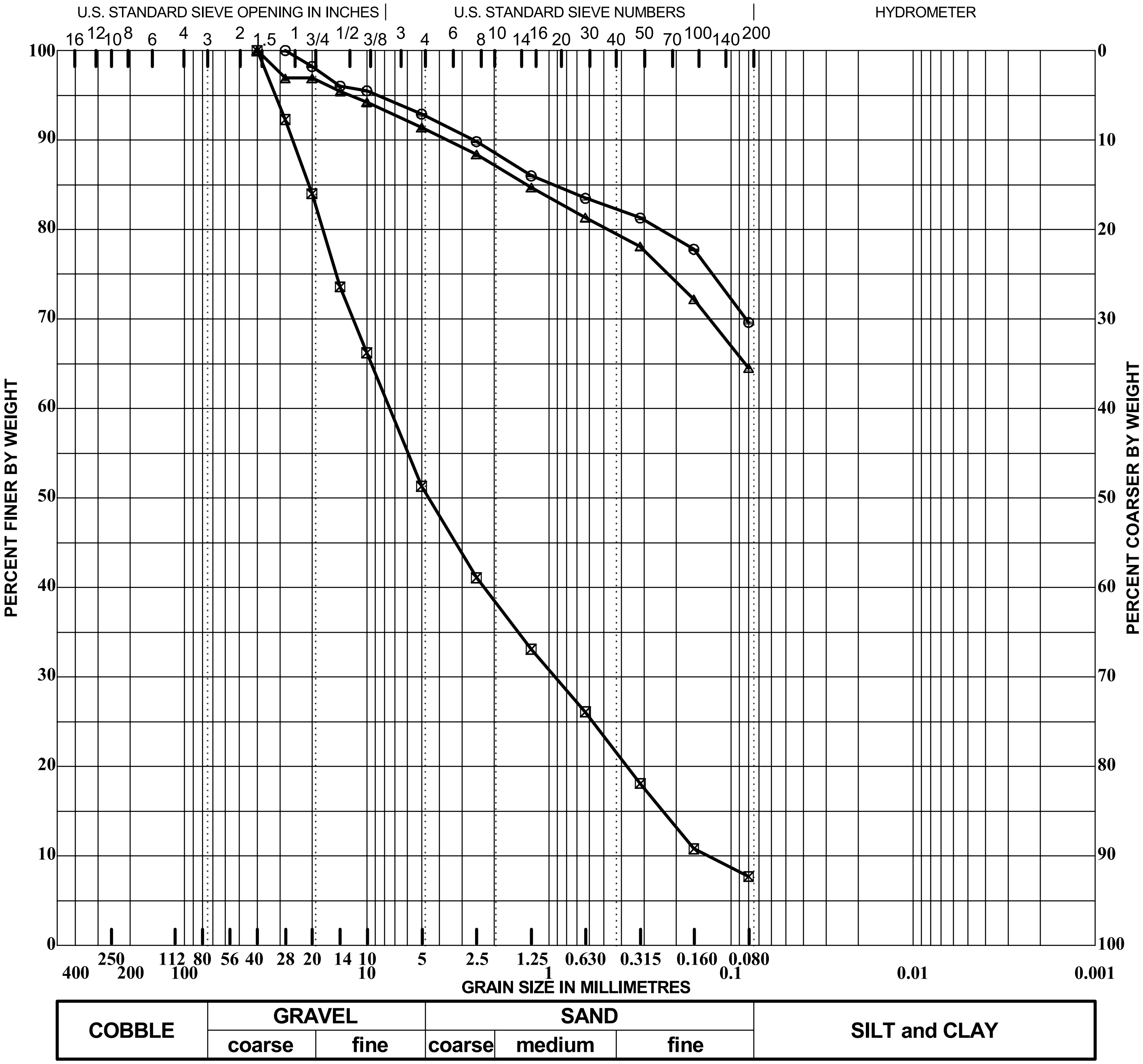
Project: **Marine Geotechnical Investigation - Cooper Cove Wharf**

Project No.: **121624742**

Location: **Cooper Cove, NL**

FIGURE 2

GRADATION CURVES



	Sample	Depth (m)	Description	W%	W_L	W_P	I_P
⊖	BH-29 SS5	4.80	Sandy SILT (ML)	12.1			
⊠	BH-33 SS8	5.99	Poorly graded GRAVEL with silt and sand (GP-GM)	7.1			
△	BH-41 SS6	4.21	Sandy SILT (ML)	11.3			

	Sample	Depth (m)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
⊖	BH-29 SS5	4.80	28.00				7.1	23.3	69.6	
⊠	BH-33 SS8	5.99	40.00	7.49	0.923	0.1338	48.7	43.6	7.7	
△	BH-41 SS6	4.21	40.00				8.6	26.9	64.5	

REMARKS:

Stantec

Client: **Port of Argentia**

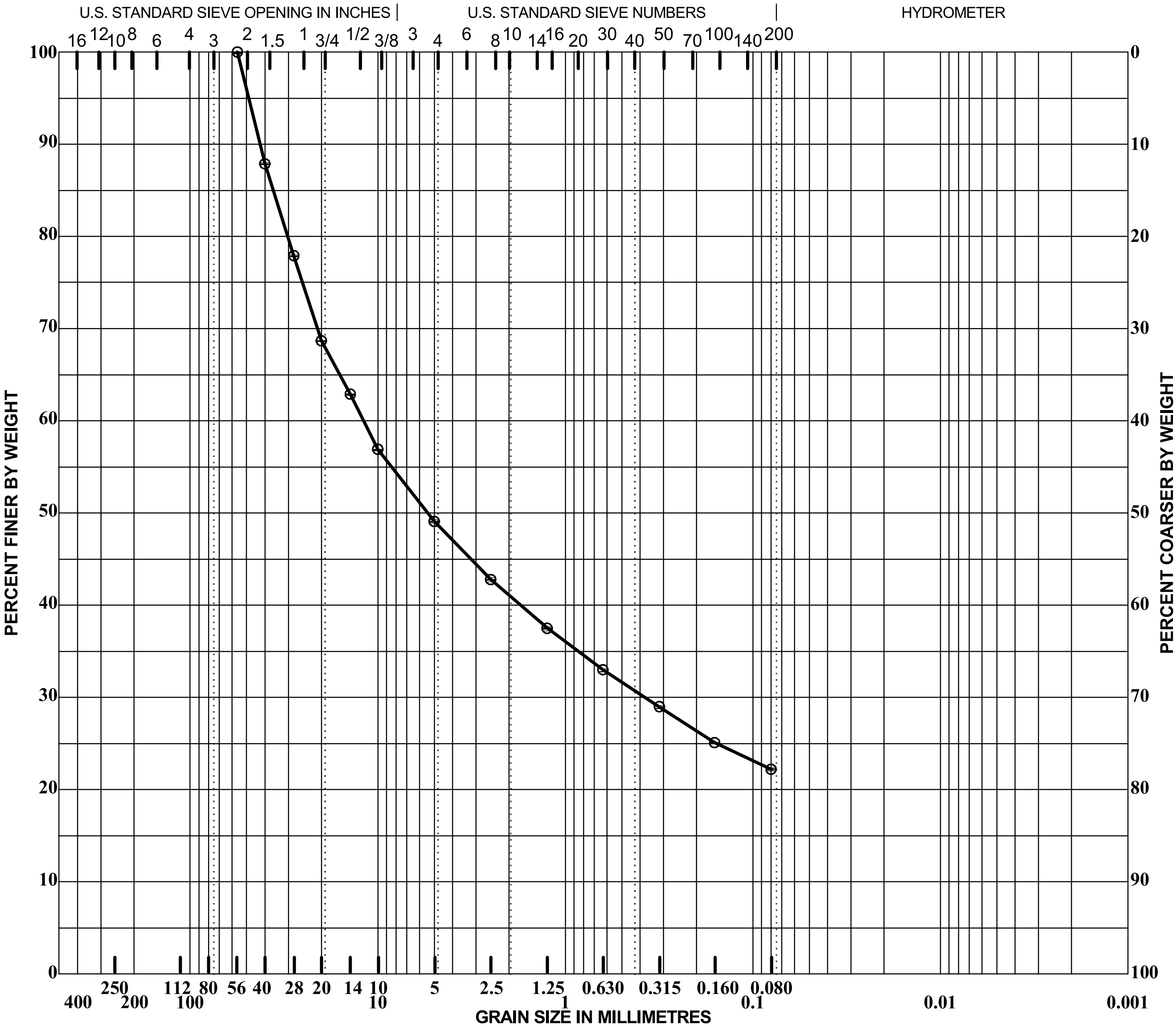
Project: **Marine Geotechnical Investigation - Cooper Cove Wharf**

Project No.: **121624742**

Location: **Cooper Cove, NL**

FIGURE 3

GRADATION CURVES



COBBLE	GRAVEL		SAND			SILT and CLAY
	coarse	fine	coarse	medium	fine	

	Sample	Depth (m)	Description	W%	W_L	W_P	I_P
⊖	BH-42 SS6	3.96	Silty GRAVEL with sand (GM)	4.5			

	Sample	Depth (m)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
⊖	BH-42 SS6	3.96	56.00	11.90	0.375		50.9	26.9	22.2	

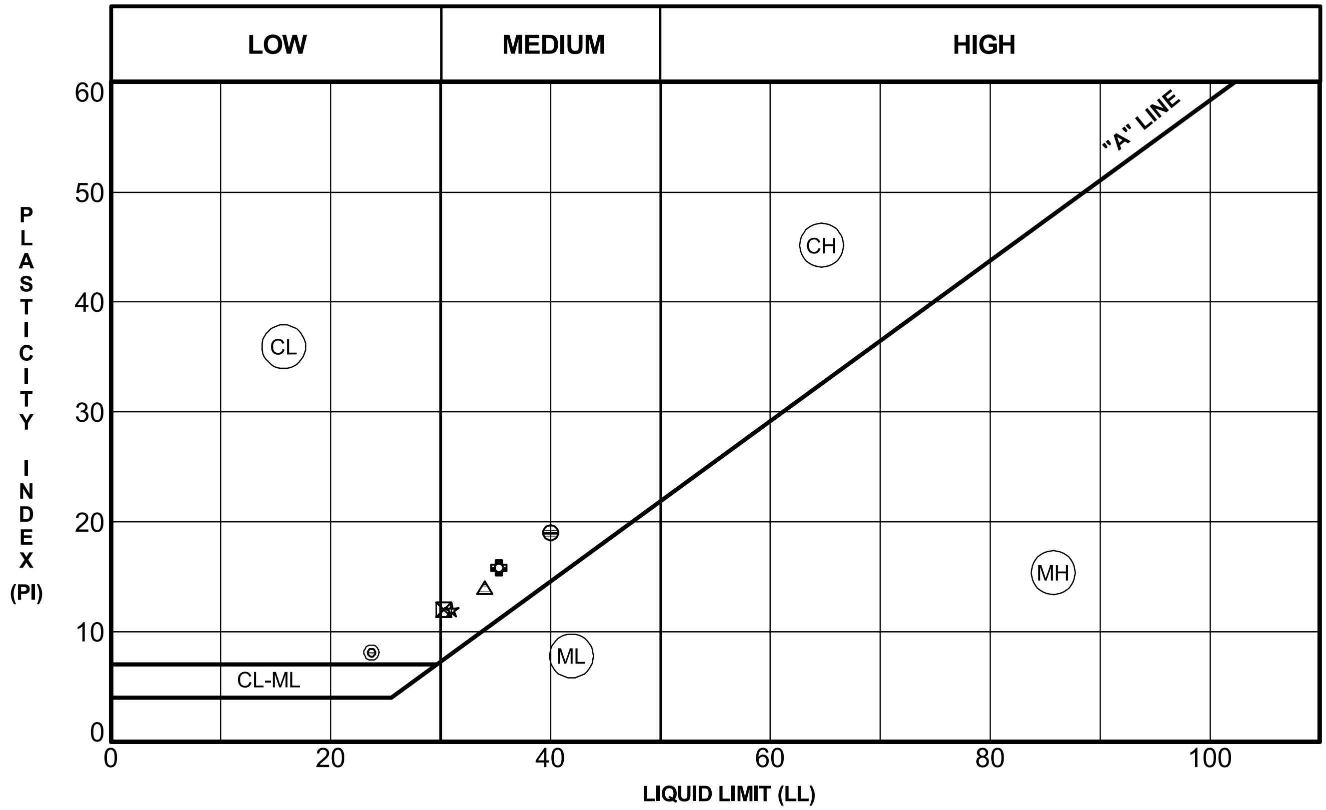
REMARKS:

Client:	**Port of Argentia**
Project:	**Marine Geotechnical Investigation - Cooper Cove Wharf**
Project No.:	**121624742**
Location:	**Cooper Cove, NL**

Stantec

FIGURE 4

GRADATION CURVES



	Sample	Depth m	W%	LL	PL	PI	Fines	Classification
⊖	BH-07 SS4		26.7	40	21	19		lean sandy CLAY (CL)
⊠	BH-07 ST5			30	18	12		lean sandy CLAY (CL)
△	BH-12 SS6		19.9	34	20	14		lean sandy CLAY (CL)
★	BH-17 SS5		10.9	31	19	12	29	lean sandy CLAY (CL)
⊚	BH38 SST06			24	16	8		lean sandy CLAY (CL)
✪	BH39 ST07			35	20	15		lean sandy CLAY (CL)

REMARKS:

Stantec

Client: **Port of Argentia**

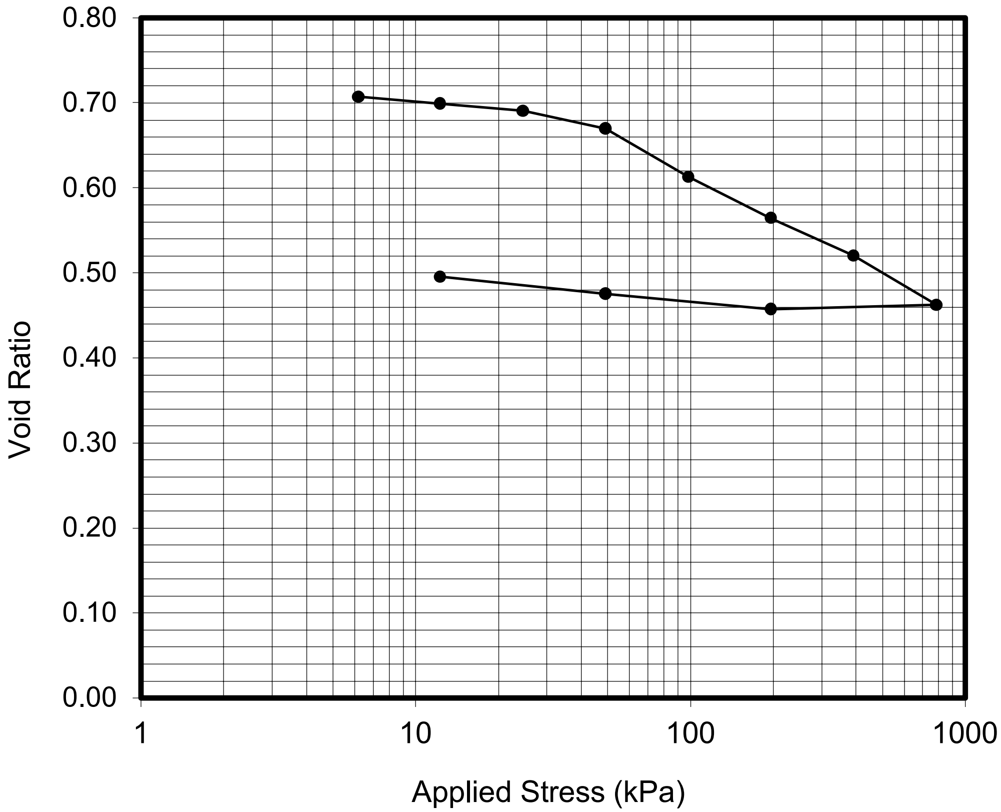
Project: **Marine Geotechnical Investigation - Cooper Cove Wharf**

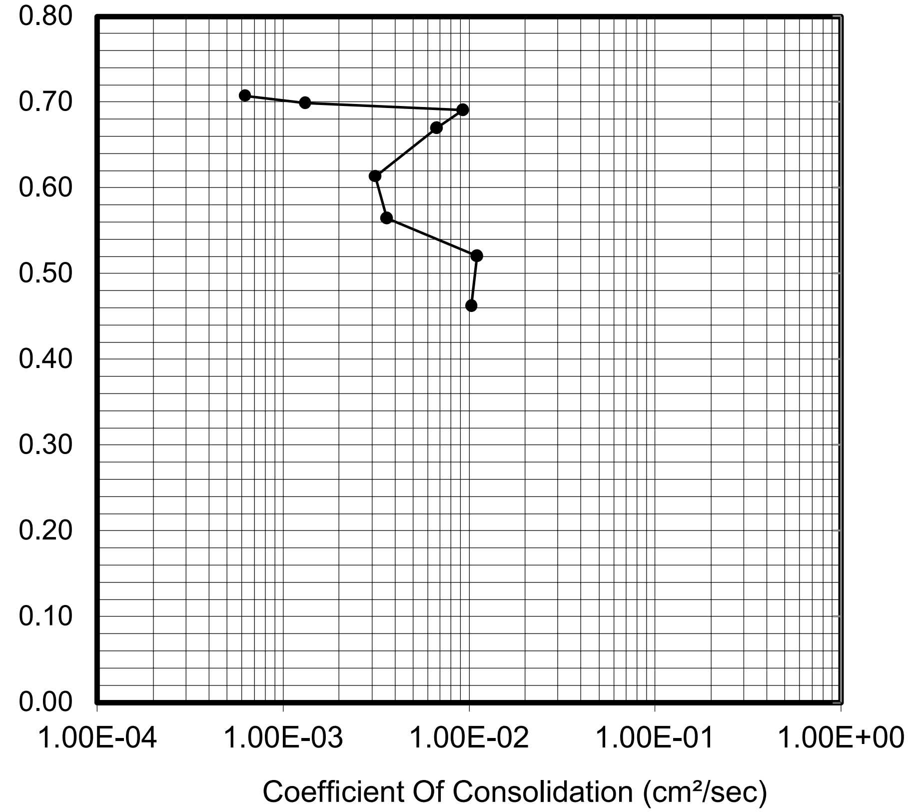
Project No.: **121624742**

Location: **Cooper Cove, NL**

FIGURE 1

PLASTICITY CHART





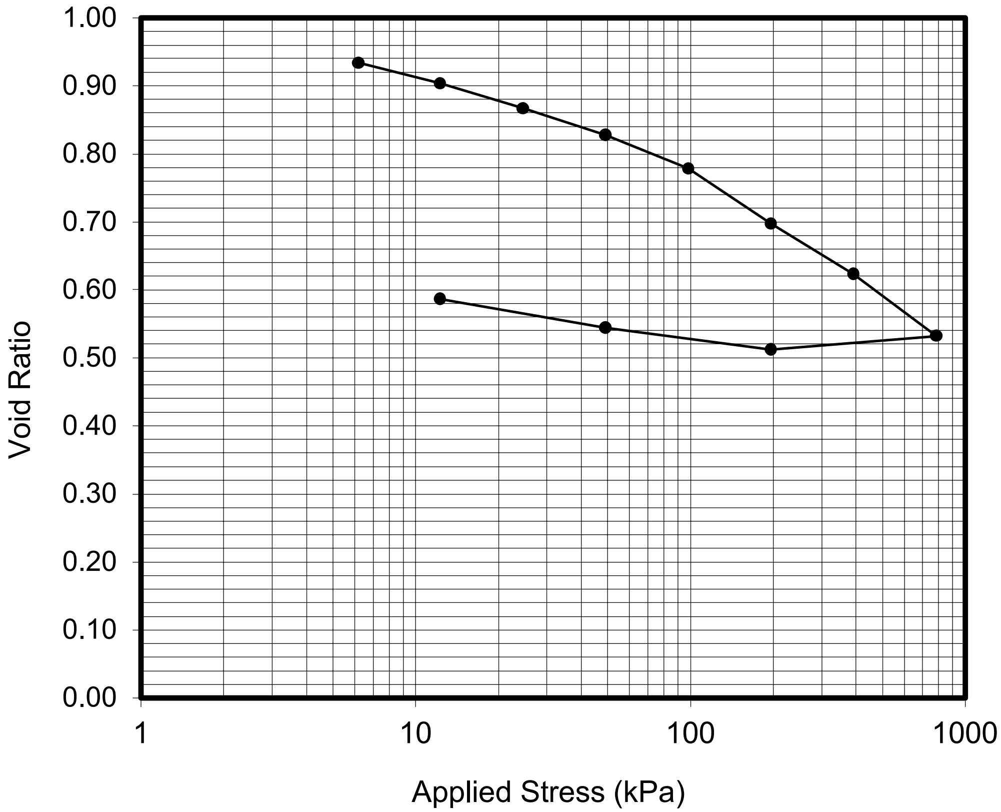
Project Name: Cooper Cove
Project No.: 121624742.200.000

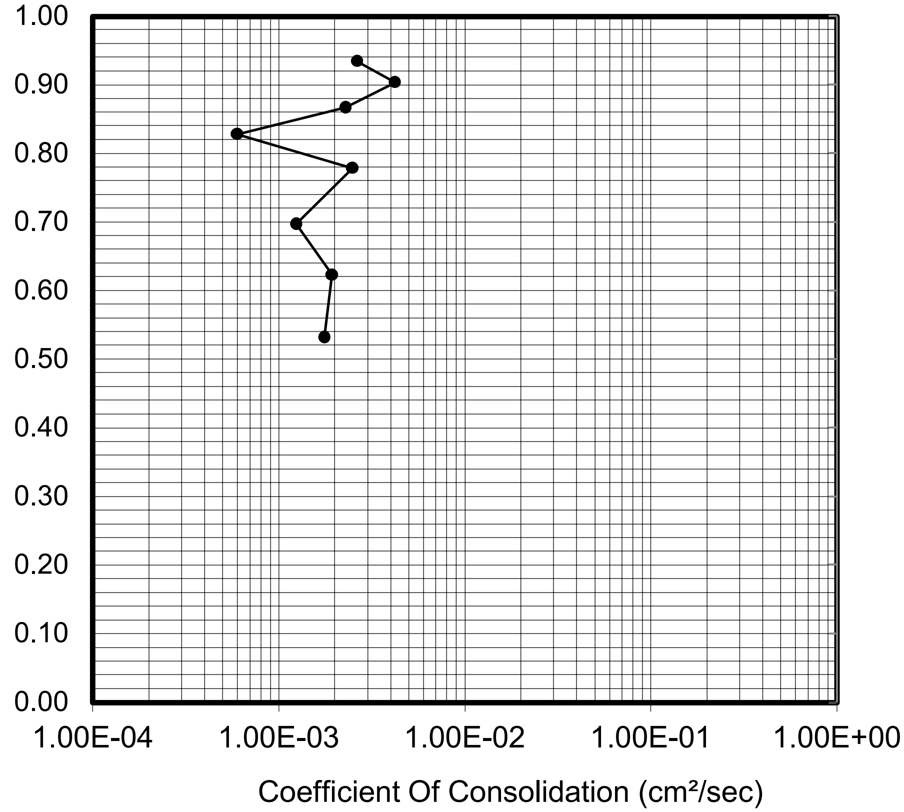
Stantec

Cooper Cove		
Boring No.	Sample No.	Depth
BH07	ST5	14'-16'

One-Dimensional Consolidation ASTM D2435

Tested By: J.Aleer
Checked By:
Date: 7-Sep-23

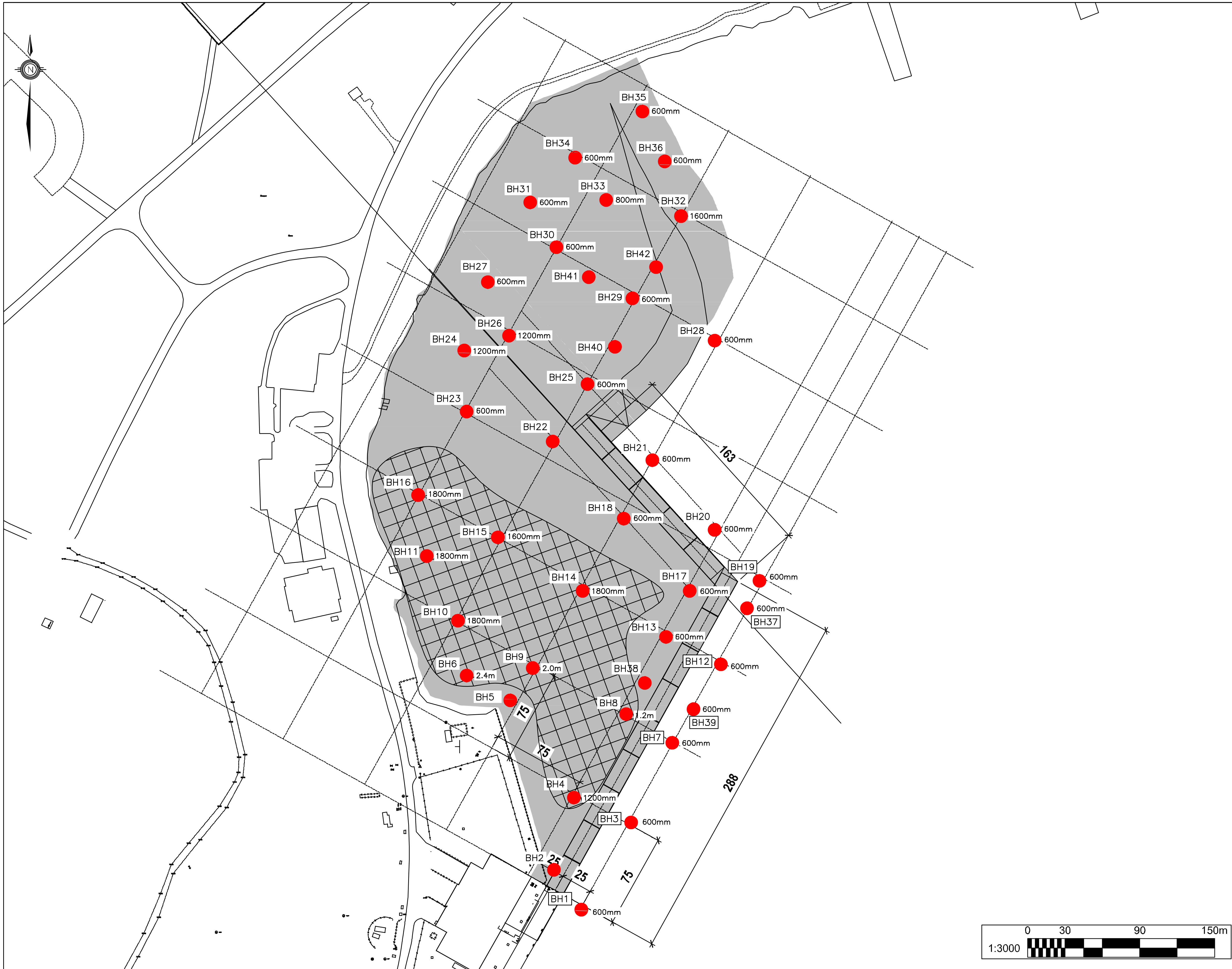




Project Name: Cooper Cove Project No.: 121624742.200.000 Stantec	Cooper Cove			One-Dimensional Consolidation ASTM D2435
	Boring No.	Sample No.	Depth	Tested By: J.Aleer Checked By: Date: 7-Sep-23
	BH39	ST7	14'-16'	

APPENDIX E

Drawings



T:\JOBS\121624742\121624742-GE-03.dwg

Stantec Consulting Ltd. © 2023

LEGEND

● BOREHOLE LOCATIONS

NOTES:

1) THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

CLIENT:

PORT OF ARGENTIA

PROJECT TITLE:

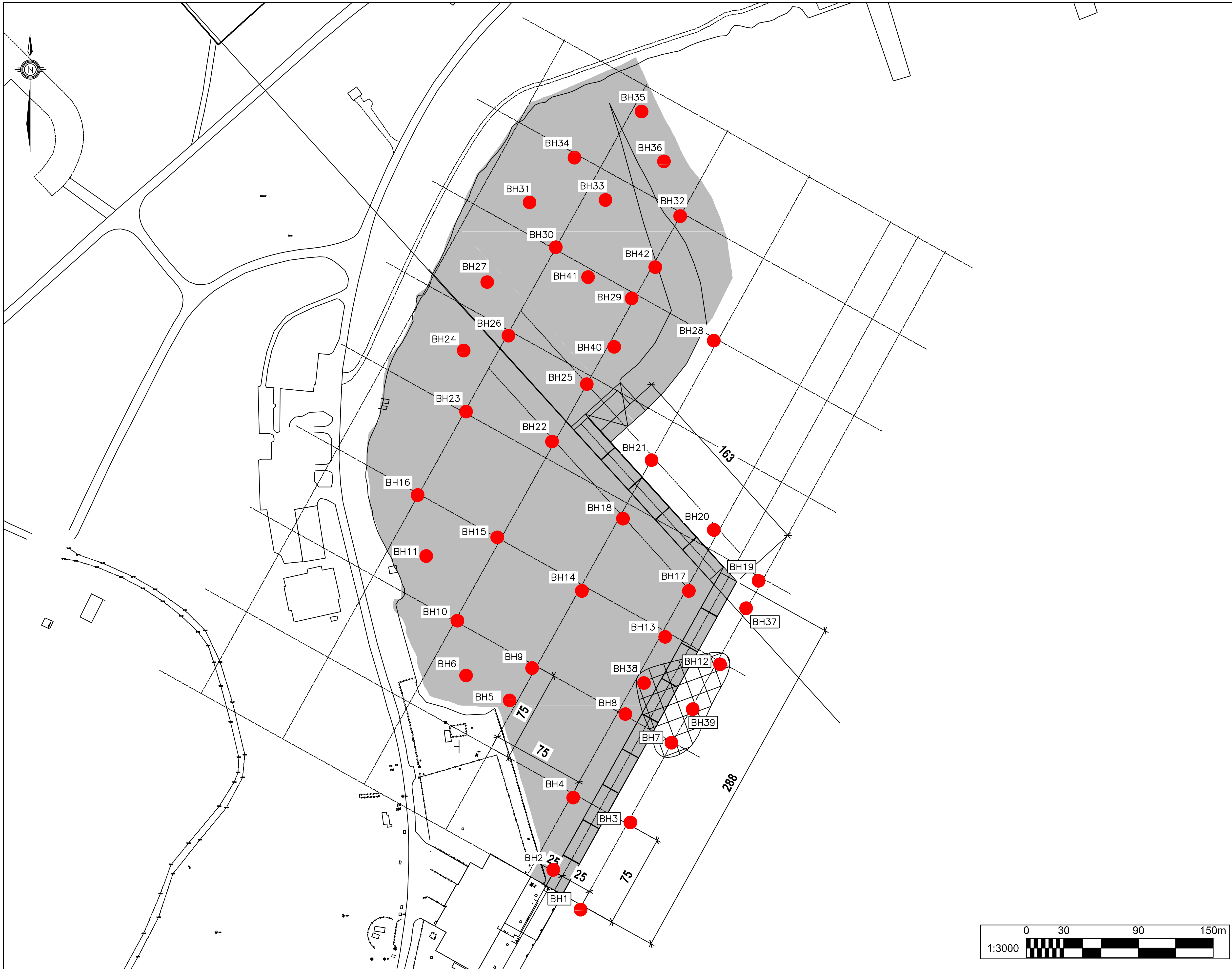
MARINE GEOTECHNICAL INVESTIGATION, COOPER COVE WHARF, COOPER COVE, ARGENTIA, NL

DRAWING TITLE:

FIGURE 5.1
EXTENT OF SOFT SEDIMENTS

Stantec

SCALE: 1:3000	DATE: SEPT. 11, 2023
DRAWN BY: S.N.	CHECKED BY:
EDITED BY: -	REV. No. 0
DRAWING No: 121624742-GE-03	



T:\JOBS\121624742\121624742-GE-04.dwg

LEGEND

BOREHOLE LOCATIONS

NOTES:

1) THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

CLIENT:

PORT OF ARGENTIA

PROJECT TITLE:

MARINE GEOTECHNICAL INVESTIGATION, COOPER COVE WHARF, COOPER COVE, ARGENTIA, NL

DRAWING TITLE:

FIGURE 5.2
AREA OF SOFT CALY

Stantec

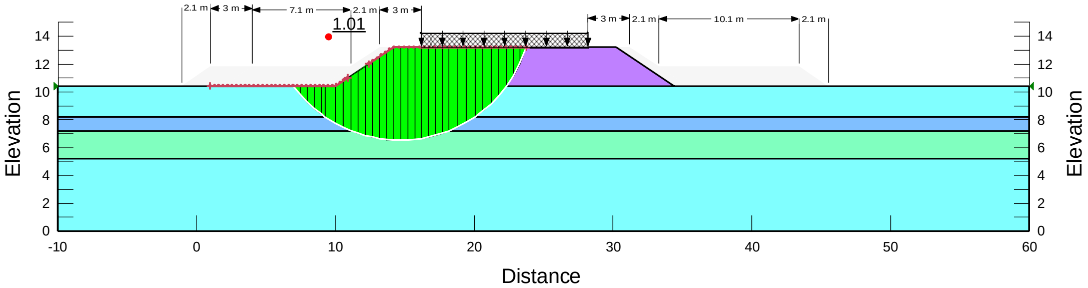
SCALE:	1:3000	DATE:	SEPT. 11, 2023
DRAWN BY:	S.N.	CHECKED BY:	
EDITED BY:	-	REV. No.	0
DRAWING No:	121624742-GE-04		

Stantec Consulting Ltd. © 2023

APPENDIX F

Slope Stability Analysis

Color	Name	Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Cohesion (kPa)
	Clay_20kPa	Undrained (Phi=0)	18			20
	Clay_60kPa	Undrained (Phi=0)	18			60
	Dense Till	Mohr-Coulomb	12	0	34	
	Rockfill_phi_38	Mohr-Coulomb	12	0	38	



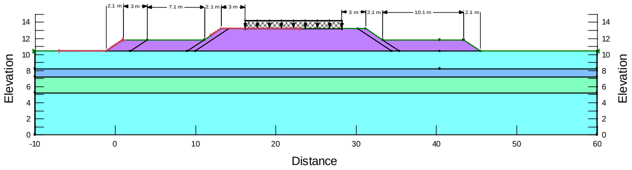
Stantec

Figure 1 – Slope Stability analysis for C_u = 20kPa/60kPa

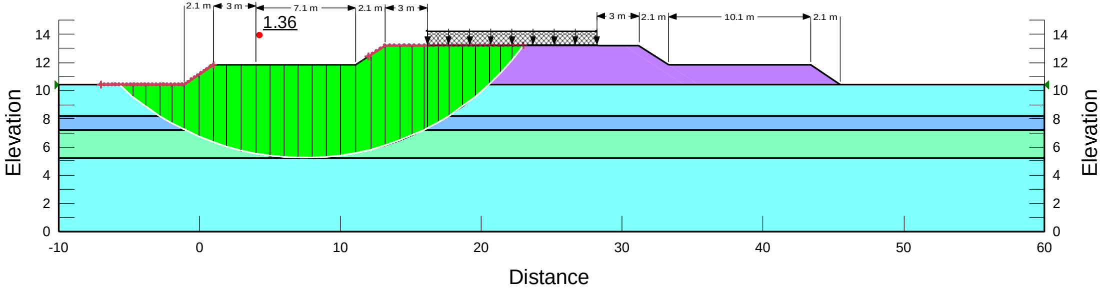
121624742 - Coopers Cove - SLOPE STABILITY STUDY

Date – 09/11/2023

Color	Name	Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Cohesion (kPa)
	Clay_20kPa	Undrained (Phi=0)	18			20
	Clay_60kPa	Undrained (Phi=0)	18			60
	Dense Till	Mohr-Coulomb	12	0	34	
	Rockfill_Mattress	Mohr-Coulomb	12	0	38	



Cross-section



Stantec

Figure 2 – Slope Stability analysis for C_u = 20kPa/60kPa & Berm with Bench = 3 m

121624742 - Coopers Cove - SLOPE STABILITY STUDY

Date – 09/11/2023

Appendix H

GHG Estimates for Construction

Construction Emission Estimates

Scope 1 - Direct Emissions

Construction Phase	Construction Year Equipment is Used	Equipment Type	Equipment Model	# of Units	# of Operating Weeks	Work Days Per Week	Hours Per Day	Total Operating Hours[1]	Fuel Type	HP	Tier	Fuel Usage (L/hr)	Emission Factor (g/L)[2],[3]			Emissions (tonnes)				
													CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	CO_2e (IPCC AR4)	CO_2e (IPCC AR5)
Fab./construction of Caissons & Ro-Ro Ramp	3&4	Crane	Liebherr HS 8030HD	1	73	5	10	3650	Diesel	241	3	5.9	2681	0.073	0.227	5.77E+01	1.57E-03	4.89E-03	5.92E+01	5.91E+01
	3&4	Concrete Truck	Peterbilt Model 365	13	73	5	10	3650	Diesel	350	3	15	2681	0.073	0.227	1.91E+03	5.20E-02	1.62E-01	1.96E+03	1.95E+03
	3&4	Pump Truck	TBD	1	73	5	10	3650	Diesel	350	3	10.5	2681	0.073	0.227	1.03E+02	2.80E-03	8.70E-03	1.05E+02	1.05E+02
	3&4	Flatbed Truck	TBD	1	24	5	10	1200	Diesel	345	3	15	2681	0.073	0.227	4.82E+01	1.31E-03	4.09E-03	4.95E+01	4.94E+01
Dredging Operations	3	Excavator	CAT 336	4	14	5	10	700	Diesel	304	3	38	2681	0.073	0.227	2.85E+02	7.77E-03	2.42E-02	2.93E+02	2.92E+02
	3	Dump Trucks	CAT 725	12	14	5	10	700	Diesel	338	3	92	2681	0.073	0.227	2.07E+03	5.64E-02	1.75E-01	2.13E+03	2.12E+03
Caisson Installation - New Fleet Dock	4	Flatbed Truck	TBD	1	26	5	10	1300	Diesel	345	3	15	2681	0.073	0.227	5.23E+01	1.42E-03	4.43E-03	5.36E+01	5.35E+01
	4	Crane	Liebherr HS 8030HD	1	26	5	10	1300	Diesel	241	3	5.9	2681	0.073	0.227	2.06E+01	5.60E-04	1.74E-03	2.11E+01	2.10E+01
	4	Excavator	CAT 336	4	2	5	10	100	Diesel	304	3	38	2681	0.073	0.227	4.07E+01	1.11E-03	3.45E-03	4.18E+01	4.17E+01
	4	Dump Truck	CAT 725	10	2	5	10	100	Diesel	338	3	92	2681	0.073	0.227	2.47E+02	6.72E-03	2.09E-02	2.53E+02	2.52E+02
	4	Roller/Vibrator	CAT CW34	6	2	5	10	100	Diesel	133	3	23	2681	0.073	0.227	3.70E+01	1.01E-03	3.13E-03	3.79E+01	3.78E+01
Caisson Installation - New Wharf Face	4	Flatbed Truck	TBD	1	26	5	10	1300	Diesel	345	3	15	2681	0.073	0.227	5.23E+01	1.42E-03	4.43E-03	5.36E+01	5.35E+01
	4	Crane	Liebherr HS 8030HD	1	26	5	10	1300	Diesel	241	3	5.9	2681	0.073	0.227	2.06E+01	5.60E-04	1.74E-03	2.11E+01	2.10E+01
	4	Excavator	CAT 336	4	2	5	10	100	Diesel	304	3	38	2681	0.073	0.227	4.07E+01	1.11E-03	3.45E-03	4.18E+01	4.17E+01
	4	Dump Truck	CAT 725	10	2	5	10	100	Diesel	338	3	92	2681	0.073	0.227	2.47E+02	6.72E-03	2.09E-02	2.53E+02	2.52E+02
	4	Roller/Vibrator	CAT CW34	6	2	5	10	100	Diesel	133	3	23	2681	0.073	0.227	3.70E+01	1.01E-03	3.13E-03	3.79E+01	3.78E+01
Ro-Ro Ramp installation	5	Flatbed Truck	TBD	1	17	5	10	850	Diesel	345	3	15	2681	0.073	0.227	3.42E+01	9.31E-04	2.89E-03	3.51E+01	3.50E+01
	5	Crane	Liebherr HS 8030HD	1	17	5	10	850	Diesel	241	3	5.9	2681	0.073	0.227	1.34E+01	3.66E-04	1.14E-03	1.38E+01	1.38E+01
Infill (Fleet Dock & New Wharf Face)	4&5	Excavator	CAT 336	1	54	5	10	2700	Diesel	304	3	38	2681	0.073	0.227	2.75E+02	7.49E-03	2.33E-02	2.82E+02	2.81E+02
	4&5	Dump Truck	CAT 725	22	54	5	10	2700	Diesel	338	3	92	2681	0.073	0.227	1.46E+04	3.99E-01	1.24E+00	1.50E+04	1.50E+04
	4&5	Roller/Vibrator	CAT CW34	4	54	5	10	2700	Diesel	133	3	23	2681	0.073	0.227	6.66E+02	1.81E-02	5.64E-02	6.83E+02	6.81E+02
	4&5	Water Truck	Ford F-150	1	54	5	10	2700	Diesel	250	3	6.5	2681	0.073	0.227	4.70E+01	1.28E-03	3.98E-03	4.83E+01	4.81E+01
Armour Stone Placement	5	Dump Truck	CAT 725	20	4	5	10	200	Diesel	338	3	92	2681	0.073	0.227	9.86E+02	2.69E-02	8.35E-02	1.01E+03	1.01E+03
	5	Excavator	CAT 336	1	4	5	10	200	Diesel	304	3	38	2681	0.073	0.227	2.04E+01	5.55E-04	1.73E-03	2.09E+01	2.08E+01
	5	Dozer	CAT D5	2	4	5	10	200	Diesel	170	3	20	2681	0.073	0.227	2.14E+01	5.84E-04	1.82E-03	2.20E+01	2.19E+01
Additional Infill Adjacent to Ro-Ro Ramp	5	Excavator	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2681	0.073	0.227	N/A	N/A	N/A	N/A	N/A
	5	Dump Truck	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2681	0.073	0.227	N/A	N/A	N/A	N/A	N/A
	5	Roller/Vibrator	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2681	0.073	0.227	N/A	N/A	N/A	N/A	N/A
	5	Water Truck	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2681	0.073	0.227	N/A	N/A	N/A	N/A	N/A
Site Grading	5	Roller/Vibrator	CAT CW34	1	4	5	10	200	Diesel	133	3	23	2681	0.073	0.227	1.23E+01	3.36E-04	1.04E-03	1.26E+01	1.26E+01
	5	Grader	CAT 140	1	2	5	10	100	Diesel	250	3	20	2681	0.073	0.227	5.36E+00	1.46E-04	4.54E-04	5.50E+00	5.49E+00
	5	Water Truck	Ford F-150	1	4	5	10	200	Diesel	250	3	6.5	2681	0.073	0.227	3.48E+00	9.49E-05	2.95E-04	3.57E+00	3.57E+00
																Total GHG Emissions (tonnes CO2e)			22571.12	22511.43

Notes:

[1] Number of Total Operating Hours for each piece of equipment estimated based on number of operating weeks, work days per week and hours per day.

[2] Mobile Equipment Emission Factors are taken from the 2023 National Inventory Report 1990-2021, Part 2; Greenhouse Gas Source and Sinks in Canada:
Table A6.1-14: Emission Factors for Energy Mobile Combustion Sources.

[3] Emission Factor values for Tier 4 Off-road Diesel Vehicles >= 19 kW have been applied as a conservative approach.