Fisheries and Aquaculture
1575A Lake Rd
Sandy Point, Nova Scotia
B0T 1W0
novascotia.ca

Public Notice – Adjudicative Application Posted

These documents have been submitted with respect to an adjudicative application for a boundary amendment of an existing Marine Aquaculture Licence/Lease. The application follows a Scoping period, during which the applicant collected information to support their application. The information in these documents is provided as part of the routine disclosure of information by the Department of Fisheries and Aquaculture (NSDFA, the "Department"). Some information may be redacted as business confidential information or personal information.

These documents were provided to the Department by the applicant (with the exception of the attached Schedule "A" which was generated by the Department). The Department is not responsible for the content of these documents, including, but not limited to, the accuracy, reliability, or currency of the information contained within.

Adjudicative Application for a Boundary Amendment to an Existing Aquaculture Licence and Lease	
Applicant: Kelly Cove Salmon Ltd.	**Species:** Atlantic salmon, Lump fish
Location: Annapolis Basin, Annapolis County	**Method of Cultivation:** Marine Cage Cultivation
Application File Number: AQ#1040	**Application Received On:** October 28, 2016

To learn more about the marine aquaculture lease and license application process, please visit https://novascotia.ca/fish/aquaculture/licensing-leasing/Aqua-Licensing-and-Leasing-Overview.pdf

For information on the Nova Scotia Aquaculture Review Board, please visit https://arb.novascotia.ca/

NOVA SCOTIA

Fisheries and Aquaculture
1575A Lake Rd
Sandy Point, Nova Scotia
B0T 1W0

novascotia.ca

NOTICE

Posting Date of this Notice: **April 21, 2023**

Please note that this application is being reviewed pursuant to the *Canadian Navigable Waters Act* by Transport Canada. Written comments regarding the effect of this work on marine navigation may be submitted as follows, for a period of 30 days following the above posting date of this notice.

1. On line at: http://cps.canada.ca/ under the Registry# 7568 / NPP#2007-200889
2. By Mail at: Manager
   Transport Canada - Navigation Protection Program
   6th floor-95 Foundry Street, Moncton, NB E1C 5H7

Table of Contents (Page 1 starts after this table)

Sweeney International Marine Corp.
46 Milltown Blvd.
St. Stephen, New Brunswick
Canada E3L 1G3
Tel: (506) 467-9014
Fax: (506) 467-9503
www.simcorp.ca

October 24, 2016

SIMCorp File #SW2016-060

Ms. E. Lynn Winfield
Licencing Co-ordinator
Nova Scotia Department of Fisheries & Aquaculture
Aquaculture Division
1575 Lake Road
Shelburne, Nova Scotia
B0T 1W0

Dear Ms. Winfield:

Reference: **Boundary Amendment Application for Site #1040 / Victoria Beach**

On behalf of our client, Kelly Cove Salmon Ltd., we are submitting the following in support of an application for a boundary amendment for Site #1040 / Victoria Beach:

1) A completed "Aquaculture Amendment Application" Form;
2) A cheque in the amount of $1,000 ($500 application fee for the licence plus $500 application fee for the lease) payable to the Minister of Finance;
3) Supporting information as required by Network Agencies and the Aquaculture Review Board; and,
4) A complete set of Site Development Plans detailing the proposed amended lease boundaries, bathymetry, cage configuration, cross-sections and proposed marking plan.

If you require anything further please do not hesitate to contact our office at any time.

Yours truly, [redacted]

Sr. Project Manager

cc. [redacted] VP Saltwater Operations, Cooke Aquaculture Inc.
Jeff Nickerson, NS Production Manager, Kelly Cove Salmon Ltd.
[redacted] SIMCorp

NOVA SCOTIA
Fisheries and Aquaculture

Office Use Only

Aquaculture Amendment Application

Licence/Lease No.: 1010

Name of licence/lease holder:

Applicant: Kelly Cove Salmon Ltd Business Registration Number: [redacted]

Contact Person: Jeff Nickerson, NS Production Manager

Telephone No. (Work): (902) 875-8603 (Home): ____ (Cell) [redacted]

Fax No. (902) 755-1492 Email Address: jnickerson@cookeaqua.com

Mailing Address: P.O. Box 1546
Shelburne, NS
Postal Code B0T 1W0

Civic Address: 803 Ohio Road
Shelburne, NS
Postal Code B0T 1W0

Is this aquaculture amendment application for: check (✓) appropriate box(s):

- ☐ Change of species
- ☐ Change of culture method
- ☑ Change of site boundaries

Provide explanation: A boundary amendment application is being filed to encompass the existing occupation including all cages, mooring lines and anchors.

A complete aquaculture amendment application includes the following: check (✓) appropriate box(s):

- ☑ Amendment fee (payable to Minister of Finance)
- ☐ Deed or Property Lease for land-based (if applicable)
- ☑ Development Plan (provided by NSDFA)
- ☐ Orthophoto with site layout (land based)
- ☑ Amendment Application Forms (Provided by NSDFA)
- ☑ Gear configuration sketches (if applicable)
- ☑ Hydrographic chart with site layout (marine based)
- ☐ Department of Environment fresh water withdrawal permit (if applicable)
- ☑ GPS coordinates of lease corners or boundary

Application packages are available at your local Coastal Resource Coordinator Office (see attached list) or the Shelburne Office at:

Nova Scotia Department of Fisheries and Aquaculture
Attention: Aquaculture Division
1575 Lake Road
Shelburne, Nova Scotia
B0T 1W0

Telephone Number (902) 875-7439
E-Mail: aquaculture@gov.ns.ca

For the purpose of assessing aquaculture amendment applications, it is necessary to provide information to other government departments and interested public. Business plan information is not released to the public. By signing this amendment application, the applicant agrees to the Department releasing application information about the proposed development.

[redacted]

October 24, 2016
Date

Signature of
Nova Scotia Department of Fisheries and Aquaculture Designate

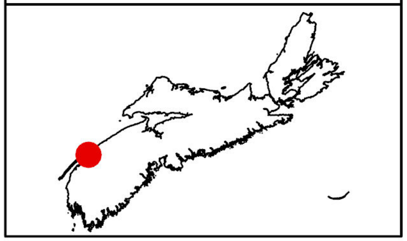
Date

[redacted]

1040 Victoria Beach

Total 1,000.00

SCHEDULE A

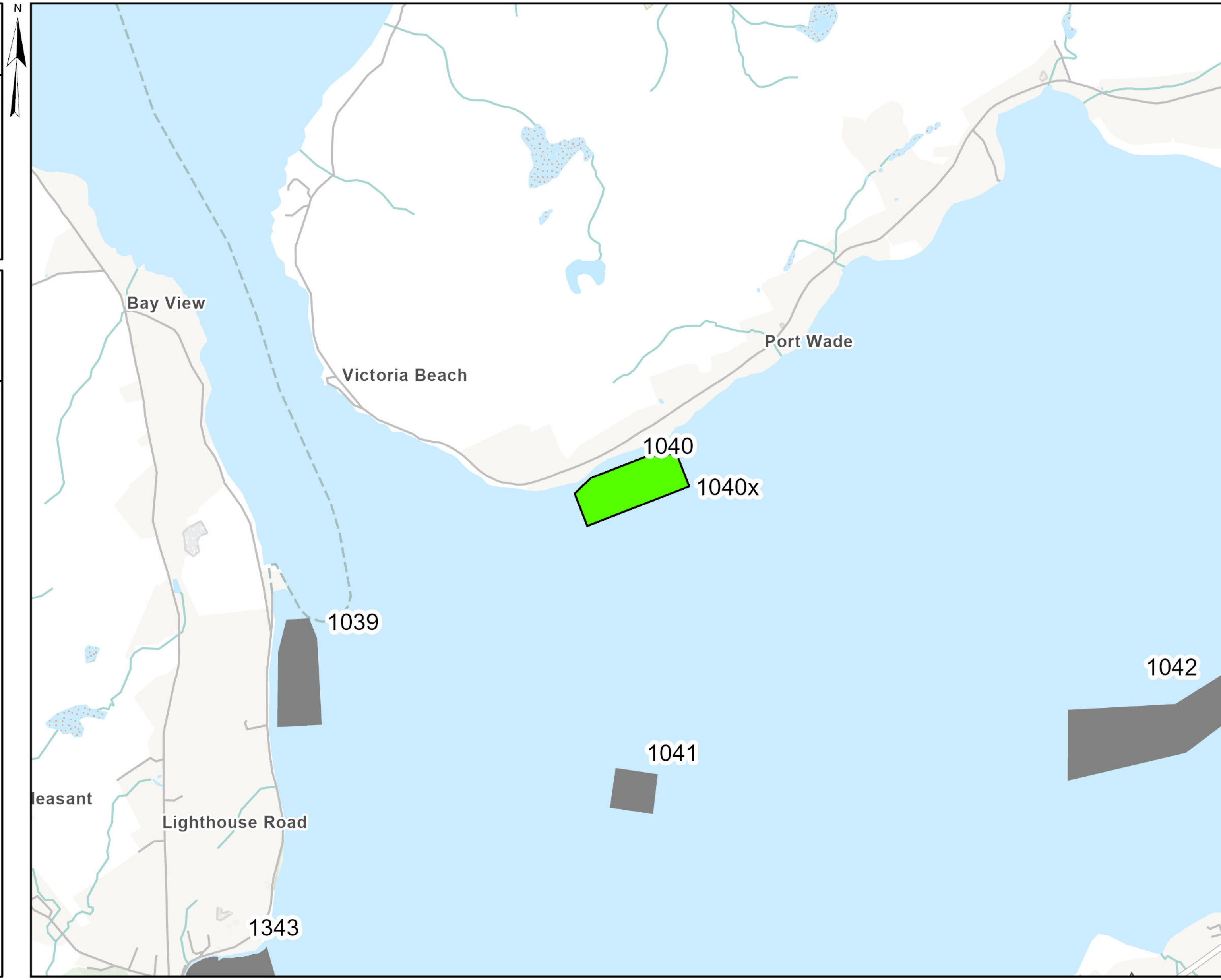


Aquaculture Site

1040x

Corner	Latitude	Longitude
1	44° 39' 55.543"	-65° 43' 31.937"
2	44° 40' 4.178"	-65° 43' 37.118"
3	44° 40' 8.525"	-65° 43' 31.142"
4	44° 40' 14.898"	-65° 43' 10.278"
5	44° 40' 15.778"	-65° 42' 59.146"
6	44° 40' 7.142"	-65° 42' 53.966"
Centre	44° 40' 6.207"	-65° 43' 16.118"

DATUM NAD 83 CSRS UTM Zone 20
The above coordinates are not from a legal survey



License/Lease Holder	County	Waterbody	Hectares	Species Type	Culture Type	Chart
Kelly Cove Salmon Ltd.	Annapolis	Annapolis Basin	31.43	Finfish		4396

Proposed Amendment
Other Issued Lease
Other Proposed Application

0 0.5 1 2
Kilometers

NOVA SCOTIA
Fisheries and Aquaculture

Disclaimer
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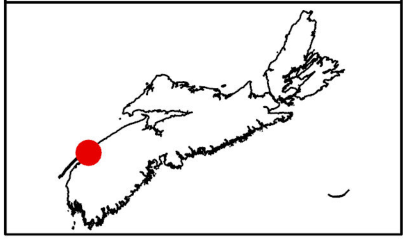
Date: 2023-02-17
Created By: MK

SCHEDULE A



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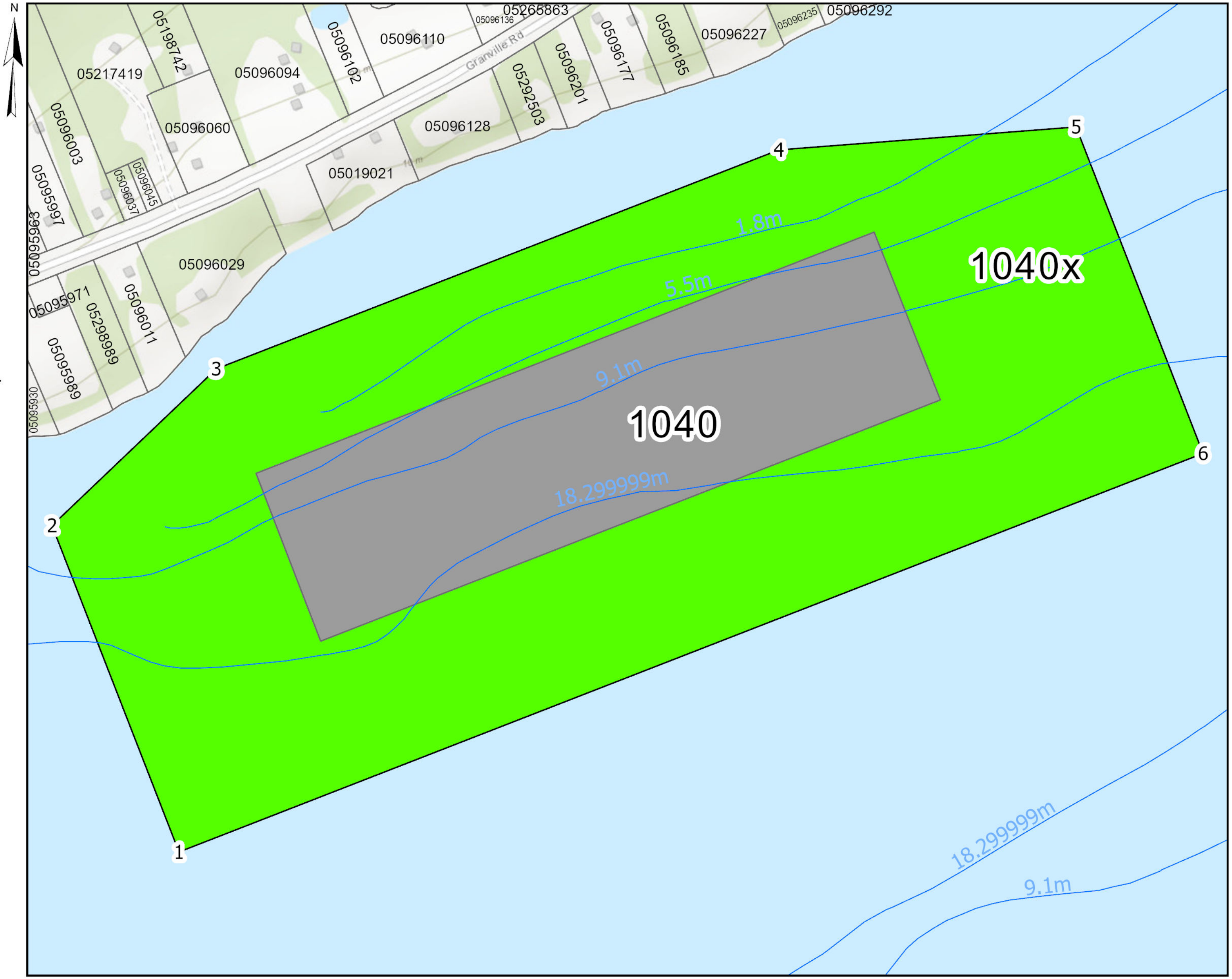

License/Lease Holder	County	Waterbody	Hectares	Species Type	Culture Type	Chart
Kelly Cove Salmon Ltd.	Annapolis	Annapolis Basin	31.43	Finfish		4396

Proposed Amendment
Other Issued Lease

0 50 100 200 300
Meters

NOVA SCOTIA
Fisheries and Aquaculture

Disclaimer
This map should not be used for navigation or legal purposes. It is intended for general reference use only.

Date: 2023-02-16
Created By: MK

NS1040 Victoria Beach Boundary Amendment

Finfish Marine Aquaculture Development Plan for Site #1040 Victoria Beach
County of Annapolis
Province of Nova Scotia

October 11, 2022

Prepared for:
Kelly Cove Salmon Ltd.
P.O. Box 33
Bridgewater, NS
B4V 2W6

Prepared by:
Sweeney International Marine Corp.
46 Milltown Blvd.
St. Stephen, NB
E3L 1G3
Canada
Tel: (506) 467-9014
Fax: (506) 467-9503
www.simcorp.ca

New Brunswick Newfoundland Nova Scotia

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www.simcorp.ca

October 11, 2022

SIMCorp File # SW2016-060

Jeff Nickerson
Kelly Cove Salmon Ltd.
P.O. Box 33
Bridgewater, NS
B4V 2W6

Dear Mr. Nickerson:

Reference: **Application for a boundary amendment for aquaculture site #1040, Victoria Beach, Nova Scotia**

Please find enclosed the supporting materials for the above-mentioned boundary amendment at marine aquaculture site #1040, in Annapolis Basin, NS.

If you have any questions or comments on the following report, please do not hesitate to contact our offices.

Sincerely,

[redacted]

Senior Marine Environmental Biologist
Atlantic Region
Sweeney International Marine Corp.
[redacted]

cc: [redacted] (SIMCorp)
[redacted] (KCS)
[redacted] (KCS)

EXECUTIVE SUMMARY

<u>Project</u>: Application for a boundary amendment of aquaculture site #1040 in Annapolis Basin, Nova Scotia

Marine aquaculture site #1040, called Victoria Beach, is in Annapolis Basin, Annapolis County, Nova Scotia. Kelly Cove Salmon Ltd. (KCS) has been farming in the Annapolis Basin since 2002. The Victoria Beach site has operated with sixteen 100-m cages housing up to 550,000 Atlantic salmon. However, assessments of oceanographic and environmental parameters indicate that the Victoria Beach marine farm can sustain at least 660,000 Atlantic salmon. The nearby Rattling Beach farm (site #1039) has similar oceanographic conditions and has successfully accommodated 660,000 Atlantic salmon in twenty 100-m cages with minimal impacts to the benthic environment and significant economic benefits to the local economy. Thus, a production increase is proposed for the Victoria Beach aquaculture site. This expansion will increase production by approximately 20%, will allow all equipment to be contained within the lease area, will result in increased employment numbers in the local area in both direct and indirect jobs, and will increase KCS' contribution to the provincial GDP and federal, provincial, and municipal taxes.

Annapolis Basin is considered significant habitat for migratory and aquatic birds. The area offers a variety of tourist-related activities, including whale and bird watching, hiking, and boating. The main fisheries in the Annapolis Basin include lobster and scallop, but clams are also an important resource. A fishery for groundfish also exists, and a few small pelagic species are also captured in the area. Aquaculture, both finfish and shellfish, in the Annapolis Basin area has been able to successfully co-exist for decades with other resources in the area, providing increased employment and industry diversity.

The Victoria Beach marine aquaculture site is within the range of the Nova Scotia Southern Upland and Inner Bay of Fundy designated units of Atlantic salmon. Both designated units have experienced drastic declines in population over recent decades. The closest river with a remnant population of salmon is the Bear River, located 6 km from the Victoria Beach marine farm. KCS has made significant investments in both research and capital equipment for green-based thermo-mechanical sea-lice treatment technologies, cleaner-fish-based biocontrol of sea lice, and the use of approved natural products to control and remove lice from farmed salmon, and indirectly, the local environment. KCS continues to assess best practices and management strategies for their farms, evaluate and deploy leading farm technologies, and co-develop world-leading aquaculture research, training, and certifications for both existing staff and future employees. KCS and its parent company, Cooke Aquaculture Inc., are committed to salmon conservation, as evidenced by their involvement as founding members of the Fundy Salmon Recovery Project, which is working toward restoration of Inner Bay of Fundy salmon populations. Cooke Aquaculture is looking forward to partnering on similar projects to help restore native salmon populations in Nova Scotia.

The following report and associated documents have been prepared by Sweeney International Marine Corp. (SIMCorp) for Kelly Cove Salmon Ltd. (KCS) in support of a boundary amendment of #1040 to include 20 cages of 100-m circumference housed in

48.77-m grid cells in a 2 x 10 configuration. The lease dimensions applied for are 290 x 910 x 290 x 188 x 500 x 247 m, resulting in a farm with an area of 31.4 ha. Plans are to construct and stock the site with 660,000 Atlantic salmon in twenty cages for spring 2024.

SIMCorp is assisting KCS in this application for a boundary amendment of site #1040 through the preparation of this report and other supporting roles. All correspondence should be copied to SIMCorp.

LIST OF SELECTED ACCRONYMS

KCS	– Kelly Cove Salmon Ltd.
SIMCorp	– Sweeney International Marine Corp.
AAR	– *Aquaculture Activities Regulation*
COHFT	– Certificate Of Health For Transfer
COSEWIC	– Committee On the Status of Endangered Wildlife In Canada
DFO	– Department of Fisheries and Oceans Canada
FCR	– Feed Conversion Ratio
FMP	– Farm Management Plan
GMG	– GMG Fish Services Ltd.
HDPE	– High-density polyethylene
ICCAT	– International Commission for the Conservation of Atlantic Tunas
NERACOOS	– NorthEastern Regional Association of Coastal Ocean Observing Systems
NSDFA	– Nova Scotia Department of Fisheries and Aquaculture
SARA	– *Species at Risk Act* (Canadian)
WIP	– Wildlife Interaction Plan

PROJECT TEAM AND CONTACT INFORMATION

The project team, their qualifications, and roles with respect to the preparation of this report are summarized as follows:

Team Member	Affiliation	Role	Qualification
[redacted]	KCS	Corporate Support	VP of Chief Sustainability Officer
Jeff Nickerson	KCS	Corporate Support	Business Development Manager
[redacted]	KCS	Corporate Support	Compliance Manager
[redacted]	SIMCorp	Sr. Project Manager	Company Owner
[redacted]	SIMCorp	Senior Marine Environmental Biologist, Atlantic Region	MSc
[redacted]	SIMCorp	Marine Environmental Biologist, New Brunswick	BSc, EPt
[redacted]	Acker & Doucette Surveying Inc.	Survey Plan Preparation	NSLS

CONTACT INFORMATION

Proponent:

Company Name: Kelly Cove Salmon Ltd.
Principal Contact: Jeff Nickerson
Mailing Address: P.O. Box 33
Bridgewater, NS, B4V 2V6
Telephone: (902) 875-8603
Facsimile: (506) 755-1492
Cellular: [redacted]
E-mail: jnickerson@cookeaqua.com

Project Management:

Company Name:	Sweeney International Marine Corp.
Principal Contact:	[redacted]
Mailing Address:	46 Milltown Blvd. St. Stephen, New Brunswick, E3L 1G3
Telephone:	(506) 467-9014
Facsimile:	(506) 467-9503
Cellular:	[redacted]
E-mail:	[redacted]

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

Factors to be Considered in Decisions Related to Marine Aquaculture Sites

Section 1.0 Optimum Use of Marine Resources

Kelly Cove Salmon Ltd. (KCS) is the Atlantic Canada farming division of Cooke Aquaculture. KCS has been farming in the Annapolis Basin since 2002. The lease and license for Site #1040, called Victoria Beach, was issued in 2005 to Casey Fisheries. It was purchased by KCS in 2011. Since that time, the site has operated with sixteen 100-m cages housing up to 550,000 Atlantic salmon. However, assessments of oceanographic and environmental parameters indicate that the Victoria Beach marine farm can sustain at least 660,000 Atlantic salmon. The nearby Rattling Beach farm (site #1039) has similar oceanographic conditions and has successfully accommodated 660,000 Atlantic salmon in twenty 100-m cages with minimal impacts to the benthic environment and significant economic benefits to the local economy. Thus, a production increase is proposed for the Victoria Beach aquaculture site.

The proposed marine farm will consist of twenty, 48.77-m grid cells in a 2 x 10 configuration. The proposed lease would incorporate all aquaculture-related gear above and below the water line and would have dimensions of 290 x 910 x 290 x 188 x 500 x 247 m, resulting in a farm with an area of 31.43 ha. This expansion will increase production by approximately 20%, will result in increased employment numbers in the local area in both direct and indirect jobs, and will increase KCS' contribution to the provincial GDP and federal, provincial, and municipal taxes.

The general area around site #1040 appears on Canadian Hydrographic Service (CHS) Nautical chart #4396 (Annapolis Basin) and National Topographic Systems Map Sector 021A (Annapolis Royal, Nova Scotia). The coordinates of the corners of the proposed lease area were obtained using DGPS and are presented in Table 1.

Site #1040 is north-northeast of Digby, in Annapolis Basin, Annapolis County, Nova Scotia (Fig. 1). The Annapolis Basin provides many different resources for humans and animals. Fishing, especially lobster and scallops, are important activities contributing to the economic wellbeing of the communities in Digby and Annapolis Counties. In addition, Annapolis Basin is considered significant habitat for migratory and aquatic birds. The area offers a variety of tourist-related activities, including whale and bird watching, hiking, and boating.

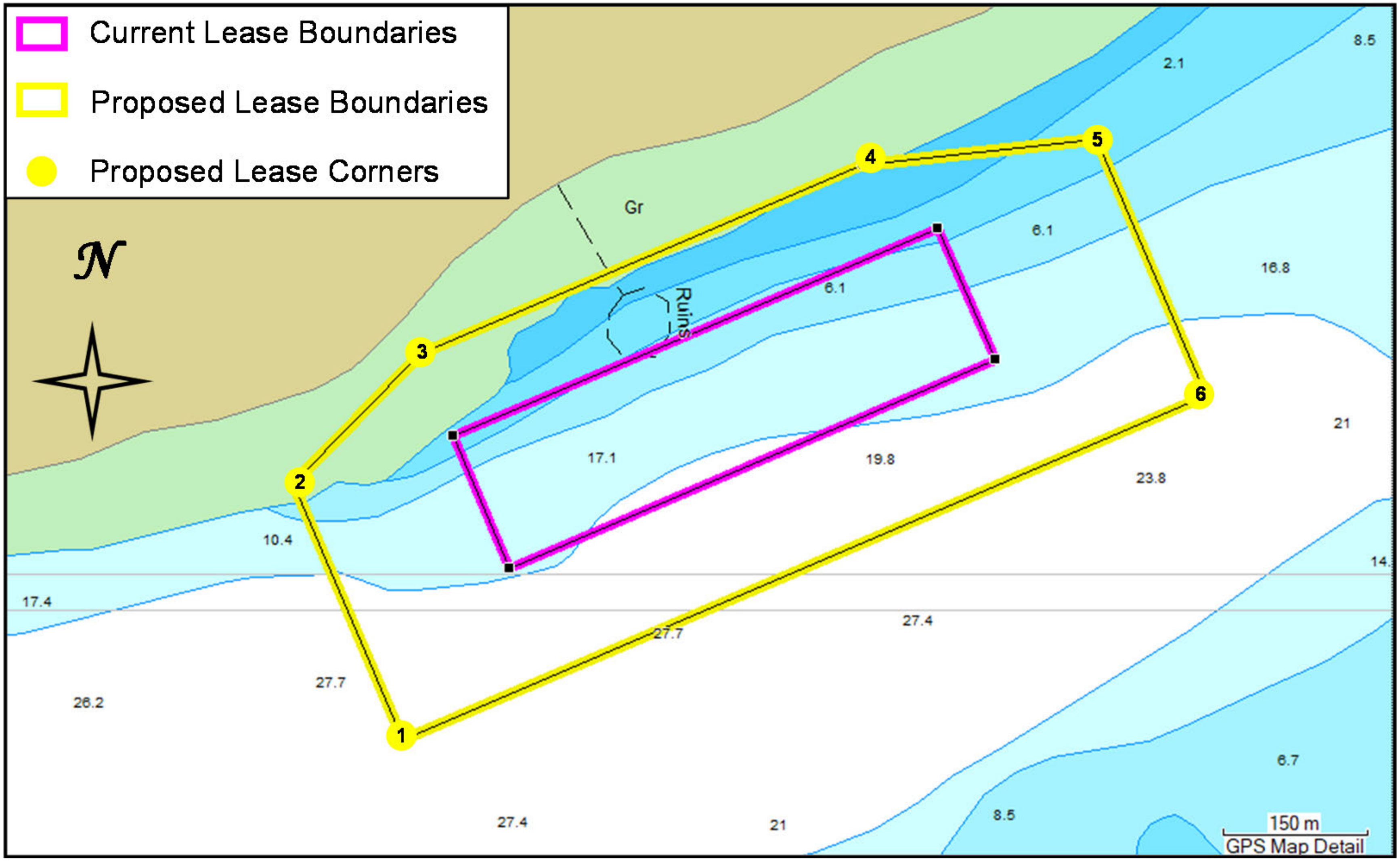
Aquaculture in the Annapolis Basin area has been able to successfully co-exist with other resources in the area for decades, providing increased employment and industry diversity. KCS, along with other related divisions of Cooke Aquaculture Inc. (CAI), employs approximately 207 people in Nova Scotia. Victoria Beach is an existing site and does not displace or adversely affect other industries in the area. Extensive benthic and water-quality monitoring programs are in place at the site. KCS participates in various salmon restoration projects through Atlantic Canada and uses numerous operational measures to ensure wildlife interaction is as minimal and neutral as possible.

As part of the scoping process, KCS hosted a public session near the Victoria Beach site. Information was shared with the public regarding the farm and how the site is designed and managed. Feedback from the public was gathered and can be found in the public engagement materials located in Appendix A.

Table 1. Coordinates for the Boundary Amendment in Annapolis Basin

APPROXIMATE SITE CO-ORDINATES (NAD 83)		
Corner	**Latitude**	**Longitude**
1	44° 39' 55.54"	65° 43' 31.94"
2	44° 40' 04.18"	65° 43' 37.12"
3	44° 40' 08.52"	65° 43' 31.14"
4	44° 40' 14.90"	65° 43' 10.28"
5	44° 40' 15.78"	65° 42' 59.15"
6	44° 40' 07.14"	65° 42' 53.97"
Approximate Site Center	44° 40' 07.68"	65° 43' 17.27"

Figure 1. Proposed Boundaries for Victoria Beach #1040 in Annapolis Basin



SECTION 2.0 THE CONTRIBUTION OF THE PROPOSED OPERATION TO COMMUNITY AND PROVINCIAL ECONOMIC DEVELOPMENT

2.1 Production Plan

The total number of fish to be introduced to the Victoria Beach (#1040) site is 660,000 with an expected grow out period of 21 months (Table 2). The expected fallow period is 3 months as outlined in the harvest plan (Table 3).

Table 2. Projected maximum values for production cycle

Species and Strain	Stock Source (hatchery)	Number of Cages and Type	Cage Size (m)	Rearing & Predator Net Depth (m)		Total Number of Fish Introduced	Mean Weight of Fish Introduced (g)	*Length of Grow-out Period	*Maximum Stocking Density (kg/m^3)	*Maximum Biomass (kg)	*Total Amount of Feed (kg)	Average Harvest Weight (kg)
Atlantic Salmon, Saint John River	Any KCS owned and operated hatchery	20	100	Predator	10	660,000	150	21 months	25	3,564,000	4158 (MT)	6
		HDPE		Rearing	9							

- Projected maximum vales for production cycle is assuming a mortality of 10% and a FCR of 1.2.

Table 3. Harvest Plan Details

End Date	Date of Re-entry	Expected Fallow Period
January 15, 2024	May 2024	3 months

2.2 Infrastructure

All active KCS finfish farms operate under a Farm Management Plan (FMP), which is approved by the Nova Scotia Department of Fisheries and Aquaculture (NSDFA). The plan covers fish-health management, containment management, farm operations, and environmental monitoring.

Victoria Beach is an existing, approved site that currently has infrastructure to support the operations already in place, including sixteen (16) net pens.

The containment management is an essential part of a marine finfish farm. The equipment and infrastructure must be of proven, sturdy construction and take many factors into consideration, such as weather, currents, ice flow, etc., to reduce the risk of fish being released or escaping into the environment. It is also an important aspect from a fish-health perspective. Mechanical damage from improper equipment can cause trauma and stress to the fish, leading to infection.

The cages at Victoria Beach are engineered to minimize wildlife interactions with farmed fish. Above-water bird rings and netting are installed to discourage bird encounters. Underwater predator netting during winter months eliminates incidents of predation.

GMG is the fish-services division of Cooke Aquaculture Inc. and a sister company to KCS. GMG provides the moorings for installation, and the specifications were determined by modelling of the oceanographical conditions encountered at this location. CAI engineering staff determined all the infrastructure components are adequate as per NSDFA regulations. The cages and moorings were modeled using guidance from the following engineering standards:

- NS 9415:2009 – “Marine fish farms: Requirements for site survey, risk analyses, design, dimensioning, production, installation and operation”
- “Marine Scotland: A Technical Standard for Scottish Finfish Aquaculture”
- ISO16488 – “International Standard: Marine fish farms – open net cage – design and operation”
- API RP 2SK – “Design and Analysis of Stationkeeping Systems for Floating Structures”
- DNV-OS-E301 – “Position Mooring”

Each area of the grid was designed to withstand different maximum loads based on the previously listed criteria. The cage components such as the handrail, float pipes, bird stands, and weight rings are made of HDPE.

NSDFA annually reviews and approves the FMP for each site. The FMP outlines all policies and procedures, infrastructure, equipment, and mitigation plans specific to a site with respect to fish-health management, containment management, farm operations, and environmental monitoring. NSDFA has approved the infrastructure, the equipment, and the containment strategy as outlined in section **7.2.3.1 Infrastructure** and section **7.2.3.2 Containment Strategy** for the existing Victoria Beach site.

Multiple KCS vessels are used to service the cages at the site, depending on the required task. Vessels include feeding boats, skiffs, and maintenance barges. While in use, the vessels will be tied to the cages, otherwise they will be moored to the wharf or in service at other locations. Access to shore is necessary for all marine finfish sites. Wharves may be private or shared by multiple users or multiple sites and are suitable for site activities. The wharf used by this facility is the Government Wharf in Digby. Refer to sections **5.3.2.1 Right to Navigation** and **8.2.2 Boat Traffic and Wharves** for additional information.

2.3 Services and Suppliers

Although KCS is a vertically integrated company, it uses local suppliers whenever possible. Types of suppliers used by KCS in Nova Scotia includes divers, mechanics, boat repair facilities, hardware providers, welders, heavy-equipment operators, crane operators, marine suppliers, fuel distribution companies, environmental consultants, electricians, boat brokers, boat builders, engine suppliers, hotels, restaurants, and ferries. Figures 2 and 3 illustrate the location of Cooke Aquaculture's suppliers in Atlantic Canada and Nova Scotia, respectively.

Figure 2. Cooke Aquaculture Atlantic Canada Supplier Locations

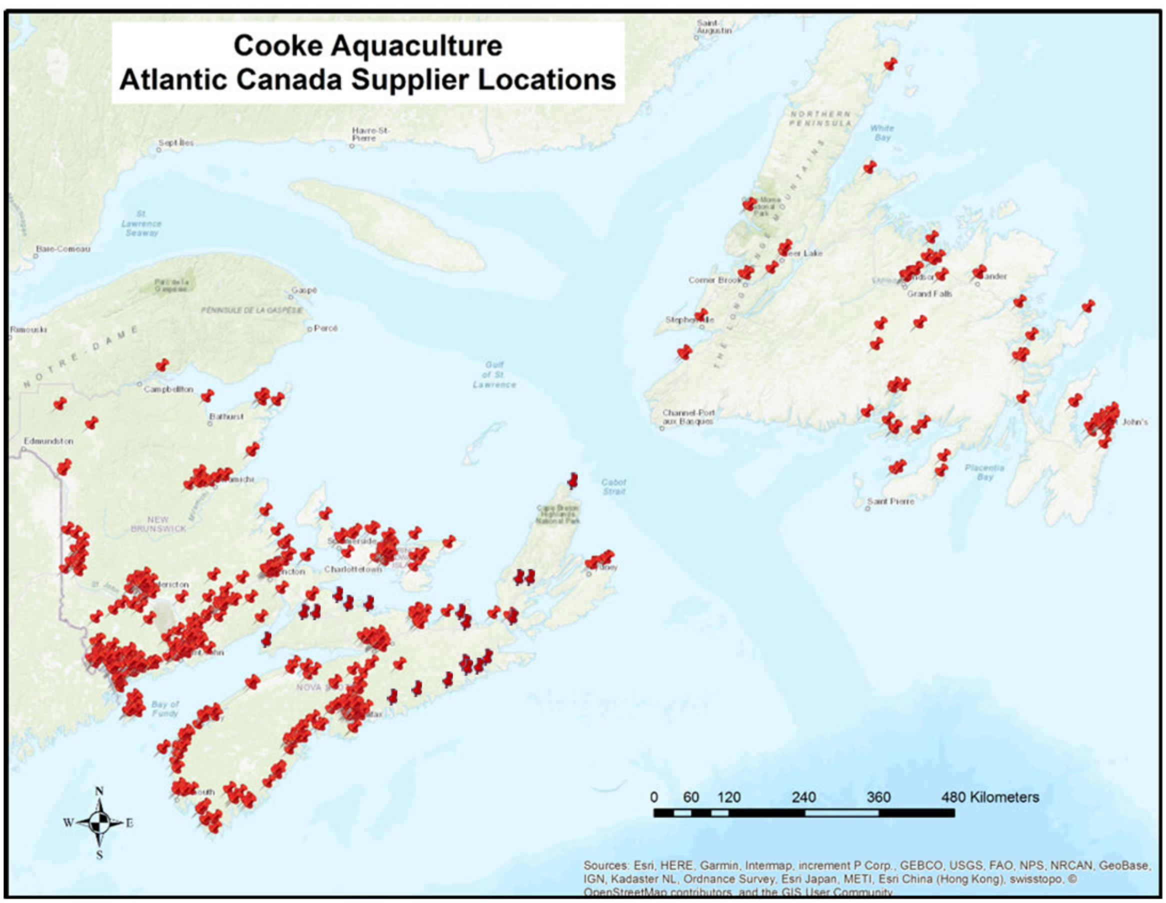
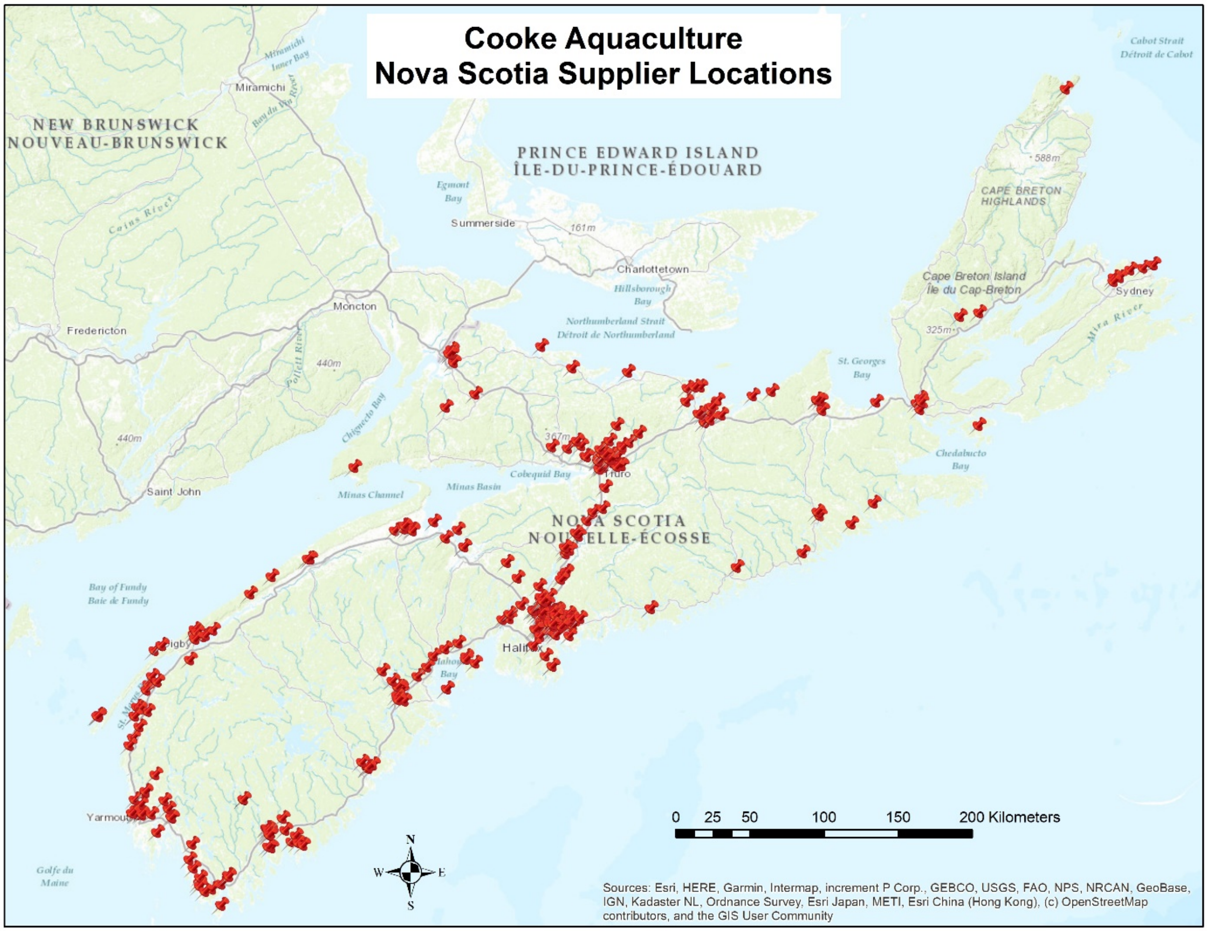


Figure 3. Cooke Aquaculture Nova Scotia Supplier Locations



2.4 Employment

KCS is Cooke Aquaculture's farming division, and Victoria Beach is an important component of KCS' success in Nova Scotia. Cooke Aquaculture employs approximately 1968 people in Atlantic Canada, with approximately 207 people employed in Nova Scotia. KCS' positions include feed and maintenance technicians, fish-health and environmental-management professionals, technical support, boat captains, accounting, human resources, and various administrative positions. The majority of positions offered by KCS in Nova Scotia are full time. Cooke's operations also contribute to employment in service and supply industries, as listed in section **2.3 Services and Suppliers**. In addition, KCS' feed division, Northeast Nutrition Inc., is based in Truro and their distribution company, AC Covert, is based in Dartmouth.

The proposed expansion will increase production by approximately 20% and will result in increased employment numbers in the local area in both direct and indirect jobs.

2.5 Other Economic Contributions to the Local Community and Province

KCS contributes to the local economy in Digby and throughout Nova Scotia by using the services and suppliers listed in section **2.3 Services and Suppliers**. Services and suppliers are locally sourced whenever possible. The proposed expansion will increase KCS' contribution to the provincial GDP and federal, provincial, and municipal taxes.

2.6 Financial Viability

Proof of financial viability will be submitted directly to NSDFA separate from this application.

2.7 Adverse Economic Impacts

As evidenced by the 27 years the farm has been in operation, the Victoria Beach farm does not displace any other industry. KCS actively communicates with other local industries and permits local fishermen to use the lease area for fishing. There are no expected adverse economic impacts.

SECTION 3.0 FISHERIES ACTIVITIES IN THE PUBLIC WATERS SURROUNDING THE PROPOSED AQUACULTURAL OPERATION

3.1 Status of Fisheries Activities

3.1.1 Commercial Fisheries

There are over 500 species of fish found in Atlantic Canada and most of them are present off the Atlantic coast of Nova Scotia. However, the number of commercially harvested finfish is much less than this and can be roughly grouped into two categories: 1) groundfish, which occur on or close to the seafloor, and 2) pelagic fish, which occur in the water column usually away from the seafloor. Various shellfish and seaweeds also support commercial fisheries. In 2020, the top five groundfish and pelagic species landed included herring, haddock, redfish spp., halibut, and hake (Table 4; Fisheries and Oceans Canada 2021a).

Table 4. Atlantic Coast Commercial Landings for 2020
Note: sourced from Fisheries and Oceans Canada (2021a)

2020 ATLANTIC COAST COMMERCIAL LANDINGS, BY REGION (metric tonnes, live weight)				
	Nova Scotia			
	Maritimes	Gulf	Total	Atlantic Total
Groundfish				
Atlantic Cod	1,010	5	1,015	14,004
Haddock	16,953	0	16,953	17,033
Redfish spp.	7,656	22	7,678	12,072
Halibut (Atlantic)	4,504	51	4,556	6,293
Flatfishes	x	x	717	15,762
Greenland turbot	26	x	x	10,707
Pollock	x	x	3,082	3,171
Hake	3,662	3	3,664	3,969
Cusk	146	0	146	146
Catfish	0	0	0	0
Skate	x	x	79	579
Dogfish	x	0	x	1
Other	x	x	651	710
Total	**38,487**	**82**	**38,569**	**84,446**
Pelagic & other finfish				
Herring	41,807	2,619	44,426	81,445
Mackerel	1,182	133	1,315	7,809
Swordfish	1,334	0	1,334	1,334
Tuna	471	51	522	768
Alewife	471	318	789	3,150
Eel	x	1	x	89
Salmon (Atlantic)	x	0	x	0
Smelt	0	0	0	59
Silversides	0	0	0	167
Shark	x	0	x	1

Capelin	0	0	0	26,391
Other	11	0	11	31
Total	**45,282**	**3,122**	**48,404**	**121,245**

X Suppressed to meet confidentiality requirements

<u>Groundfish</u>

There are a several commercially harvested species of groundfish off the shores of Nova Scotia. The most common traditional fisheries include cod, haddock, and pollock, which occur mainly on the large fishing banks and in the Bay of Fundy. The fishery is conducted using mobile gear (otter trawl) and fixed gear (longline, handline, and gillnet) with the most active time of year being July through September (Rozalska and Coffen-Smout 2020). Haddock in 4X is in a rebuilding phase with stocks continuing to increase in biomass for the last decade (DFO 2017a). However, fish size is decreasing at age (DFO 2017b). Cod in 4X demonstrate poor juvenile recruitment and low biomass levels (DFO 2019a), with biomass indices being the lowest in the time series (DFO 2020a). O'Boyle (2012) listed Western Scotian Shelf cod as critical. The western-component pollock fishery experienced a period of diminished numbers-at-age for older ages from 1995–2005, with some modest improvement since then (DFO 2020b). In 2018 and 2019, indices at length of western-component pollock were below both the long-term and short-term median for lengths greater than 51 cm (DFO 2020a).

Flatfish are also important commercial groundfish, but they are caught mostly on the fishing banks and deeper areas (Rozalska and Coffen-Smout 2020). In NAFO Divisions 4X5Y, these species are halibut, yellowtail flounder, American plaice, winter flounder, and witch flounder (Rozalska and Coffen-Smout 2020). Overall, most flatfish species in this area are in decline or at low levels. Winter flounder is better in overall status; however, recent declines in biomass have been observed (DFO 2020a). American-plaice stock status was still in decline as of 2016 and COSEWIC considers the Maritime population to be threatened (COSEWIC 2009a). Halibut stocks appear to be improving (DFO 2020a), and the biological information for this species continues to develop.

O'Boyle (2012) had considered silver-hake stock status to be critical; however, recent biomass estimates showed increases from 2008 to 2016 (DFO 2017b) but with further declines in 2017 and 2019 (DFO 2020a).

The Victoria Beach site is in Maritimes Statistical Districts 38 and 39. For 2015, 177,099 kg of groundfish were landed with a value of $420,741. Key species landed included Atlantic cod, witch flounder, haddock, halibut, monkfish, pollock, redfish, sculpin, skate, white hake, and winter flounder. Both sculpin and winter flounder were noted as species caught for bait (C. O'Neil, pers. comm.). There is no directed fishery for skates in the Maritime Region, but skates, other than thorny skates, may be retained or discarded in NAFO divisions 4X5 (Rosalska and Coffen-Smout 2020). Environment and Climate Change Canada (2017a) reports a groundfish fishery around site #1040. Fisheries and Oceans Canada were contacted for more recent landing data from 2018 and 2019; however, due to confidentiality requirements data from Districts 36, 37, and 38 were combined to encompass all of Digby

County, and Districts 39 and 35 were combined as Annapolis County. In 2018 and 2019, haddock and redfish were among the top 5 species landed in Digby County (A. Campbell, pers. comm.); in 2020 and 2021, haddock and redfish were again among the top 5 species landed (D. Eberhard, pers. comm.). Other species counted among the landings in District 38 for 2020 and 2021 included winter and witch flounders, little and winter skates, sculpin, halibut, monkfish, cod, and pollock. In District 39, groundfish species landed in 2020 and 2021 included halibut and sculpin (D. Eberhard, pers. comm.).

Figures 4 - 11 show the approximate groundfish landings off the coast of Nova Scotia between 2014 and 2018 (Rozalska and Coffen-Smout 2020).

<u>Species list</u>

- Atlantic pollock (*Pollachius virens*)
- Haddock (*Melanogrammus aeglefinus*)
- Atlantic cod (*Gadus morhua*)
- Winter and witch flounder (*Pseudopleuronectes americanus* and *Glyptocephalus cynoglossus*)
- Atlantic halibut (*Hippoglossus hippoglossus*)
- Sculpin (*Myoxocephalus* spp.)
- Little, winter and unspecified skates (*Leucoraja erinacea*, *Leucoraja ocellata*)
- Cusk (*Brosme brosme*), restricted to by-catch only
- Redfish (*Sebastes* sp.)
- Monkfish (*Lophius americanus*)
- White hake (*Urophycis tenuis*), restricted to by-catch only

Figure 4. Commercial Groundfish Landings (2014-2018)

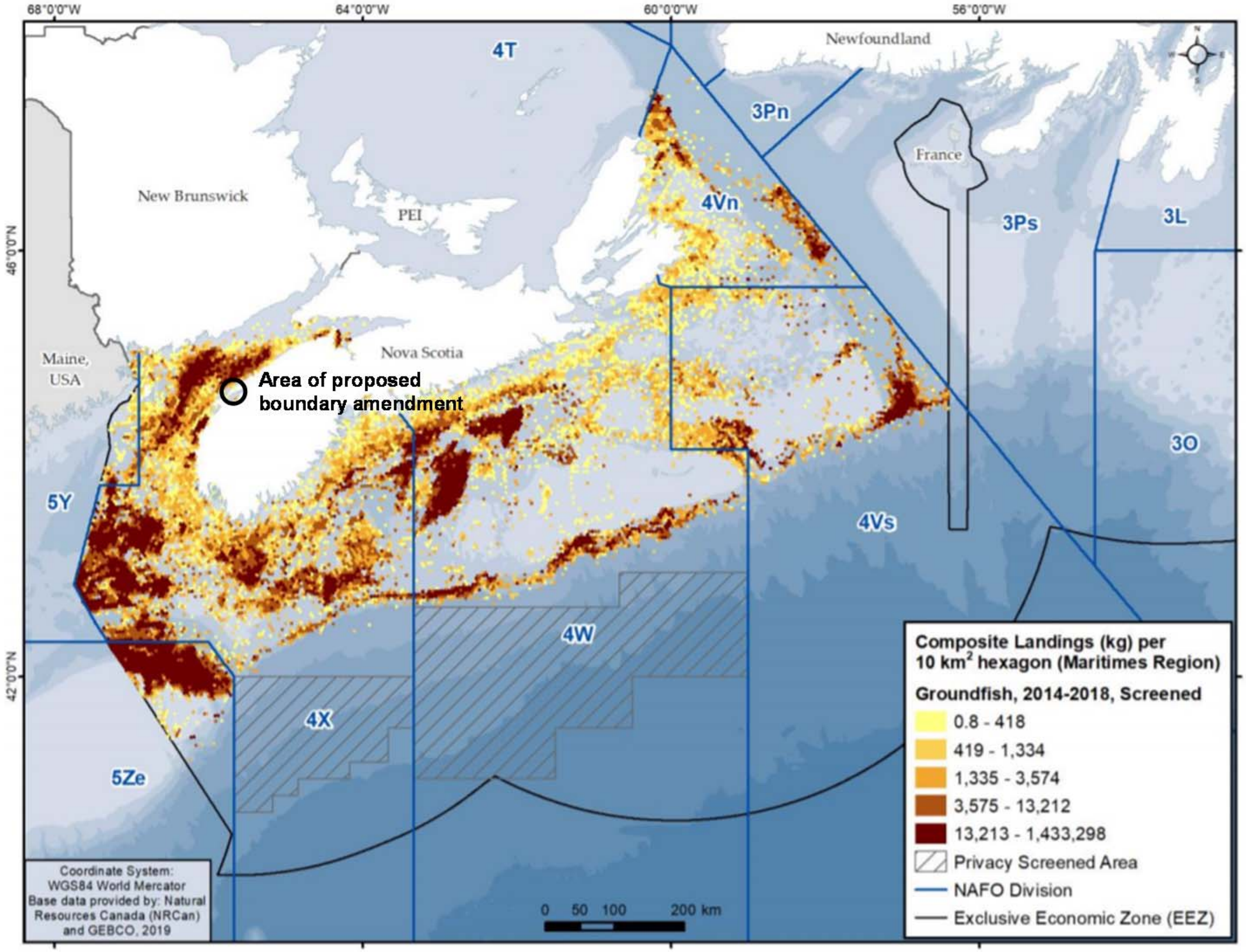


Figure 5. Commercial Cod, Haddock, and Pollock Landings (2014 – 2018)

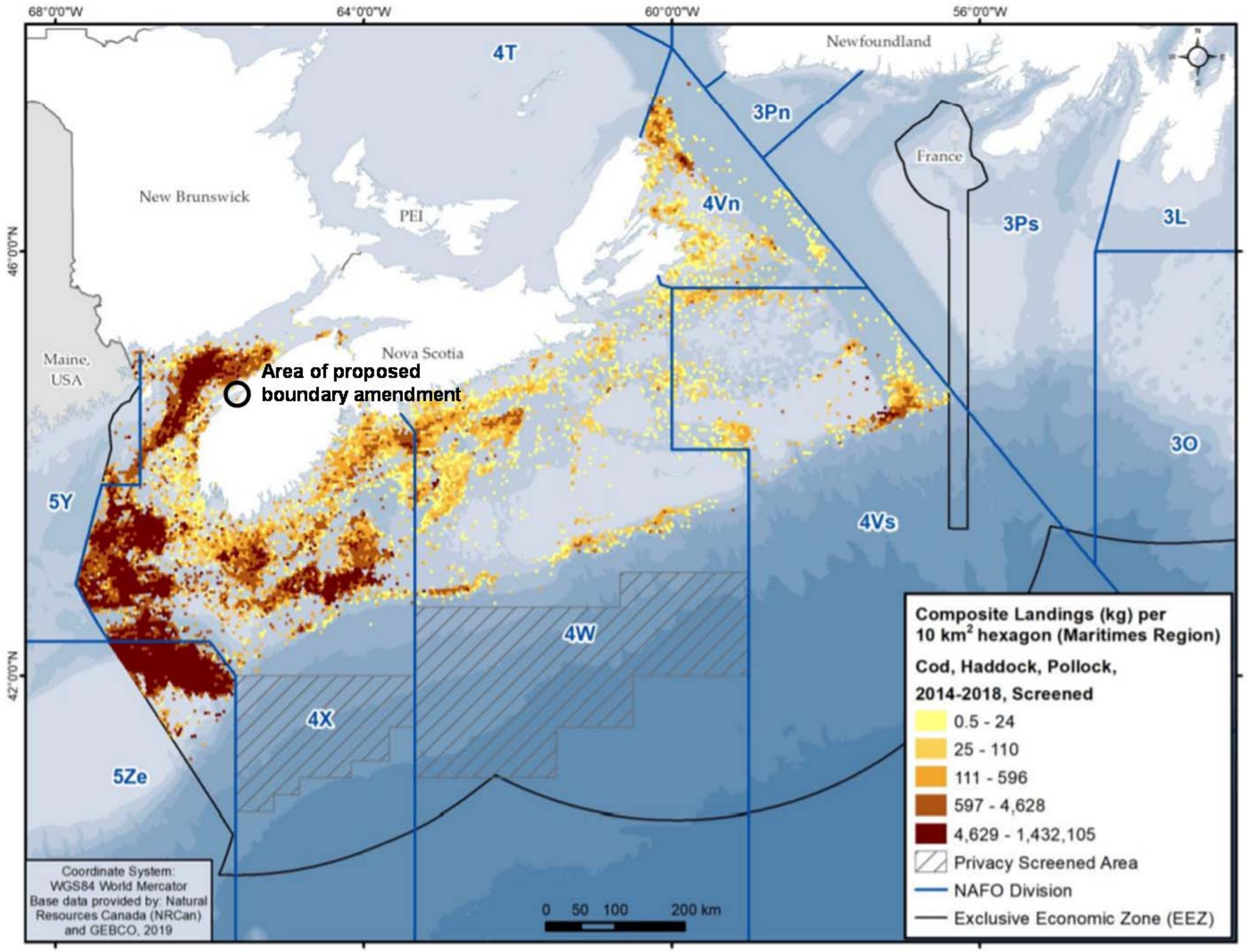


Figure 6. Commercial Flatfish Landings (2014 – 2018)

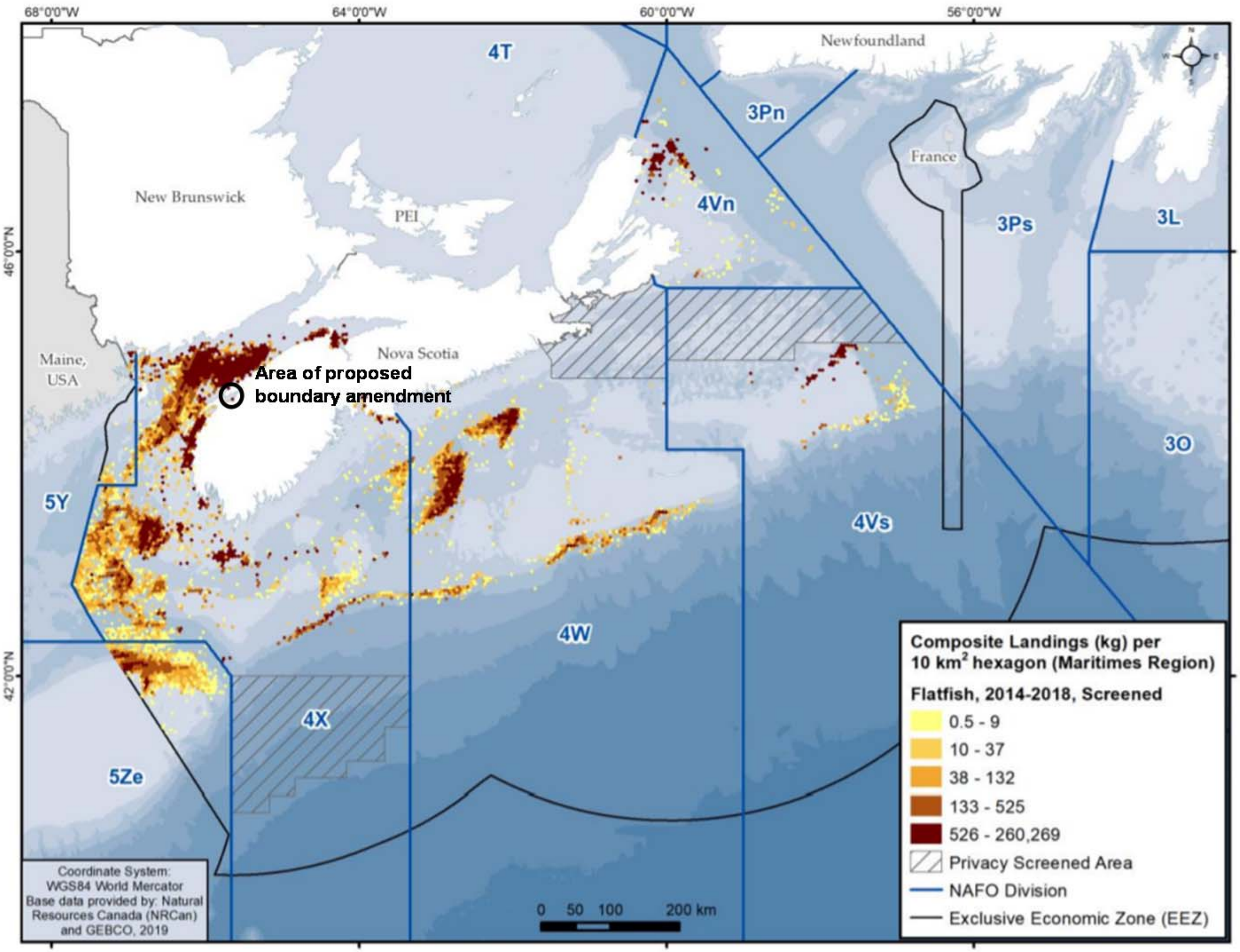


Figure 7. Commercial Atlantic Halibut Landings (2014 – 2018)

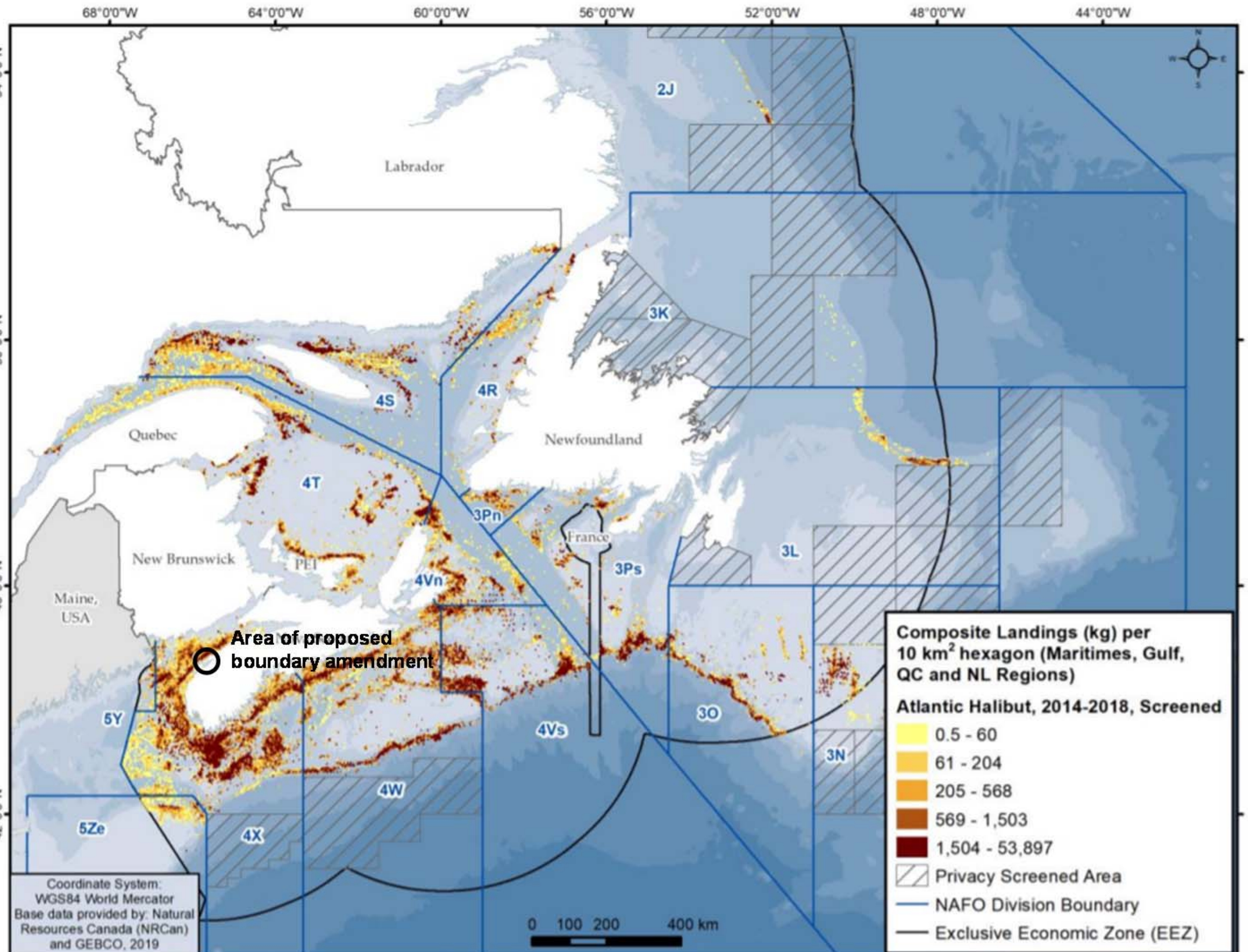


Figure 8. Redfish Landings (2014 – 2018)

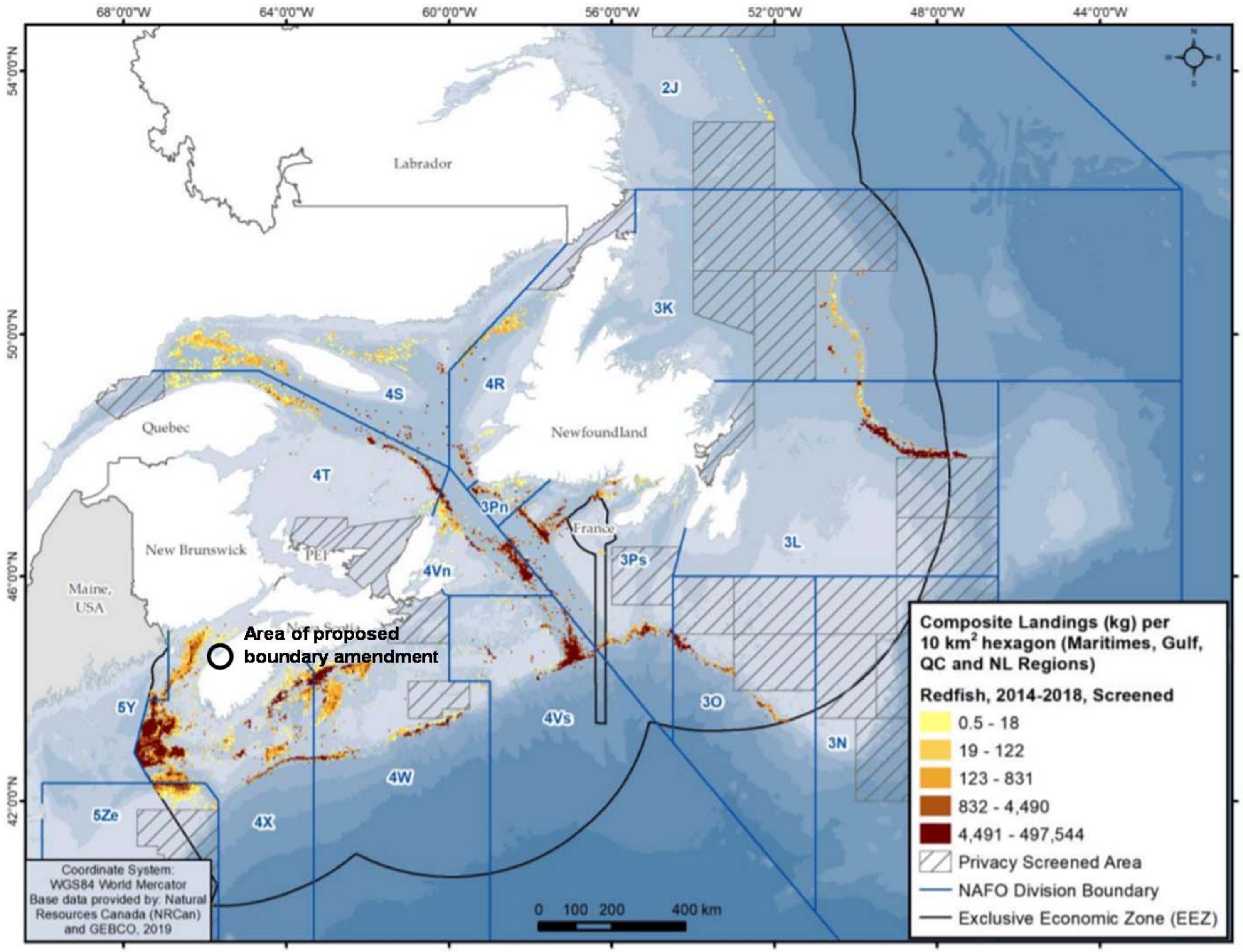


Figure 9. Monkfish Landings (2014 – 2018)

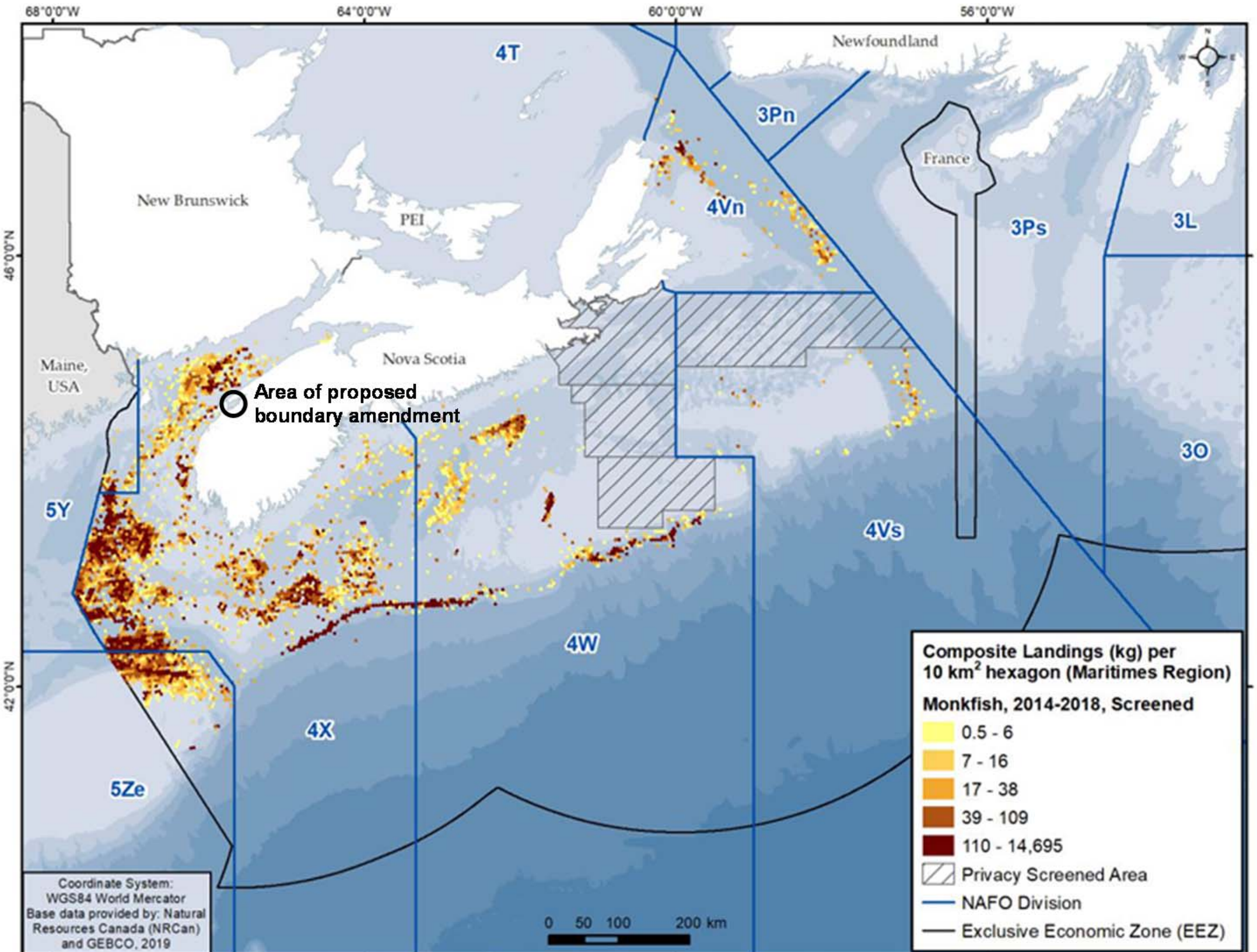


Figure 10. Sculpin Landings (2014 – 2018)

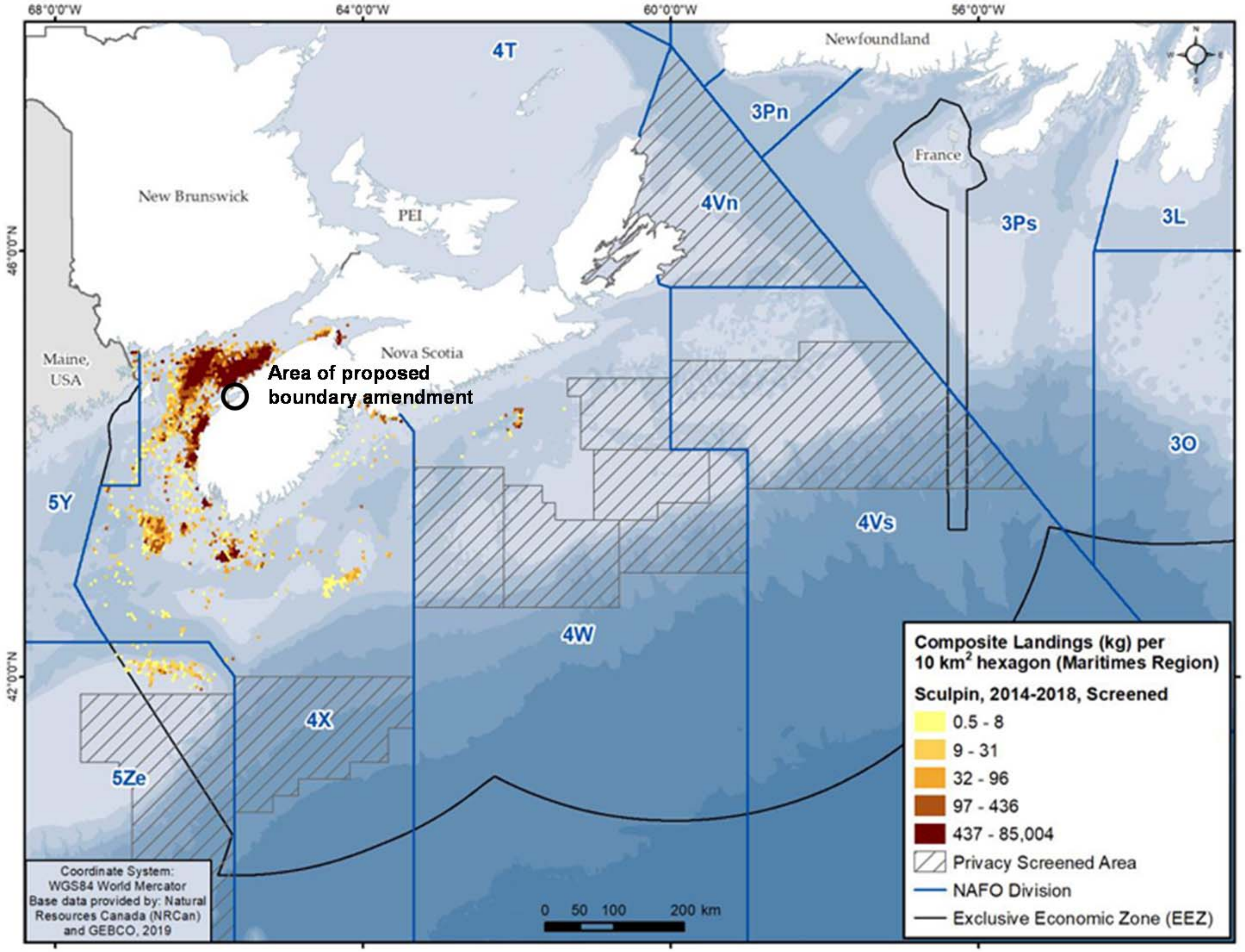
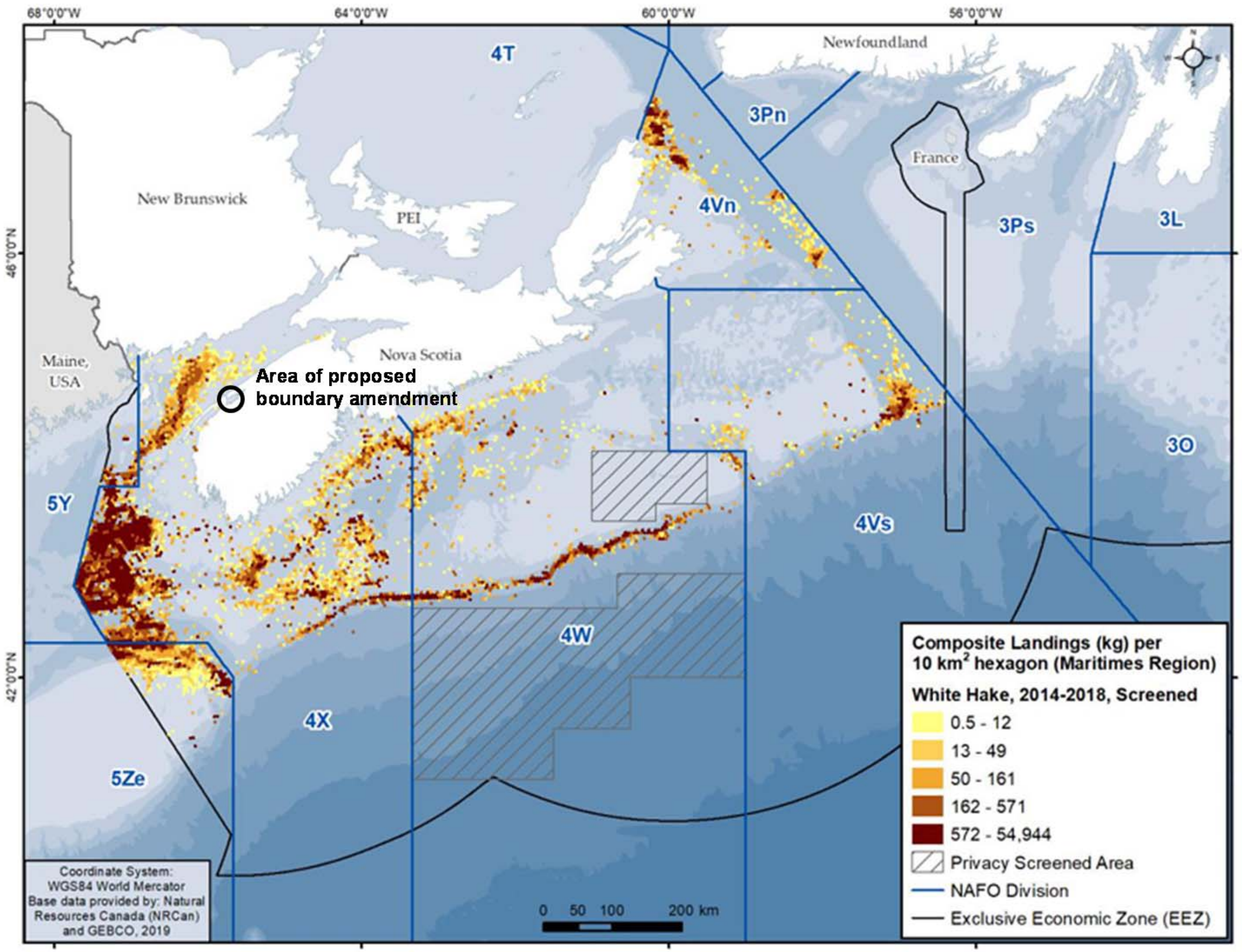


Figure 11. White Hake Landings (2014 – 2018)



Pelagics

The most-common commercial species of pelagic fish off the shores of Nova Scotia include herring (Fig. 12), mackerel (Fig. 13), swordfish, tuna, and alewife, with herring being the most valuable pelagic in 2020 (Table 4; Fisheries and Oceans Canada 2021a). Herring (*Clupea harengus*) stocks in the Southwest Nova Scotia / Bay of Fundy herring spawning component have been of concern for a decade or more, with no observed increase in stock despite reduced catch levels (DFO 2020c). Clark et al. (2012) presented evidence of the decline in spawning grounds, targeting of juveniles in the fishery, and declines in catches. There was an increasing trend in Scots Bay from 2005 to 2019, and a decreasing trend in German Bank from 1999 to 2019, but recent biomass estimates show an increase in German Bank in 2019, and a decrease in Scots Bay (DFO 2020c). Approximated moving-biomass averages for the Southwest Nova Scotia / Bay of Fundy area have been decreasing since 2015 with a slight increase in 2019 (DFO 2020c). The herring fishery largely takes place on dense summer feeding, overwintering, and spawning locations and is dominated by purse seine, gillnet, and weir (DFO 2020c).

The Northwest Atlantic mackerel stock ranges from North Carolina to Labrador and has northern and southern spawning contingents (TRAC 2010). The Department of Fisheries and Oceans considered the status of the Atlantic mackerel stock to be in the critical zone and has since 2009 (Smith et al. 2021). The mackerel fishery is conducted with gillnets, jiggers, hand lines, seines, and traps, depending on the region and time of year. It is primarily an inshore fishery of the spring and summer months and extends into more offshore waters for the fall and winter (DFO 2019b). Current allowable catch is unlikely to allow for stock growth (Smith et al. 2021). Figure 13 illustrates the general distribution of mackerel fishing activities in Atlantic waters.

The small-pelagics fisheries are Scotia-Fundy wide, meaning that any gillnet licence holder may fish in the area.

The North Atlantic swordfish stock in 2015 was above B_{MSY} and the fishing mortality was below F_{MSY}, indicating that stocks were healthy and not overfished (ICCAT 2017). Swordfish (Fig. 14) are caught using longline and harpoon, primarily along the edge of Georges Bank, the Scotian Shelf, and the Grand Banks from vessels often less than 65 feet. The Government of Canada (2013) lists principal ports in Nova Scotia as Shelburne, Sambro, Wood's Harbour, and Clark's Harbour.

The bluefin tuna (Fig. 15) is the most common tuna found off the coast of Nova Scotia and is fished with tended line, rod and reel, electric harpoon, pelagic longline, and trap nets (Government of Canada 2019a). The 2020 Standing Committee on Research and Statistics (SCRS) advice to the International Commission for the Conservation of Atlantic Tunas (ICCAT) indicates that bluefin-tuna stock biomass has decreased between 2017 and 2020 due to the strong year class of 2003 having passed its peak biomass and below-average recruitment in recent years (ICCAT 2020a). The SCRS suggests that overfishing has been occurring since 2018. As of 2020, albacore tuna stocks are not considered to be overfished

(ICCAT 2020b). Yellow-fin tuna stocks are considered healthy but maybe at the overfishing threshold; bigeye-tuna stocks are being overfished (ICCAT 2019).

In Maritimes Statistical Districts 36, 37, and 38 (Digby), fisheries landings were reported together for the county. Pelagic landings and associated value were not provided separately, other than herring. Preliminary data for 2018 and 2019 indicate 7,148 MT and 3,664 MT of herring were landed, respectively (A. Campbell, pers. comm.). Preliminary numbers for 2020 and 2021 are 4,966 MT and 5,771 MT of herring, respectively (D. Eberhard, pers. comm.). In Maritimes statistical districts 35 and 39 (Annapolis), no pelagic species were reported separately. Species other than lobster were combined into one category which together resulted in preliminary figures of 307 and 350 MT of landings in 2018 and 2019, respectively. For 2020 and 2021, preliminary figures are 664 MT and 140 MT of other species (D. Eberhard, pers. comm.). Among the pelagic species landed in District 39 were alewife/ gaspereau, elvers, and smelt.

For Digby and Annapolis Counties, 2020 – 2021 First Nations fisheries landings included bluefin tuna, herring, and elvers (D. Eberhard, pers. comm.).

Figures 12 - 15 show the approximate commercial pelagic landings off the coast of Nova Scotia between 2014 and 2018 (Rozalska and Coffen-Smout 2020).

Species list

- Atlantic bluefin tuna (*Thunnus thynnus*)
- Atlantic herring (*Clupea harengus*)
- Alewife (*Alosa pseudoharengus*)
- Elvers (*Anguilla rostrata*)
- Smelt (*Osmerus mordax*)

Figure 12. Commercial Herring Landings (2014 – 2018)

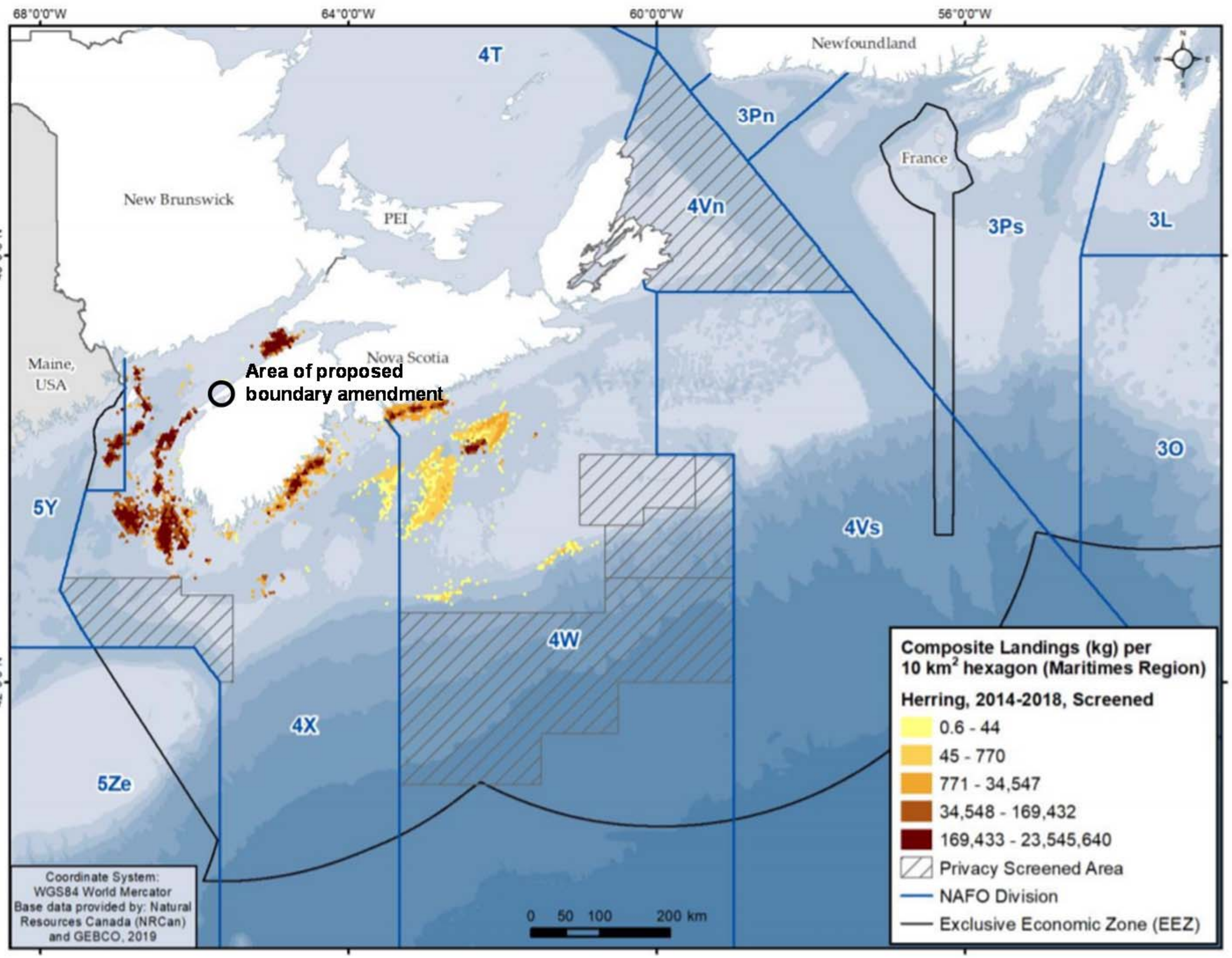


Figure 13. Commercial Mackerel Landings (2014 – 2018)

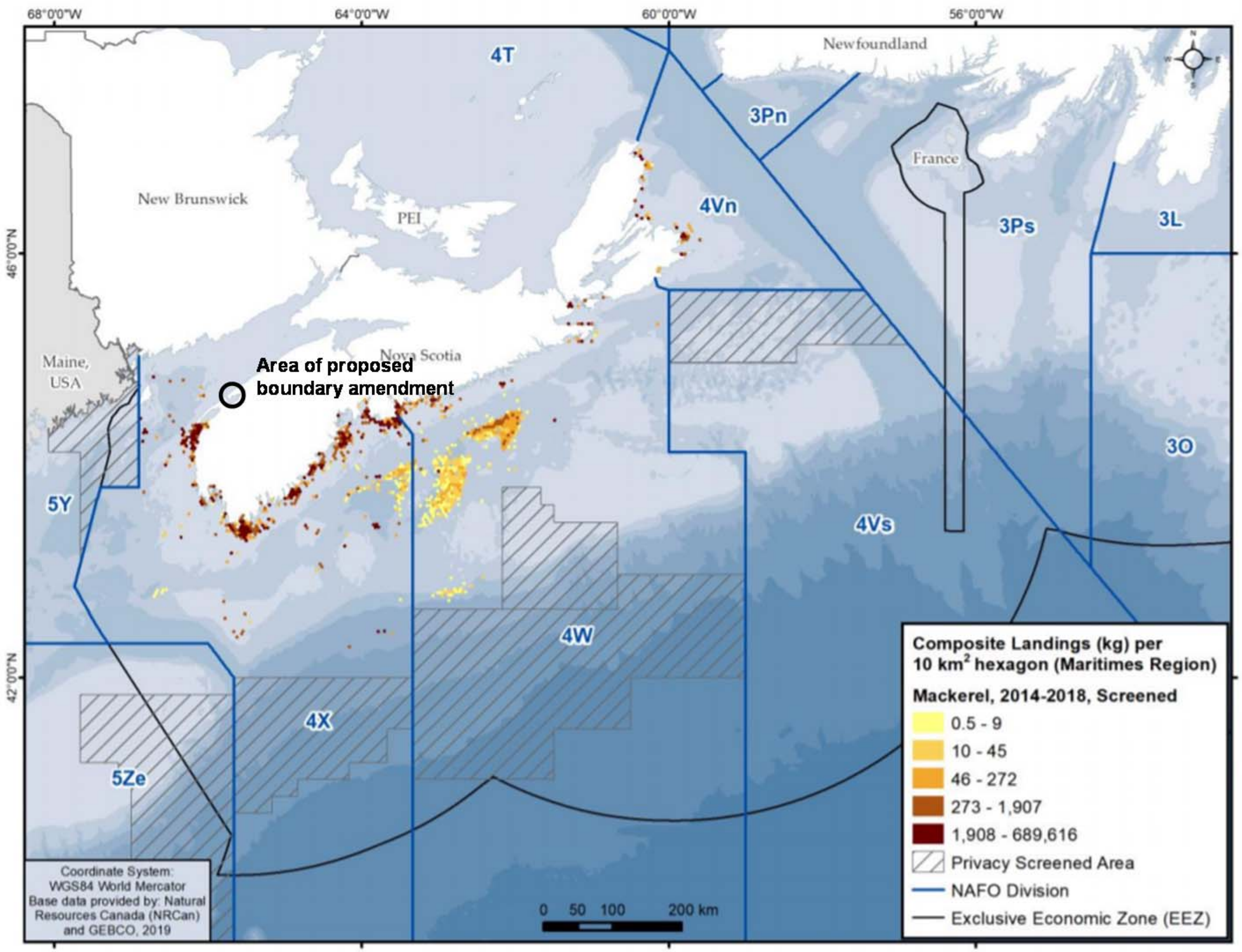


Figure 14. Commercial Swordfish Landings (2014 – 2018)

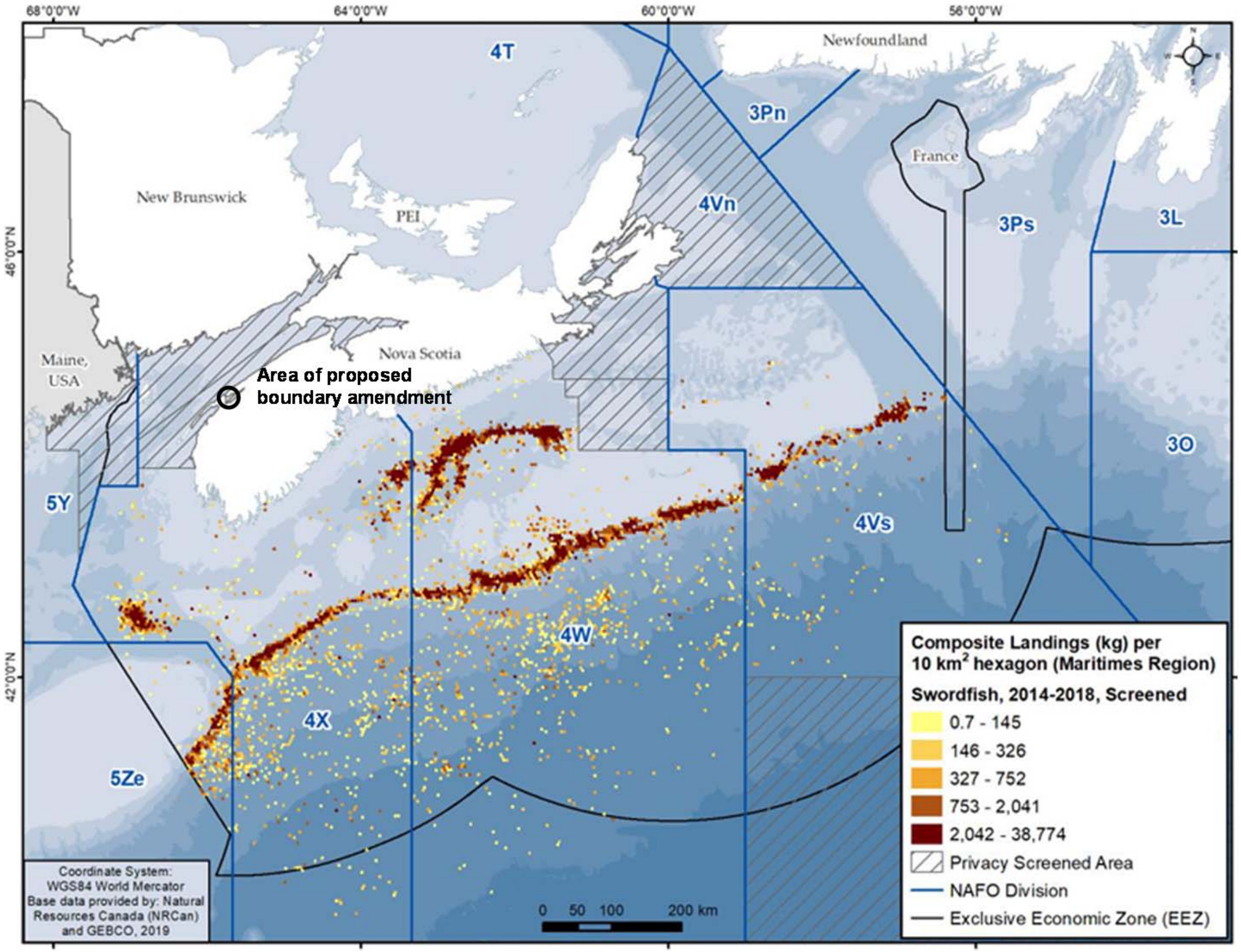
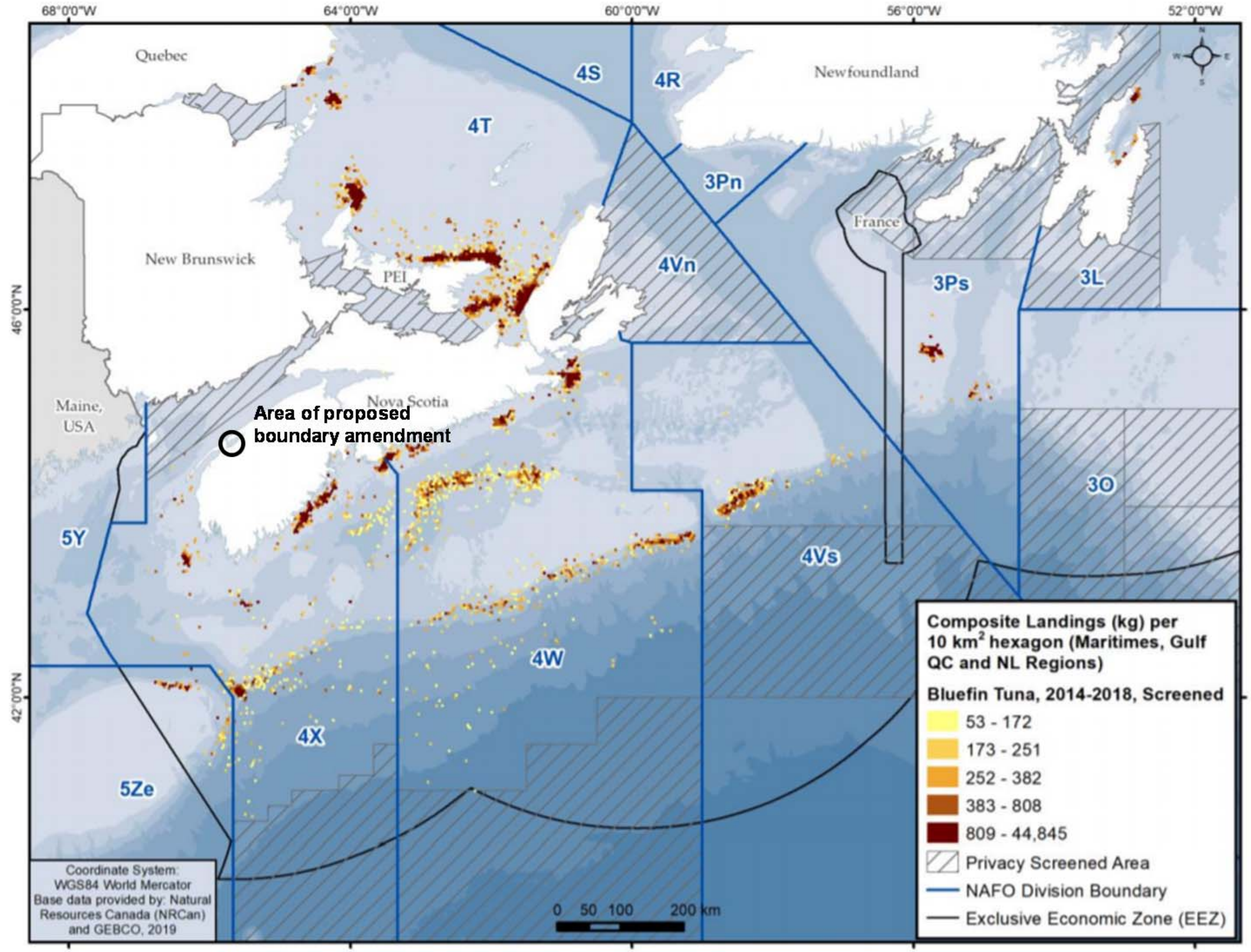


Figure 15. Commercial Bluefin Tuna Landings (2014 – 2018)



Shellfish and Other Invertebrates

There are several shellfish species that are harvested off Nova Scotia and included are such commercially important species as scallops, lobsters, shrimp, and clams (Table 5; Fisheries and Oceans Canada 2021a). Also harvested are crabs, sea cucumber, and sea urchins.

Table 5. Atlantic Coast Commercial Landings for 2020
Note: source from Fisheries and Oceans Canada (2021a)

2020 ATLANTIC COAST COMMERCIAL LANDINGS, BY REGION (metric tonnes, live weight)				
Species		**Nova Scotia**		
	Maritimes	**Gulf**	**Total**	**Atlantic Total**
Shellfish				
Clams / quahog	21,303	27	21,330	38,627
Oyster[1]	x	x	29	x
Scallop[2]	57,687	92	57,780	63,412
Squid	x	0	x	3,530
Mussel[3]	0	0	0	0
Lobster	15,271	4,881	20,151	68,070
Shrimp	19,209	0	19,209	66,106
Crab, Queen	8,862	5,428	14,290	71,080
Crab, Other	239	x	x	2,545
Whelks	x	0	x	2,323
Cockles	x	0	x	x
Sea cucumbers	x	0	x	10,455
Sea urchin	x	0	x	1,474
Other	0	0	0	0
Total	**125,807**	**10,743**	**136,550**	**330,130**
Subtotal	**209,576**	**13,947**	**223,522**	**535,821**
Others				
Marine plants	x	0	x	9,886
Lumpfish roe	x	0	x	80
Miscellaneous (4)	x	0	x	2,335
Total	84	0	84	12,300
GRAND TOTAL (5)	**209,660**	**13,947**	**223,607**	**548,121**

x Suppressed to meet confidentiality requirements
(1) Oyster: Atlantic includes wild and farmed data
(2) Scallop includes meat with roe
(3) PEI mussels are now classified under "aquaculture" because they are a farmed product
(4) Totals may not add up due to rounding

Invertebrate fisheries constitute the largest piece of the Nova Scotia fishery (Fisheries and Oceans Canada 2021a), of which, the lobster fishery is the primary component in terms of value. In 2020, Nova Scotia landed 20,151 MT of lobster valued at $280 million (Fisheries and Oceans Canada 2021a). The inshore lobster fishery dominates the Maritimes lobster landings and is shown in Figure 16. The proposed farm falls within lobster fishing area (LFA)

35. Since 2011, LFA 35 has been in a high-productivity period, with increasing abundance since the early 2000s (DFO 2021a). The LFA 35 lobster stock is currently considered to be healthy (DFO 2021a). Typical lobster grounds are characterized by a hard seafloor such as ledge, boulder, or cobble (Lawton 1993) whereas the proposed aquaculture farm is located over mixed substrate consisting mostly of gravel and sand (see **Appendix B Victoria Beach Baseline Assessment Report**). However, lobster fishermen are known to set their traps in waters ranging from a few feet deep to 25 fathoms and on various bottom types (C. MacDonald, pers. comm.). The presence of newly settled lobsters was documented between the Victoria Beach and Port Wade areas in the early 1990s during diving surveys (DFO 2020e); therefore, shallow (< 20 m deep), hard-bottom seafloor within the lease area could be potential lobster settlement habitat.

Fisheries for red crab, Jonah crab, and rock crab are smaller in scale than for snow crab. The Jonah-crab fishery occurs in both offshore and coastal areas of Southwestern Nova Scotia with landings occurring from the Bay of Fundy, Crowell Basin, and Browns Bank (Fig. 17; Rozalska and Coffen-Smout 2020). In 2020 and 2021, rock crabs and Jonah crabs were landed in Districts 38 and 39 (D. Eberhard, pers. comm.). Commercial snow (queen) crab landings for 2018 and 2019 are illustrated in Figure 18, which indicates that the proposed boundary amendment of Victoria Beach does not fall within a snow crab fishing area (see also Fig. 19.). Snow crab is the second most valuable Canadian fishery export product; however, a stock assessment indicated the Scotian Shelf biomass and allowable catches have continued to decrease since 2016 (DFO 2020f).

Shrimp represents one of Canada's most valuable seafood exports, with the northern shrimp being the only one of commercial importance on the Scotian Shelf. The fishery uses demersal otter-trawl fishing vessels both in the inshore and offshore fishery. Initially, shrimp fishing on the Scotian Shelf was concentrated in Shrimp Fishing Area (SFA) 16, which is off Southwest Nova Scotia (Fig. 20). The fishery there peaked in 1970 with 50 vessels landing 800 tonnes, but by 1977 the SFA 16 stock had decreased substantially (Fisheries and Oceans Canada 2013). A surge in landings occurred in 2010 but since have been very low to nil. Victoria Beach is within shrimp fishing area 16, which currently has no total allowable catch and is not active (Government of Canada 2021a).

The commercial fishery for scallops is typically offshore, although a smaller inshore fishery does occur along parts of the Atlantic coast (Fig. 21 & 22). Historically, the area off Digby, in the Bay of Fundy, has been the most important area for the inshore fishery (Rozalska and Coffen-Smout 2020). Scallop production area (SPA) 4 is located outside Annapolis Basin, and Annapolis Basin itself is SPA 5. Commercial catch rates in SPA 4 and 5 were 24.0 and 22.7 kg hr^{-1} in 2018 and 30.9 and 29.9 kg hr^{-1} in 2019, respectively (DFO 2021b). In SPA 4, the biomass estimate of recruit scallops was 7.0 MT in 2018 and 9.2 MT in 2019, both being below the long-term median of 31.8 MT, and the pre-recruit abundances in 2019 were low across most of SPA 4 (DFO 2021b). Although recruitment was below their respective long-term medians and, in SPA 4, coincident with low levels of pre-recruits, the commercial biomasses for both SPAs 4 and 5 are considered healthy (DFO 2021b).

Clams have been an important commercial fishery in the Annapolis Basin beginning in the mid-1800s (Sullivan 2007). The 1940s and 1950s saw plentiful harvests followed by the depletion of clam beds on various beaches by the 1960s (Sullivan 2007). From the 1970s to mid-1980s, overfishing resulted in record landings for the Annapolis Basin, despite the closure of some clam-harvesting areas. This was followed by several decades of decreasing catches, increasing closures, the rise of depuration plants, and complicated environmental and managerial changes affecting the fishery (Sullivan 2007). However, clams have remained a valued resource with as many as 279 clam licences remaining in Clam Harvesting Area 2 in 2006 (Sullivan 2007).

Preliminary landings data for Maritimes Statistical Districts 36, 37, and 38 were reported together for the county (Digby). Shellfish landings and associated value were not provided separately, other than for scallops and lobster. For 2018 and 2019, 7,769 MT and 8,215 MT of scallops were landed, respectively (A. Campbell, pers. comm.). For 2020 and 2021, 7,912 MT and 7,762 MT were landed (D. Eberhard, pers. comm.). For lobster, the values were 5,311, 5,162, 4,006, and 3,146 MT for 2018, 2019, 2020, and 2021, respectively. Preliminary landings data for Maritimes Statistical Districts 35 and 39 were reported together for the county (Annapolis). Only lobster landings were provided separately. For the years 2018, 2019, 2020, and 2021, 552, 475, 454, and 326 MT of lobster were landed, respectively. Other species landed in Districts 38 and 39 included rock and Jonah crabs, soft-shell, razor, surf/bar and other clams, and sea urchins.

First Nations fisheries landings for Annapolis and Digby Counties in 2020 and 2021 included soft-shell clam, sea scallop, Jonah crab, lobster, and green crab (D. Eberhard, pers. comm.).

Fisheries and Oceans Canada offers a real-time map of openings and closures of Canadian harvesting areas for bivalve shellfish (mussels, oysters, clams, quahogs, and scallops) (Fisheries and Oceans Canada 2021b). Prior to harvesting bivalve shellfish, it is the harvester's responsibility to ensure that the area is safe by referring to the real-time map to identify approved and prohibited areas for each bivalve species. On February 7, 2022, the area of site #1040 was closed to harvesting of some species of shellfish (Fig. 23).

<u>Species list</u>

- Lobster (*Homarus americanus*)
- Rock crab and Jonah crab (*Cancer irroratus* and *C. borealis*)
- Green crab (*Carcinus maenas)*
- Scallop (*Placopecten magellanicus*)
- Soft-shell clam, bar/surf clam, razor clam (*Mya arenaria*, *Spisula solidissima*, *Ensis leei*)
- Quahogs (*Mercenaria mercenaria*)
- Bar clam (*Spisula solidissima*)
- Sea urchin (*Strongylocentrotus droebachiensis*)

Figure 16. Total Lobster Catch
Note: Sourced from Serdynska and Coffen-Smout (2017)

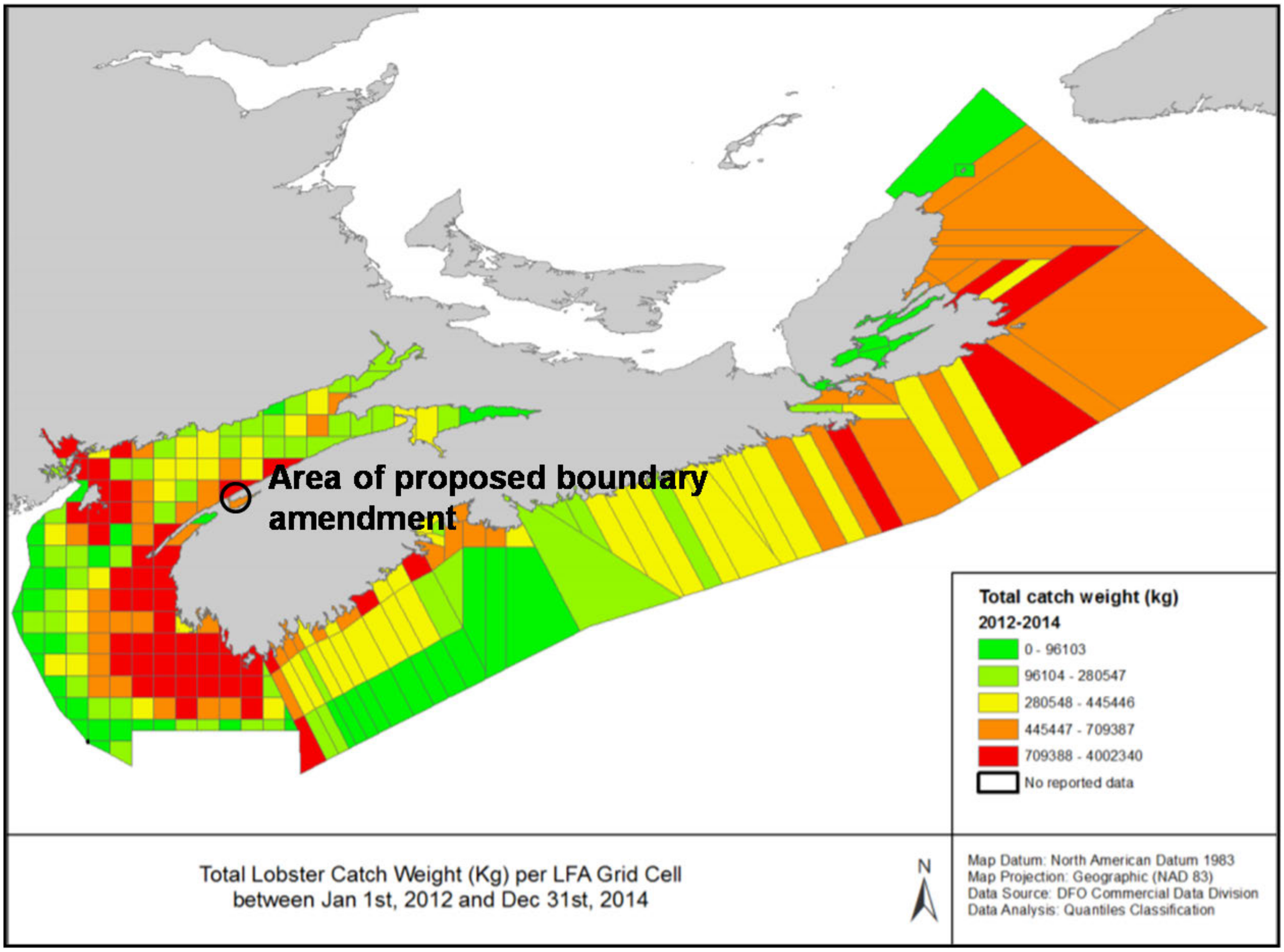


Figure 17. Other Crab Landings (2014 – 2018)
Note: sourced from Rozalska and Coffen-Smout (2020)

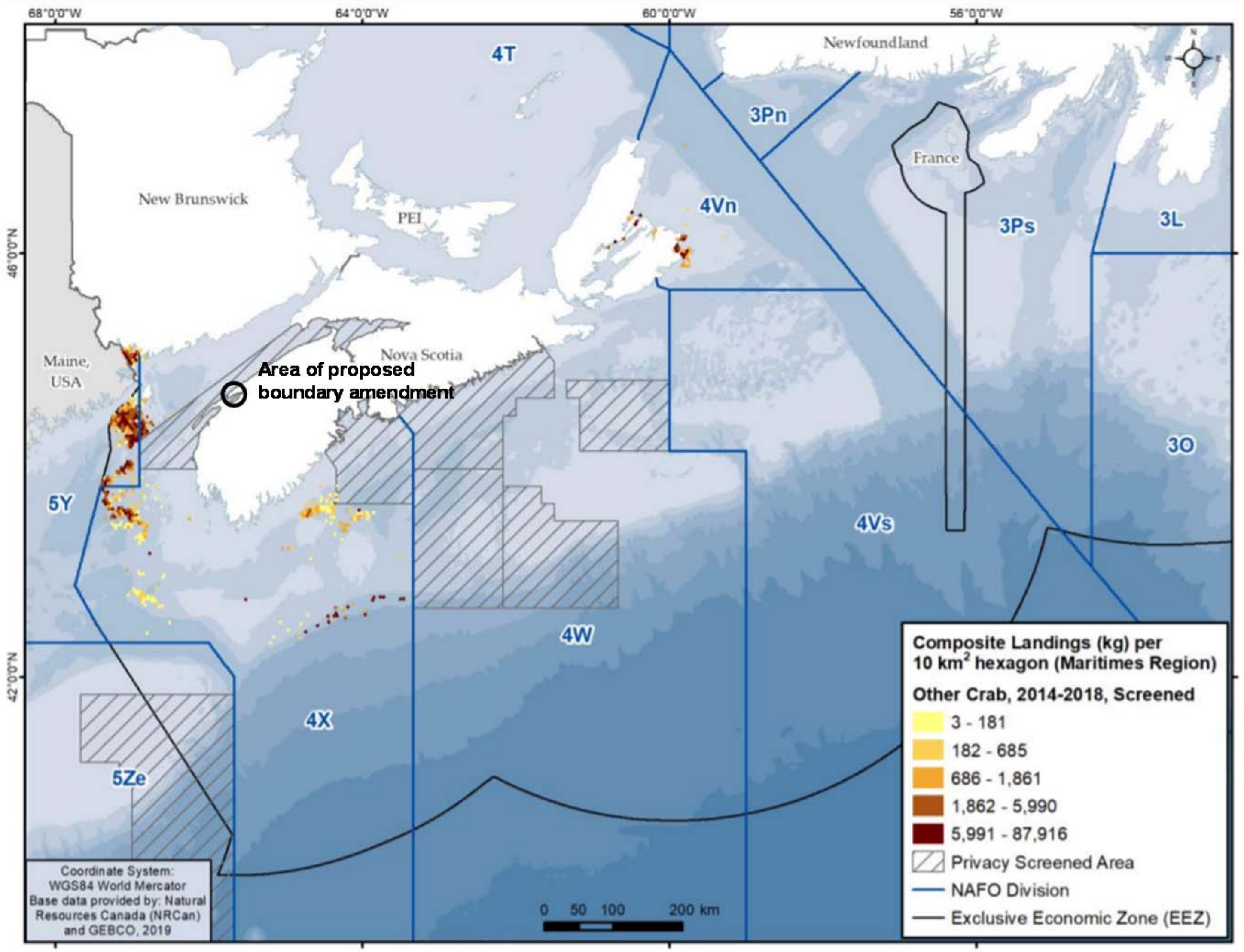


Figure 18. Commercial Snow Crab Landings
Note: Sourced from Fisheries and Oceans Canada (2020e)

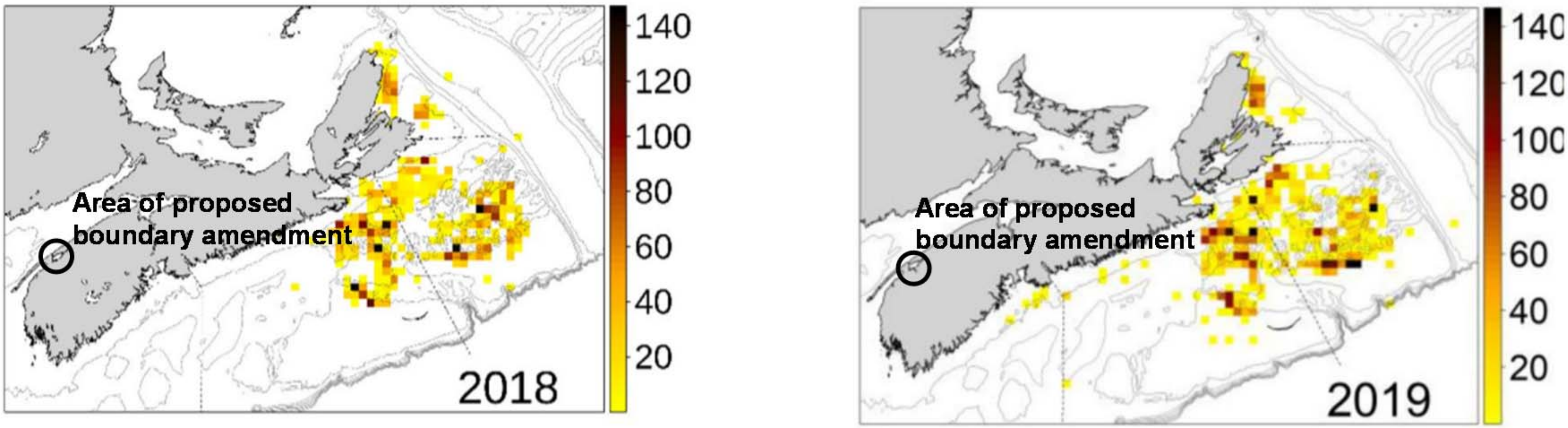


Figure 19. Commercial Snow Crab Landings (2014 – 2018)
Note: sourced from Rozalska and Coffen-Smout (2020)

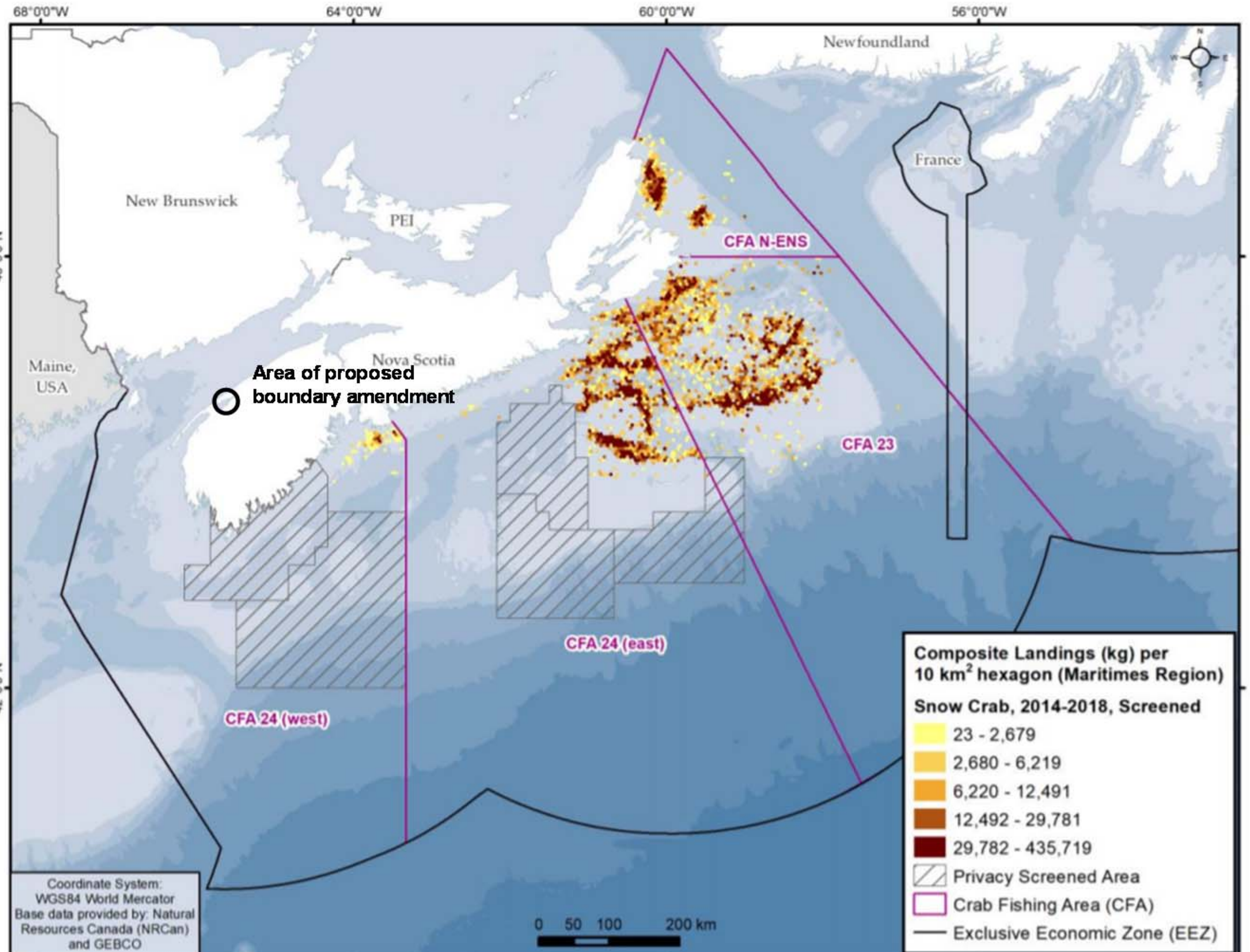


Figure 20. Shrimp Fishing Areas in Atlantic Canada
Note: Sourced from Government of Canada (2015b)

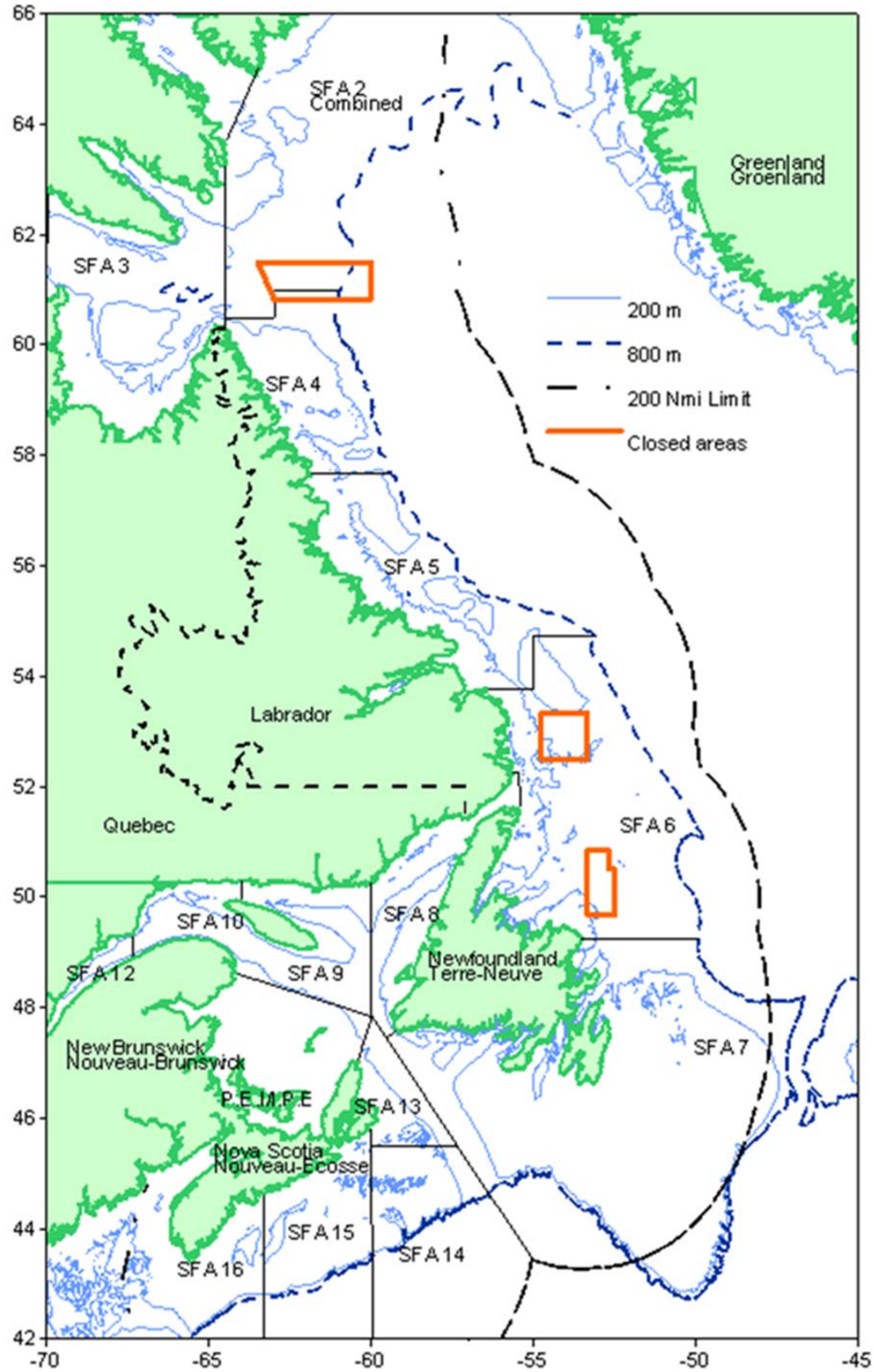


Figure 21. Commercial Scallop Landings (2014 – 2018)
Note: sourced from Rozalska and Coffen-Smout (2020)

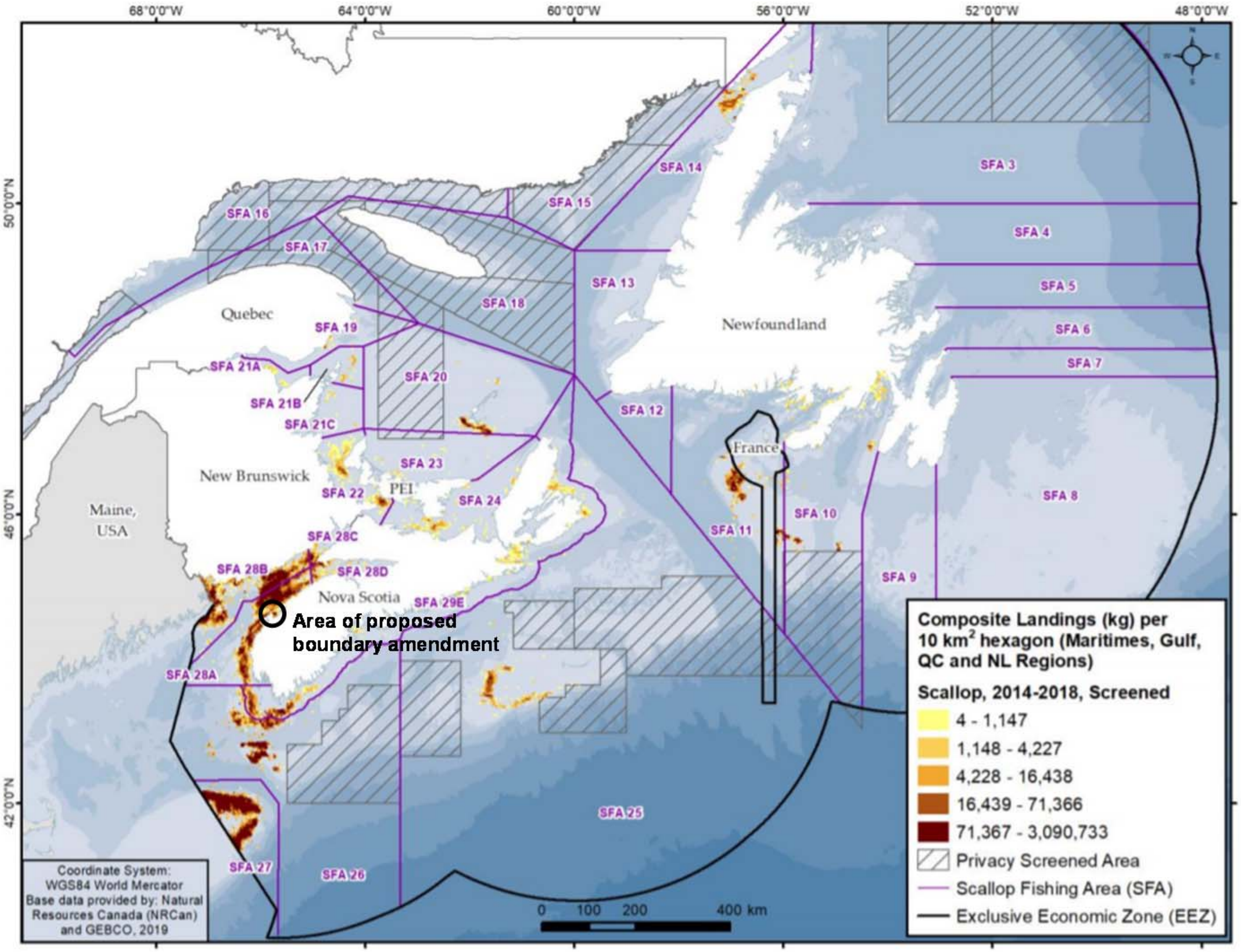


Figure 22. Scallop Production Areas
Note: sourced from Fisheries and Oceans Canada (2016)

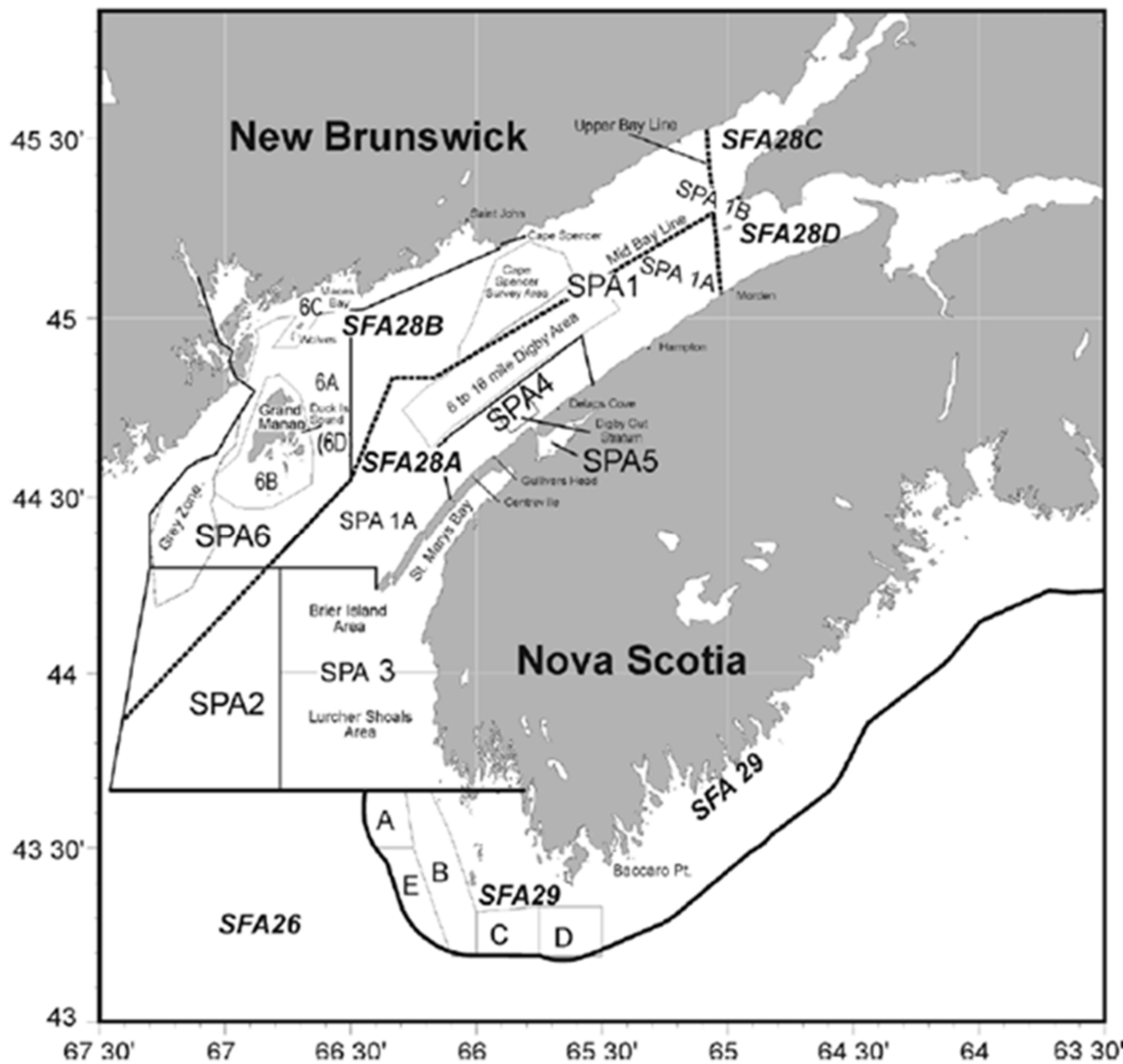
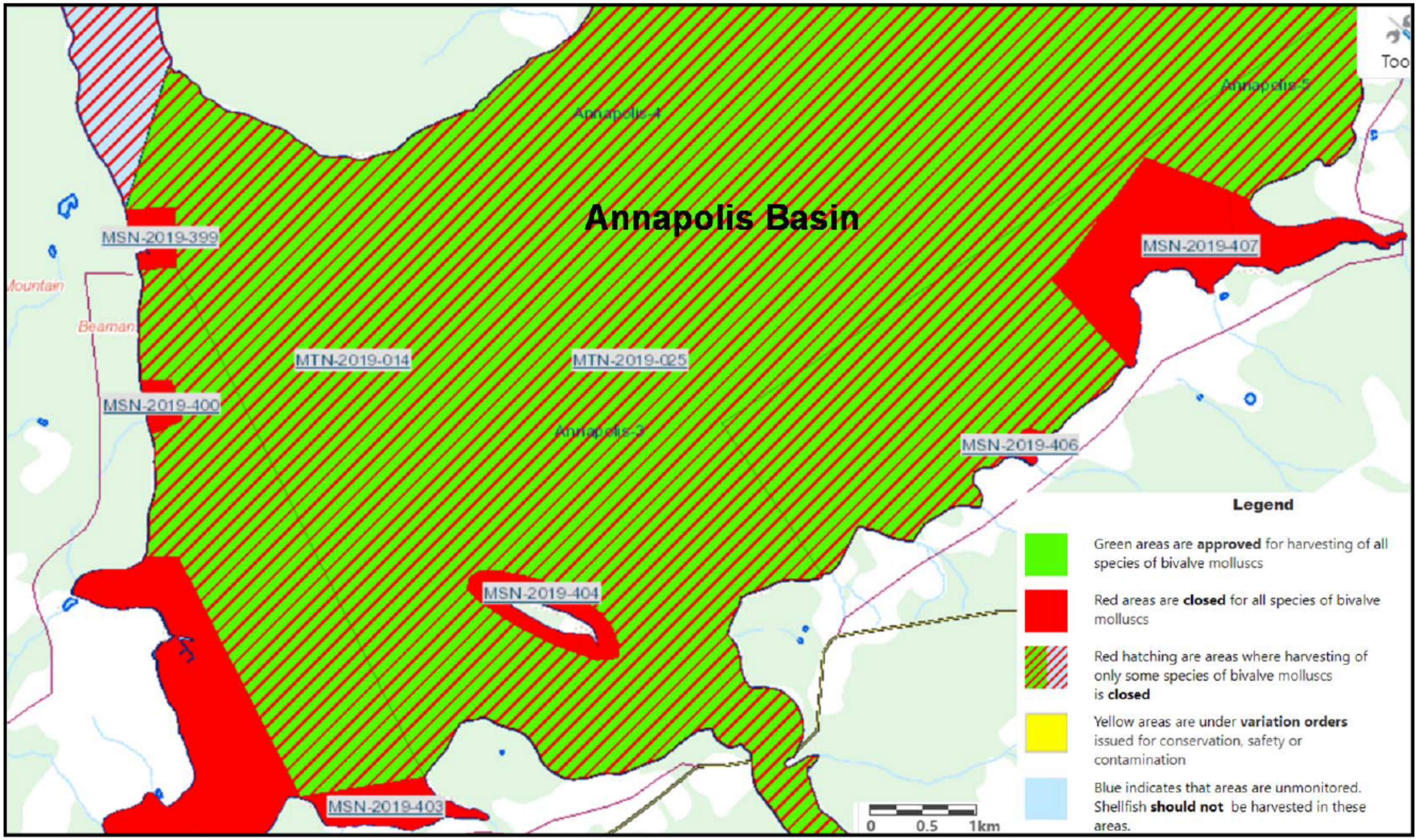


Figure 23. Real Time Shellfish Harvesting Classifications of the Annapolis Basin Area on February 7, 2022
Note: Fisheries and Oceans Canada is the central CSSP agency with respect to the real-time status of shellfish growing area classifications. Fisheries and Oceans Canada should be contacted directly for information on shellfish area closures (Fisheries and Oceans Canada 2021b).

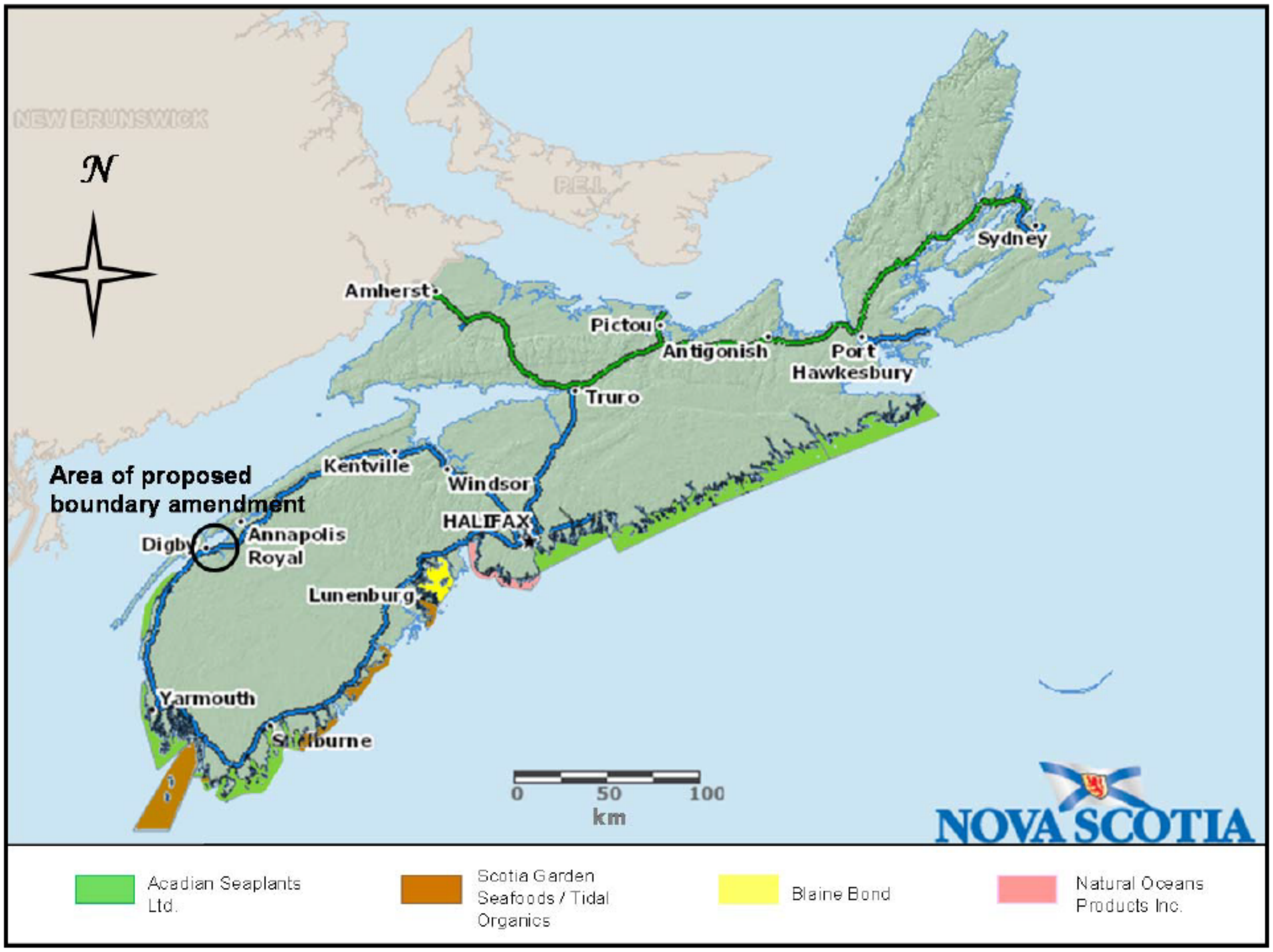


Seaweeds
Marine plants that are harvested commercially in Nova Scotia include rockweed (*Ascophyllum nodosum*), Irish moss (*Chrondus Chrispus*), dulse (*Palmaria palmata),* and kelp (*Saccharina latissima* and *Laminaria digitata*). In 2019, approximately 134 t of marine plants were landed in Nova Scotia (Fisheries and Oceans Canada 2021a; Table 5).

In Nova Scotia, *Ascophyllum* is harvested for animal fodder, food additives, fertilizer, and other specialty products. Irish moss is commonly harvested for its thickening and stabilizing properties (i.e., carrageenan). Though the species was not under any immediate threat, Irish-moss populations were beginning to experience signs of increased pressure in site-specific harvesting, and protection methods were beginning to be recognized (DFO 2013a).

The province of Nova Scotia has jurisdiction over the issuing of rockweed licences. A provincial representative from NSDFA explained that rockweed harvesting can coexist with aquaculture and no conflict is anticipated between the industries (J. Huston, pers. comm.) because rockweed harvesting takes place in shallow, intertidal water but finfish aquaculture farms require deeper water. Irish moss also occurs low in the intertidal and into the shallow subtidal and is also harvested with a hand rake (DFO 2013a). Harvesting *Ascophyllum* is considered a high-risk activity as these plants and other biota can be damaged due to harvest. There are currently no rockweed leases in place for Annapolis Basin (Fig.24).

Figure 24. Rockweed Licences in Nova Scotia
Note: sourced from NSDFA (2021a)



3.1.2 Recreational Fisheries

The management of Canada's recreational fisheries is a shared responsibility between the federal government and the provinces/territories. Generally, the federal government is responsible for all marine species except for catadromous or anadromous species in inland waters in some regions. The provinces are usually responsible for freshwater fisheries. NSDFA manages the recreational fishery in Nova Scotia.

Nova Scotia is divided into six Recreational Fishing Areas (RFA's) to allow for regional management. RFA 4 encompasses Digby, Queens, Shelburne, and Yarmouth counties. Annapolis, Hants and Kings Counties are in RFA 5. There were over 76,000 sportfishing licences sold in Nova Scotia in 2020 (Nova Scotia Department of Fisheries and Aquaculture 2021b). Freshwater species being fished recreationally in Areas 4 and 5 include trout (rainbow, speckled, and brown), small mouth bass, chain pickerel, white perch, and yellow perch (Nova Scotia Department of Fisheries and Aquaculture 2021c). As amendments to regulations can occur frequently, the Province of Nova Scotia asks that regulations be checked regularly, to ensure the public is knowledgeable about current laws and regulations (Province of Nova Scotia 2018).

Clams are harvested recreationally in clam fishing area 2. Other marine species harvested recreationally in the Annapolis Basin include striped bass, mackerel, and smelt (Town of Annapolis Royal 2021).

3.1.3 Aboriginal Fisheries

Aboriginal landings were reported in the Maritimes Statistical Districts encompassing Digby and Annapolis Counties; however, the landings data, value, and fishing effort were not available. In Digby and Annapolis Counties, herring, bluefin tuna, alewives/gaspereau, elvers, soft shell clam, sea scallop, lobster, Jonah crab and green crab were landed in 2020 - 2021. Gear used for all fisheries included rakes/tongs, angling, drag, gill/drift nets, traps, and electric harpoon (D. Eberhard, pers. comm.).

3.2 Impact on Fisheries Activities

NSDFA's Environmental Monitoring Program Framework for Marine Aquaculture in Nova Scotia – July 2021 (Nova Scotia Department of Fisheries and Aquaculture 2021d) outlines a series of principles and criteria to guide the management process and to determine levels of monitoring and mitigation strategies for each aquaculture site. Standard Operating Procedures for the Environmental Monitoring of Marine Aquaculture in Nova Scotia – July 2021 (Nova Scotia Department of Fisheries and Aquaculture 2021e) describes the procedures that support the application of the framework.

The Environmental Monitoring Program Framework focuses on benthic marine habitat in the immediate vicinity of the aquaculture site. Although sediment sulphide concentration is the key indicator for this environmental monitoring program, a suite of sediment variables is used to validate sulphide data. In addition, benthic video collected at each monitoring station is required and is used to evaluate a site's performance in the event sediment samples are unattainable.

Benthic monitoring assesses areas beneath and around areas of aquaculture production for organic loading, which is one of the primary concerns regarding aquaculture impacts on the environment, fish, and fish habitat. KCS and their contractors adhere to the Environmental Monitoring Program Framework and Standard Operating Procedures established by NSDFA.

Standard best management practices for rearing fish in a marine environment are followed at the site. These practices have controls in place to mitigate potential environmental effects on fish and fish habitat. The site must also have a selection of additional mitigation strategies to apply if an environmental compliance threshold is exceeded (refer to section **3.2.1 Environmental Impact Mitigation Strategies**).

3.2.1 Environmental Impact Mitigation Strategies

Mitigation strategies must be based on best management practices and a hazard analysis of environmental impacts. For the environmental-impact mitigation plan, hazards are identified for each operational process, and measures to control the hazard, in the form of procedures and policy, must be outlined. The site's FMP contains site-specific mitigation strategies which are reviewed annually and amended after every production cycle by NSDFA.

If poor environmental performance is determined through monitoring, mitigation must be implemented as stated in the Environmental Monitoring Program Framework. Furthermore, an updated mitigation plan to address the poor environmental performance must be added to the FMP and submitted to NSDFA. Table 6 outlines potential environmental hazards identified at the Victoria Beach aquaculture site. A healthy marine environment is vital to the site's operation. If the marine environment is poor enough to affect fishing activities, it would also be detrimental to the site's production.

KCS provides detailed maps and diagrams of their sites when requested. These maps and diagrams show the location of all above-water and underwater infrastructure, thus informing fishing efforts. KCS reports harmful algal blooms to the province of Nova Scotia, potentially benefitting invertebrate fishing activities near the site.

Table 6. Potential Environmental Impact Hazards and Measures to Control Identified Hazards at the Victoria Beach Aquaculture Site

Potential Environmental Impact Hazard	Operational Process Step(s)	Is the hazard significant? (Y/N)	Is it reasonable to occur? (Y/N)	Measures to Control Hazard
Boat traffic	• Stocking – shore to boat • Stocking – boat to cage • Harvest – cage to boat • Harvest – boat to shore	N		Not a significant hazard
Overstocking of site or specific areas of site	• Stocking of cages	Y	Y	Controlled in Certificate of Health for Transfer (COHFT) and review/approval of production plan with NSDFA
Settlement of faeces affects bottom sediments	• Grow out	Y	Y	Controlled in COHFT and review/approval of production plan with NSDFA
Cleaning of nets causes release of biofouling	• Grow out	Y	Y	Controlled within biofouling-control plan and net-washing protocol; approved by NSDFA
Disposal of non-organic waste	• Grow out	N		Controlled with waste-management strategy and waste-management plan; approved by NSDFA

Overfeeding causes settlement of uneaten feed	• Feeding	Y	Y	Controlled with recording of daily feed amounts and calculation of feed rate, use of Fishtalk, a software system, to control records, and underwater camera system to monitoring feeding; approved by NSDFA, regular monitoring of the benthos
Improper feeding technique causes settlement of uneaten feed or overfeeding	• Feeding	Y	Y	Controlled by using a central feeding system by highly qualified personnel who focus on fish behaviour during feeding; approved by NSDFA
Release of chemicals from treatments	• Sea-lice treatment	Y	Y	Controlled with sea-lice treatment plans and post-treatment reports; approved by NSDFA
Release of chemicals or antibiotics from treatments	• Disease treatment	Y	Y	Controlled with administration of treatments under the direction of a veterinarian and subsequent reporting; approved by NSDFA
Equipment disposal	• Net change	N	N	Controlled with equipment disposal procedures; approved by NSDFA
Disposal of mortalities	• Mortality and maintenance dives	Y	Y	Controlled with waste-management strategy, Site Specific Biosecurity Plan including blood water and offal; approved by NSDFA

SECTION 4.0 OCEANOGRAPHIC AND BIOPHYSICAL CHARACTERISTICS OF THE PUBLIC WATERS

4.1 Oceanographic Environment

4.1.1 Wind

The Victoria Beach aquaculture site #1040 is positioned off the north shore of Annapolis Basin, Nova Scotia. The site is sheltered by the surrounding land, with the most significant wind direction from the east-northeast, to which the site is exposed to a 11-km fetch.

The closest weather station from which hourly wind-speed and direction data are collected is the Brier Island station located on Brier Island at N44˚ 17’ 09.000” W66˚ 20’ 48.000” (Government of Canada 2021b). Data collected between January 1, 2012 and December 31, 2021 were used to produce the wind-rose plot of Figure 25. Based on this data, the most common winds in the Brier Island area occur between 145 and 165º (coming from approximately the south-southeast). The strongest winds are from the west-northwest to the northwest. The most common wind-speed class is 7 to 11 knots (Fig. 26). Maximum wind speed and direction recorded at the Brier Island weather station is presented in Table 7.

Figure 25. Wind-rose Plot of Brier Island Weather Station Data Collected Between January 1, 2012 and December 31, 2021
Note: the bars on the plot indicate the direction the wind was coming from; Data sourced from Government of Canada (2021b)

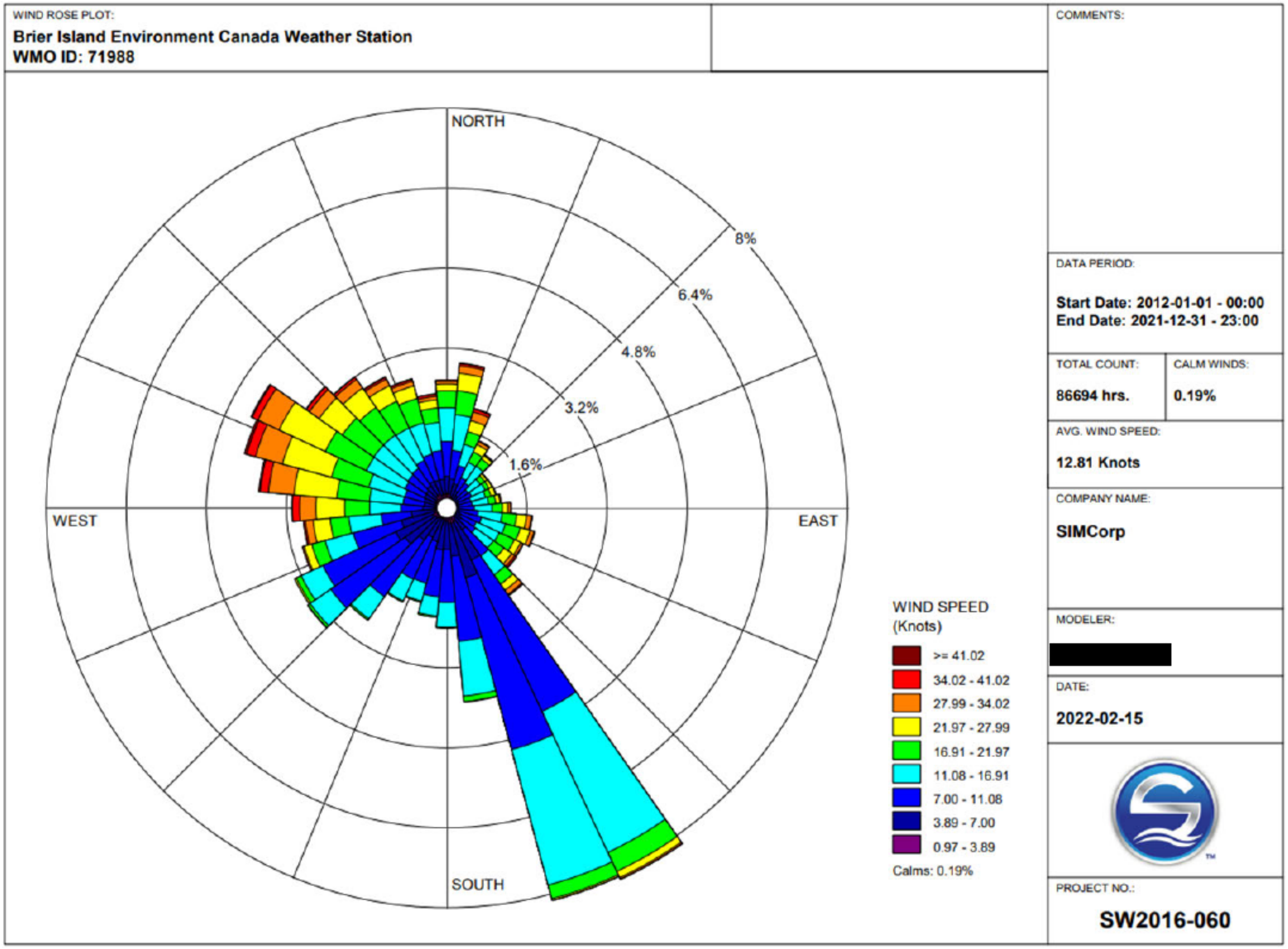


Figure 26. Frequency of Wind Speed Observed at the Brier Island Weather Station between January 1, 2012 and December 31, 2021
Data sourced from Government of Canada (2021b)

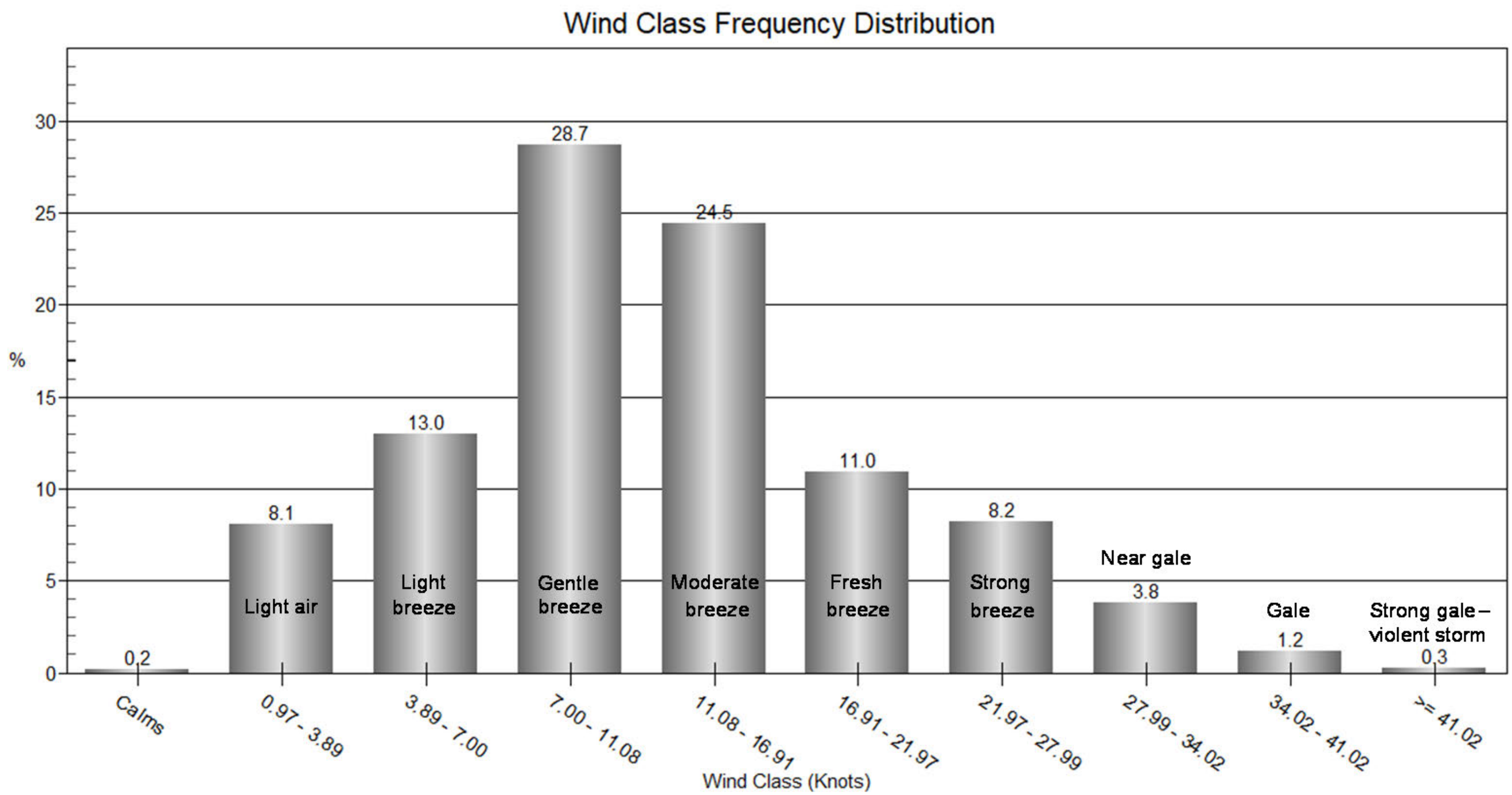


Table 7. Maximum Wind Speed and Direction Measured at the Brier Island Weather Station
Note: current to December 31, 2021(Government of Canada 2021b)

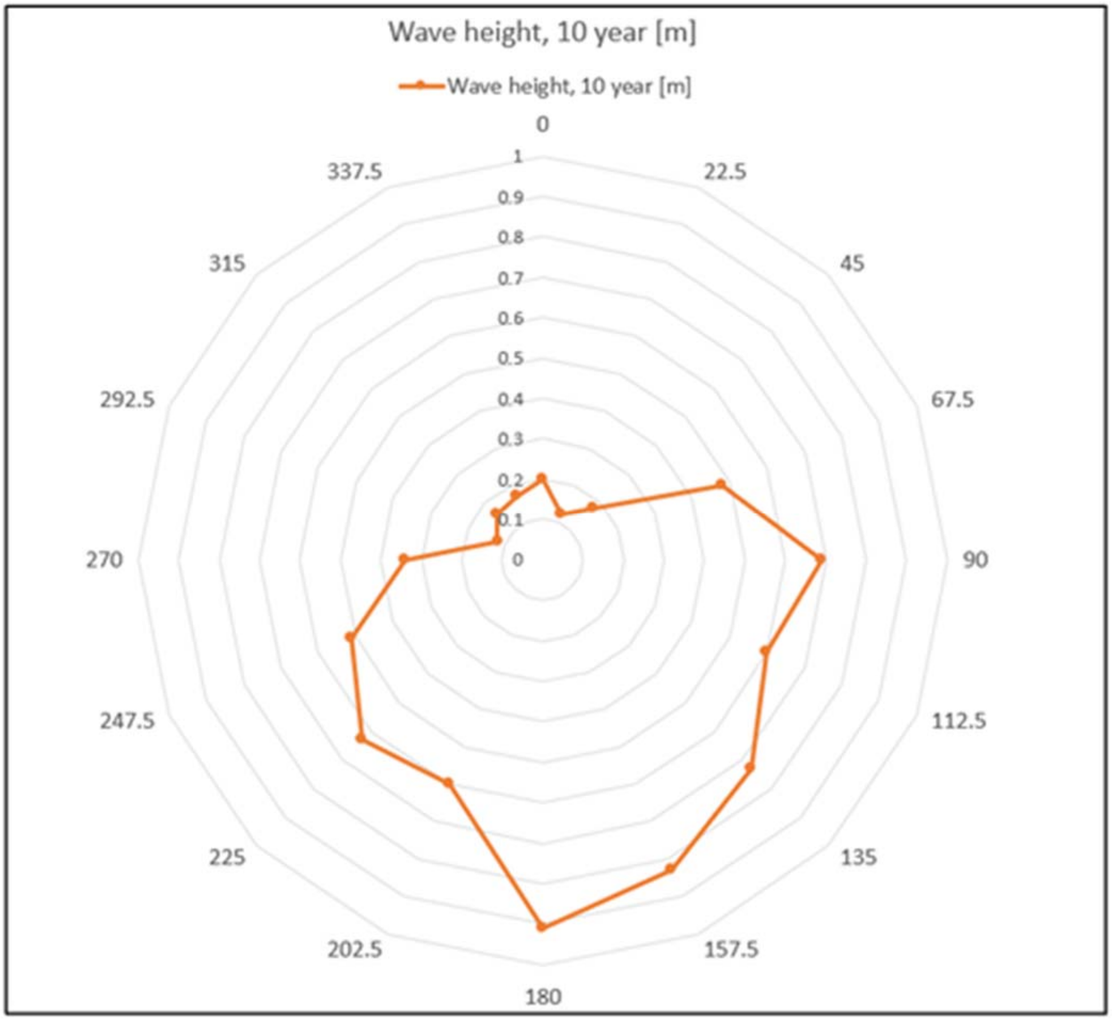
Date of Maximum Wind of the Year	Wind Speed (knots)	Wind Direction
November 13, 2021	46	ESE
May 9, 2020	44	W
September 7, 2019	46	N
January 4 & November 14, 2018	45	SE & W
February 13, 2017	49	N
February 16, 2016	50	SE
February 15, 2015	51	NNW
March 26, 2014	58	NNW
February 17, 2013	51	W
December 30, 2012	49	NW

4.1.2 Waves

The effect of waves generally diminishes with distance into the Bay of Fundy, with mean significant wave height being 1.0 to 1.6 m in the outer Bay of Fundy and Gulf of Maine, 0.5 to 1.0 m in the mid-Bay, and < 0.5 m in the upper Bay (Li et al. 2015). Maximum significant wave heights can reach 5 to 6 m in the outer Bay but are generally < 4 m in the mid-Bay and upper Bay (Li et al. 2015).

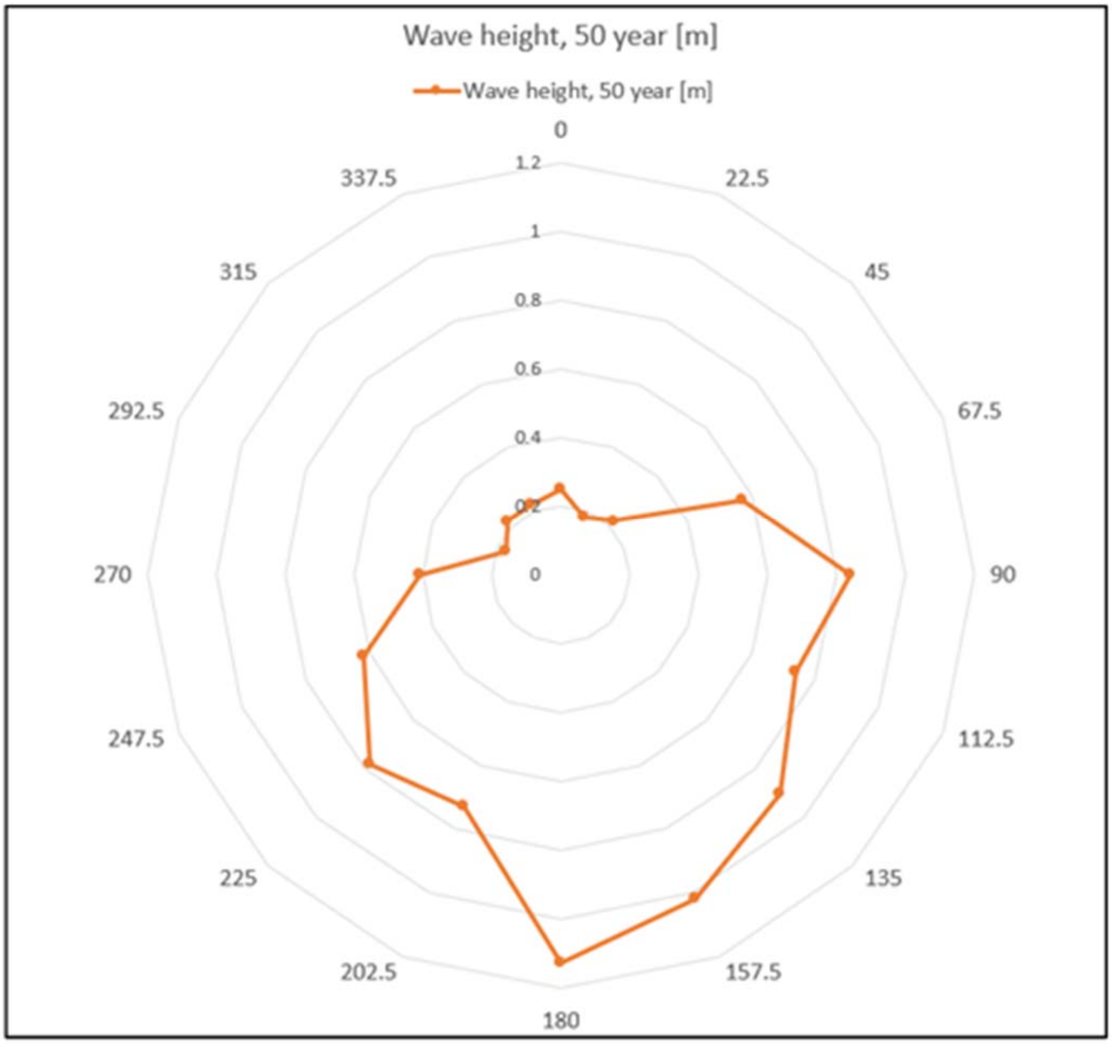
Wind and wave conditions for site #1040 in Annapolis Basin were described by Karimi and Steinke (2020). Wave data for 10- and 50-year return periods were determined using near-shore wave modelling. Results showed that the largest waves in the Basin were wind generated from the east. Waves generated in the Bay of Fundy do not travel into the Basin because their energy is dissipated when passing through Digby Gut. For site #1040, the largest waves are generated from the south and reach maximum heights of 0.9 m (10-year return) and 1.1 m (50-year return. Figures 27 and 28 are polar plots showing the maximum wave height at 10-year and 50-year return periods for marine finfish site #1040.

Figure 27. Maximum wave height at 10-year return period and direction of travel (from) for site #1040



Note: from Karimi and Steinke (2020)

Figure 28. Maximum wave height at 10-year return period and direction of travel (from) for site #1040
Note: from Karimi and Steinke (2020)



4.1.3 Extreme Storm Events and Storm Surge

Nova Scotia is sometimes subject to extreme weather conditions. Wind and wave damage caused by storms and ice damage during extremely low temperatures are environmental hazards. Employing proper gear and using the most recent technologies for cage design and construction, as well as routine inspection and maintenance, will help prevent any unfavourable effects on the cage grid caused by weather and climate extremes. In New Brunswick, Nova Scotia, and Newfoundland, KCS has several high energy sites, which are exposed to strong winds and large waves. The grid and anchoring systems used on the proposed boundary amendment in Annapolis Basin are engineered to be successful at these high energy sites. The plastic, circular cages and grid components that are employed by KCS have been engineered to withstand expected conditions at this location. During extreme weather conditions, personnel will not be working on the cage site. Once the extreme weather has passed, crews will be dispatched to examine the cage system and fish stock for damage. If damage is sustained, repairs will be carried out as necessary. Any significant damage will be reported to NSDFA. Refer to sections **7.2.3.1 Infrastructure**, **7.2.3.2 Containment Strategy**, and **7.2.3.3 Hazard Assessment for Containment Management** for additional information.

4.1.4 Tides

Based on Canadian Hydrographic Service (Fisheries and Oceans Canada 2022) tide tables for Digby (Station #00325), the predicted highest high tide for 2022 is 8.9 m and the lowest low tide is 0.1 m, giving a maximum tidal range of 8.8 m. On average, the tidal range is between 6 and 7 m. If a storm surge coincides with the highest high tide, it could result in higher water levels.

4.1.5 Currents

Collection of local current speed and direction data throughout the water column was performed from September 8 to October 17, 2011 using a 300-kHz Acoustic Doppler Current Profiler (ADCP) deployed by SIMCorp. The current meter was deployed at the center of the proposed lease, in approximately 21 m of water, at coordinates N44° 40.117’ W65° 43.298’.

Throughout the water column, the most common flow was in a general western direction, with a categorical mode of 265 to 275 degrees (Table 8). The overall, average, current speed throughout the entire water column was 31.2 cm/s. Mean current speeds were 23.7 cm/s near bottom and 41.0 cm/s at the surface. The most frequently observed speed class, throughout the water column, was 24.0 - 32.0 cm/s, and current velocities below 35.0 cm/s represented 60.1% of the measurements. Current velocities below 7.0 cm/s were only observed 6.8% of the time whereas current velocities above 56.0 cm/s accounted for 8.8% of profiles recorded throughout the deployment. Current speeds above 60 cm/s occurred at each observable depth and were more common near the surface than at depth, with maximum velocities exceeding 100 cm/s within the uppermost 7 m of the water column. The higher energy conditions near the surface are likely the result of strong tides and the influence of the Annapolis River.

Graphs illustrating the current directions and current-speed frequency distributions are in **Appendix B Victoria Beach Baseline Assessment Report**. Additional information is present in section **4.2 Baseline Monitoring** and section **8.2.1 Environmental Conditions**.

Table 8. Current Data Summary Statistics for Victoria Beach

Distance from Bottom (m)	Distance from Surface (m)	Speed Most Frequent (cm/s)	Minimum (cm/s)	Average (cm/s)	Maximum (cm/s)	< 7.0 cm/s (%)	< 35.0 cm/s (%)	> 56.0 cm/s (%)	Direction Highest Frequency (°)
4	**17**	16.0 - 24.0	0.1	23.7	74.2	8.7	80.9	1.6	265-275
5	**16**	24.0 - 32.0	0.2	25.3	80.6	6.2	75.9	2.4	265-275
6	**15**	24.0 - 32.0	0.5	26.6	85.2	8.6	71.7	3.0	265-275
7	**14**	24.0 - 32.0	0.5	27.7	87.6	7.7	68.5	3.9	265-275
8	**13**	24.0 - 32.0	0.6	28.7	88.2	7.1	65.8	4.6	265-275
9	**12**	24.0 - 32.0	0.0	29.6	89.0	6.4	63.9	5.3	265-275
10	**11**	24.0 - 32.0	0.4	30.3	93.5	6.6	61.9	6.0	265-275
11	**10**	24.0 - 32.0	0.4	31.0	94.0	6.2	59.5	6.8	265-275
12	**9**	32.0 - 40.0	0.5	31.7	96.0	6.2	58.0	7.7	265-275
13	**8**	32.0 - 40.0	0.5	32.3	99.4	6.7	56.3	8.6	265-275
14	**7**	32.0 - 40.0	0.1	33.0	100.3	6.5	54.6	9.9	265-275
15	**6**	40.0 - 48.0	0.4	33.9	103.4	6.4	53.0	11.8	265-275
16	**5**	48.0 - 56.0	0.4	34.8	103.7	6.2	50.9	13.7	265-275
17	**4**	48.0 - 56.0	0.3	36.4	105.0	6.0	47.8	16.8	265-275
18	**3**	48.0 - 56.0	0.1	39.4	105.7	2.2	41.4	22.0	265-275
19	**2**	48.0 - 56.0	0.4	41.0	109.3	5.2	38.9	26.8	265-275
Depth Averaged		**24.0 - 32.0**	**0.0**	**31.2**	**109.3**	**6.8**	**60.1**	**8.8**	**265-275**

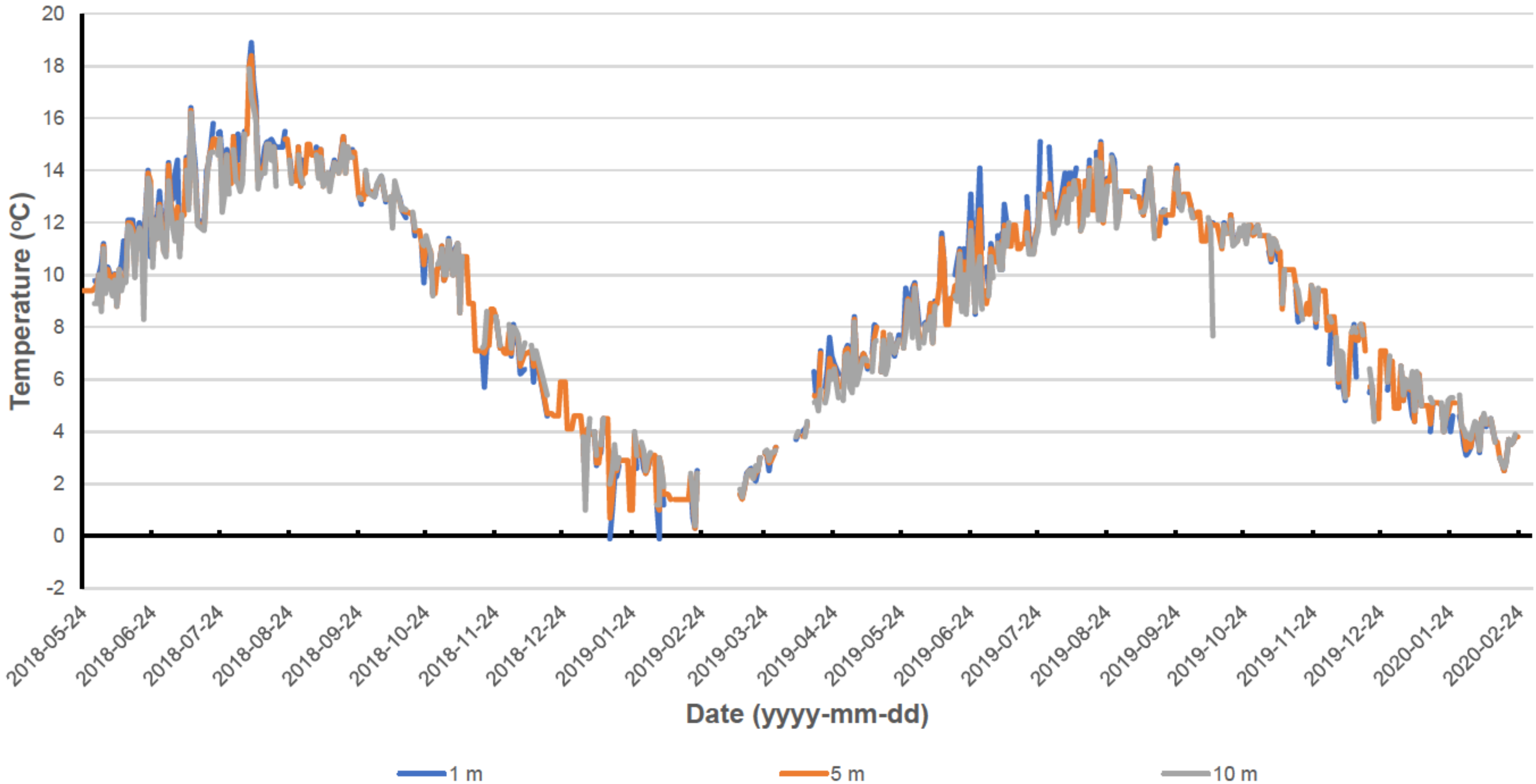
4.1.6 Salinity

Salinity at the existing, successful aquaculture site is tolerable for Atlantic salmon. Keizer et al. (1996) reported seasonal variations in bottom-water salinities in Annapolis Basin, with a minimum of 31 psu in March/April and a maximum of 33 psu in September. Surface waters showed a similar pattern but with a few events throughout the year reaching minimums of approximately 28-29 psu.

4.1.7 Temperature

Temperatures at the Victoria Beach aquaculture site were recorded and collected by KCS between the dates May 24, 2018 and February 23, 2020 (Fig. 29). The minimum water temperature experienced was approximately -0.1˚C, which occurred on January 14 and February 5, 2019 at 1 m below the surface. The maximum temperature recorded was approximately 18.9°C on August 7, 2018 at 1 m deep. Water temperatures at 5 and 10 m deep remained above 0°C. Keizer et al. (1996) reported a similar temperature range for the Annapolis Basin, with a minimum value of -0.11^{o}C and a maximum of 17.5^{o}C. The existing, successful aquaculture site at Victoria Beach would indicate that the temperatures in this area are tolerable for Atlantic salmon.

Figure 29. Daily Water Temperature Data from the Victoria Beach Aquaculture Site #1040



The effects of superchill can be detrimental to fish health and may result in high mortalities. Superchill is a phenomenon caused by the cooling of seawater below the lethal temperature for Atlantic salmon (i.e., -0.75˚C). Although cold temperatures cannot be entirely avoided in a northern climate, the effects of superchill may be diminished by fitting the cages with deep nets and locating cage systems in deep enough water that the fish may avoid the surface water layer, which, in winter, tends to be colder than deeper water. Other mitigation strategies include avoiding stress in the fish by ceasing feeding and other activities at the cage site. These activities excite the fish and bring them up to the surface where the water is colder. KCS does not approach their cage sites or feed stock during time periods when superchill is a potential threat. Refer to section **4.1.9 KCS Mitigation Strategy** for additional information.

Sea ice is typically not a problem in Annapolis Basin. When ice is present, it typically originates from freshwater input from the Annapolis River. A search of the Canadian Ice Service archives for 2003 – 2021 (Government of Canada 2020a) returned only one weekly record indicating ice presence in Annapolis Basin (Fig. 30). During the week of January 28, 2019, 2/10 ice coverage was reported, with 1/10 being grey ice 10-15 cm thick in small floes 20-100 m wide. The other 1/10 was new ice < 10 cm thick with undetermined, unknown, or no form. Ice, such as that which occurred the week of January 28, 2019, would not be damaging to an aquaculture site due to its flexible or fragile nature. Satellite images from the NASA Worldview webtool (2021) from the winter of 2019 show the patchy and changing nature of sea ice in Annapolis Basin. Figure 31 shows some of the days with the greatest coverage of sea ice. Most days had little to no ice coverage. KCS has no intentions of deploying equipment, such as ice booms, near the proposed site. KCS does, however, continuously monitor for sea ice during winter months and will take necessary precautions, if needed. Freezing spray may occasionally build up on cage structures during extreme winter conditions. When ice build-up is a concern, it can be removed by site crews.

Figure 30. Presence of Sea Ice in Atlantic Canada week of January 28, 2019
Note: Figure sourced from Government of Canada (2020a)

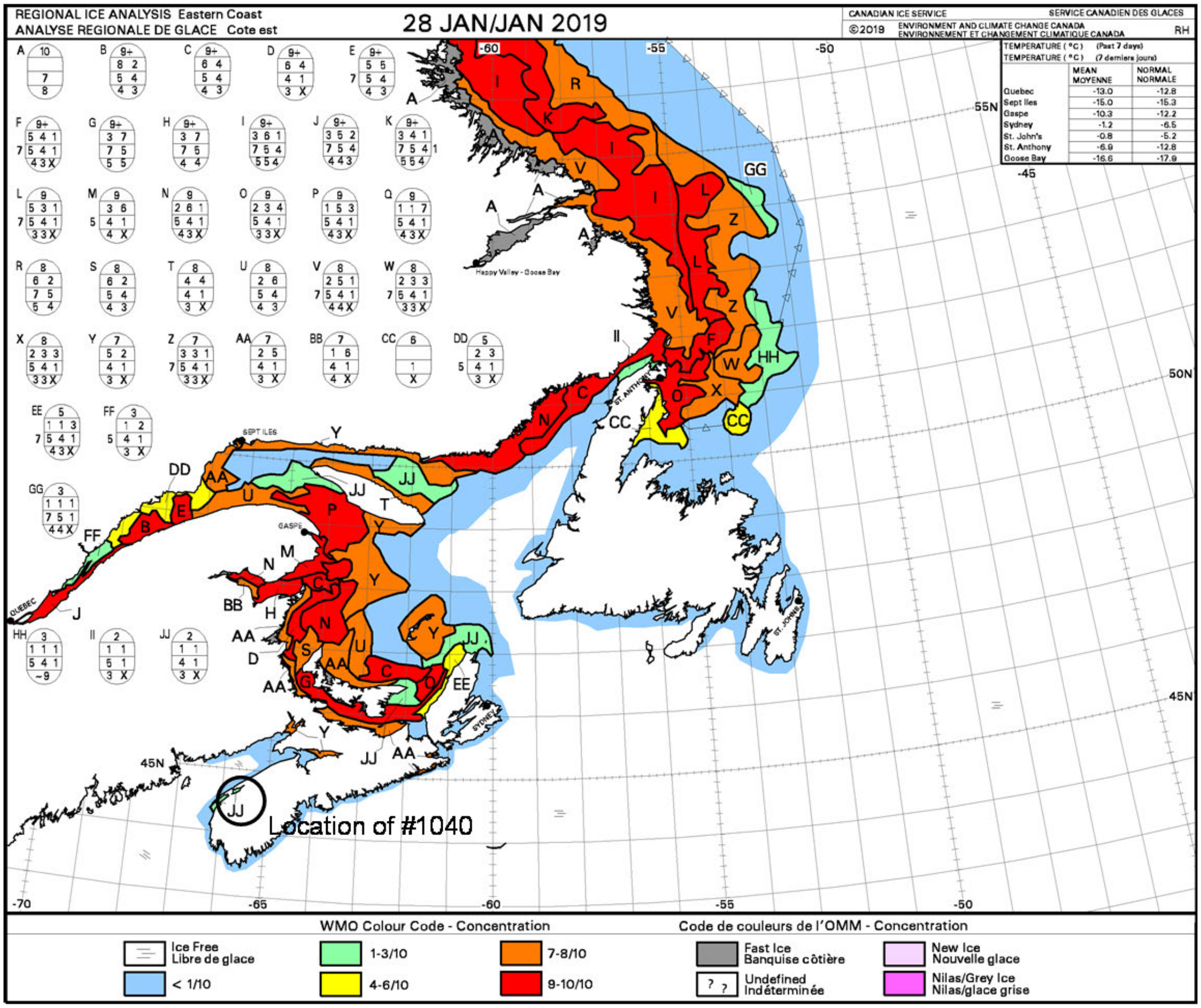
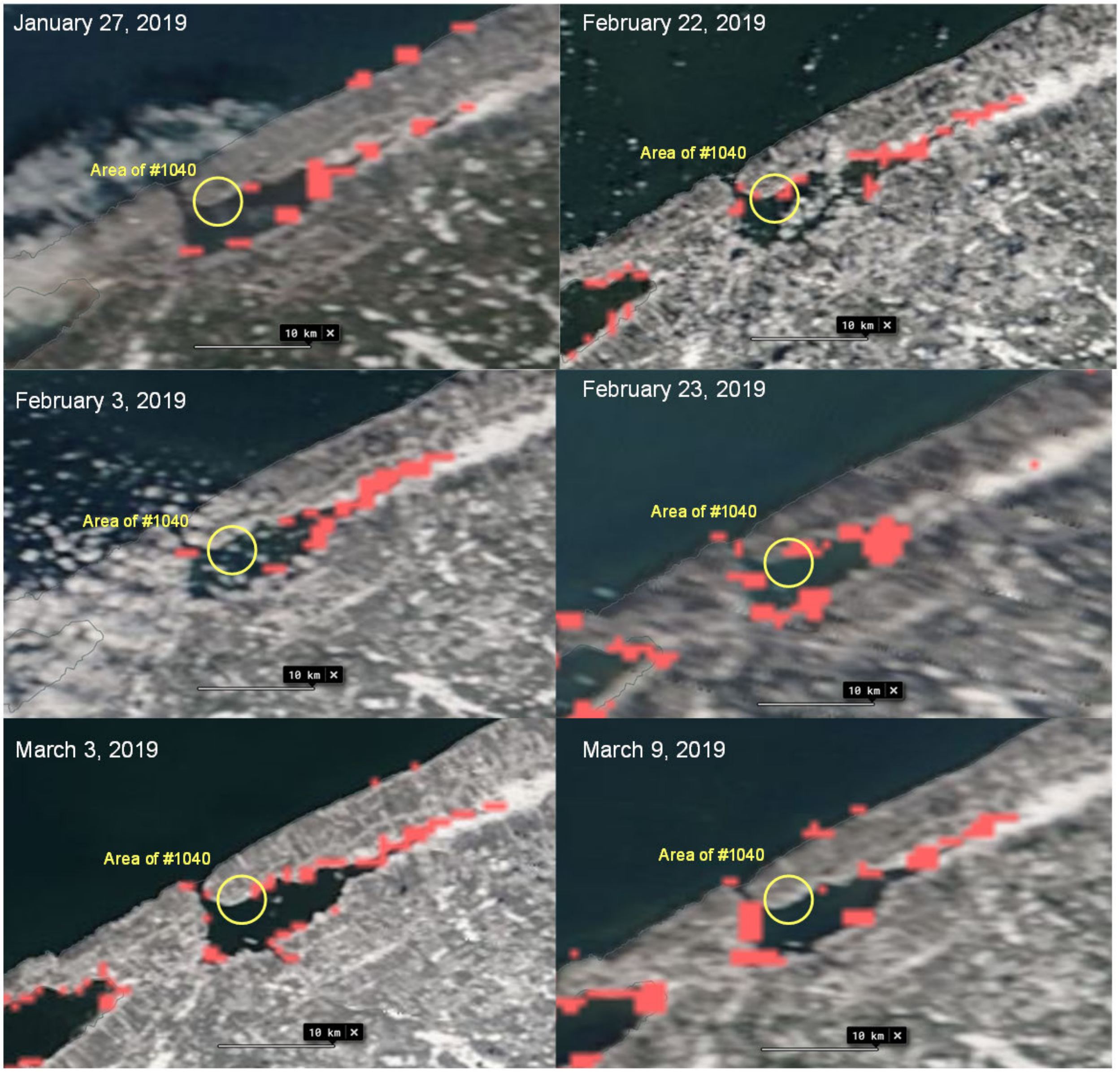


Figure 31. Satellite images of Annapolis Basin, winter 2019
Note: Figure sourced from NASA Worldview (2021)



4.1.8 Oxygen

Sea-surface dissolved-oxygen (DO) data presented in Figure 32 are from the Copernicus Programme - My Ocean visualization tool (Copernicus 2021). The two satellite images are from the year 2021 and show the dates of highest and lowest DO. Data was not available from Annapolis Basin, so the nearest grid square with data was selected. On March 25, 2021, sea-surface DO was 343.7 mmol/m^3 (11.0 mg/L), and on September 2, DO was 260.3 mmol/m^3 (8.3 mg/L).

DO concentrations at the Victoria Beach aquaculture site were recorded by KCS staff during site operations for the 2018 year class. The minimum DO value recorded was approximately 6.2 mg/L on January 2, 2020 at 10 m below the surface; however, this was an anomaly since DO is typically around 10 mg/L at this time of year. The second lowest DO value was 6.9 mg/L, recorded on September 14, 2019 at 1 m deep. The maximum value recorded was approximately 13.3 mg/L on March 19, 2020 at 5 m deep. For adult salmon, the lower limit of DO for optimal growth is generally accepted as 6 mg/L. The Victoria Beach site typically displays DO values well above this threshold. Figure 33 displays DO-concentration trends from the most-recent production cycle at Victoria Beach.

Refer to section **4.1.9 KCS Mitigation Strategy** for additional information.

Figure 32. Extremes in Sea-surface Dissolved Oxygen in Maritime Waters
Note: Images were obtained from the Copernicus Marine Environment Monitoring Service, My Ocean visualization tool, Green Ocean, dissolved oxygen (Copernicus 2021).

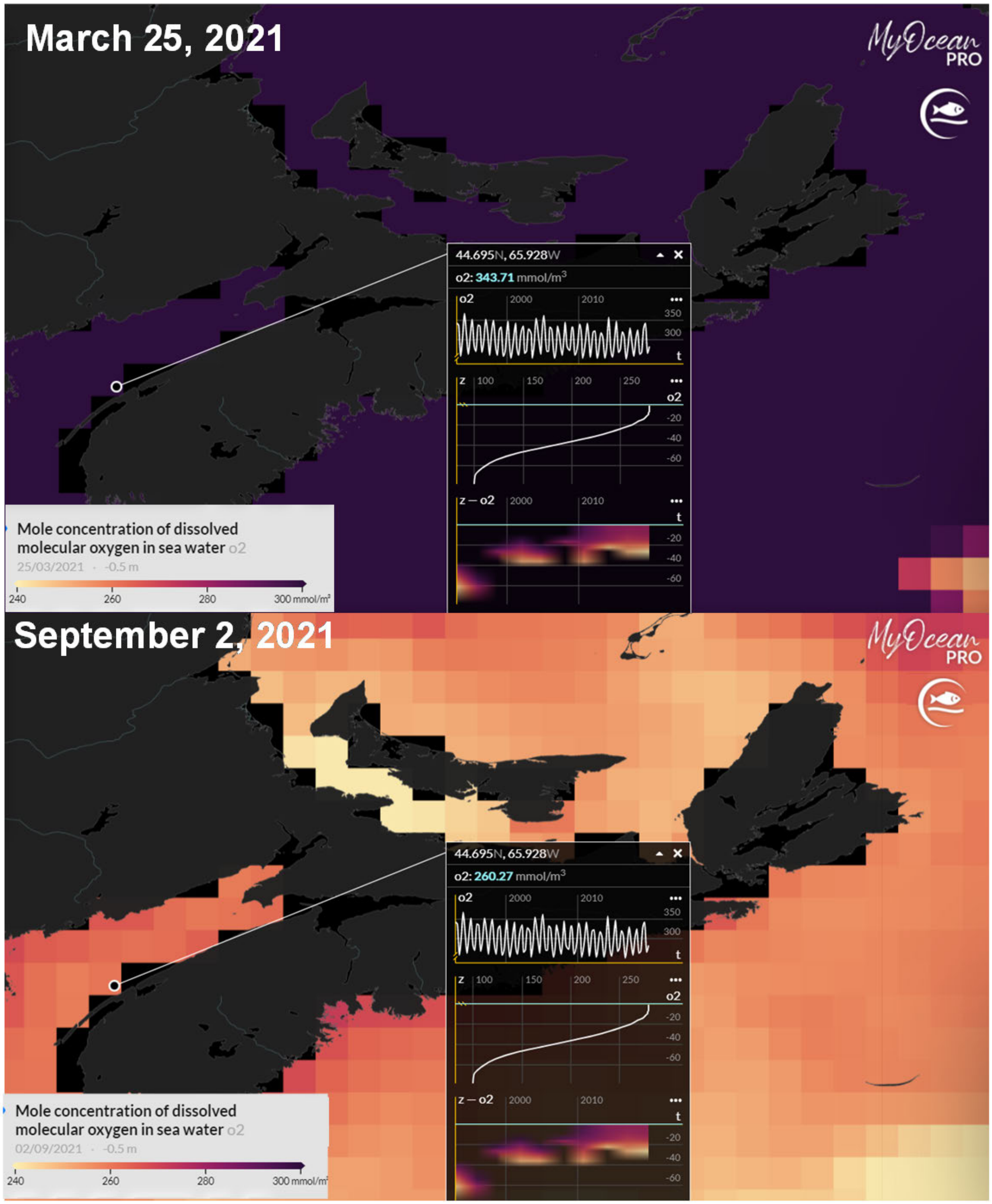
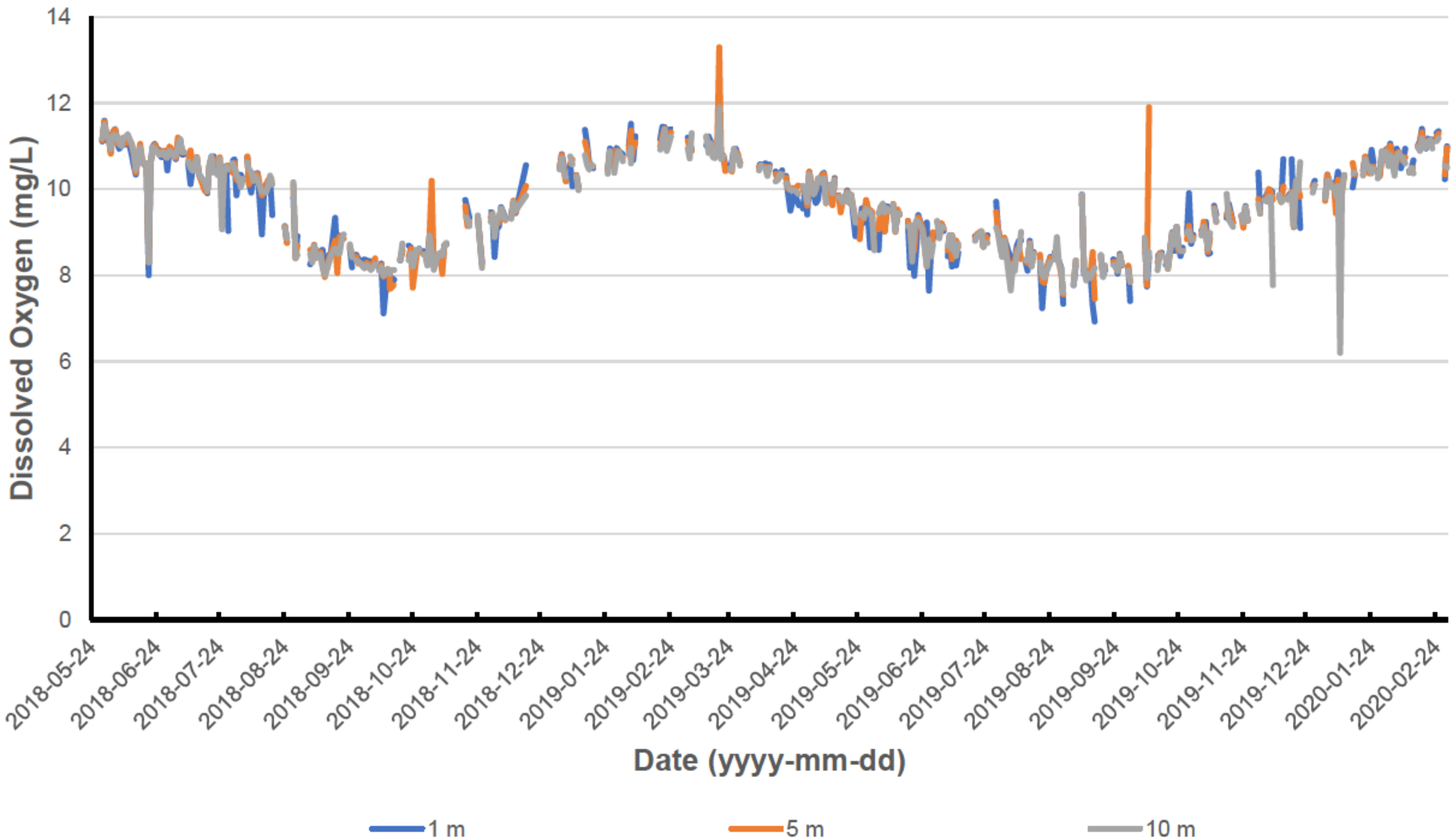


Figure 33. Dissolved-oxygen Concentration at the Victoria Beach Aquaculture Site #1040



4.1.9 KCS Mitigation Strategy

Water quality is monitored because of the uncertainty of natural cycles and processes such as season, thermoclines, weather, haloclines, algal blooms, etc. Monitoring specific water parameters will aid the producer in preparedness for dealing with fish health and will assist with feeding regimes. Mitigative actions will be taken when conditions are less than optimum. KCS will monitor oxygen and temperature daily unless weather conditions do not permit water-quality monitoring.

Requirements for water-quality monitoring and mitigation strategies are contained in the site-specific FMP, which is reviewed annually and amended after every production cycle. Table 9 describes the requirements for water-quality monitoring and the NSDFA-approved mitigation strategies.

KCS uses Fishtalk, a software system, to track water-quality parameters such as oxygen, temperature, and turbidity, as well as other records including inventory (biomass, fish number, average weight), feeding (type and quantity), and fish density.

Table 9. Water Quality Monitoring Requirements and Approved Mitigation Strategies

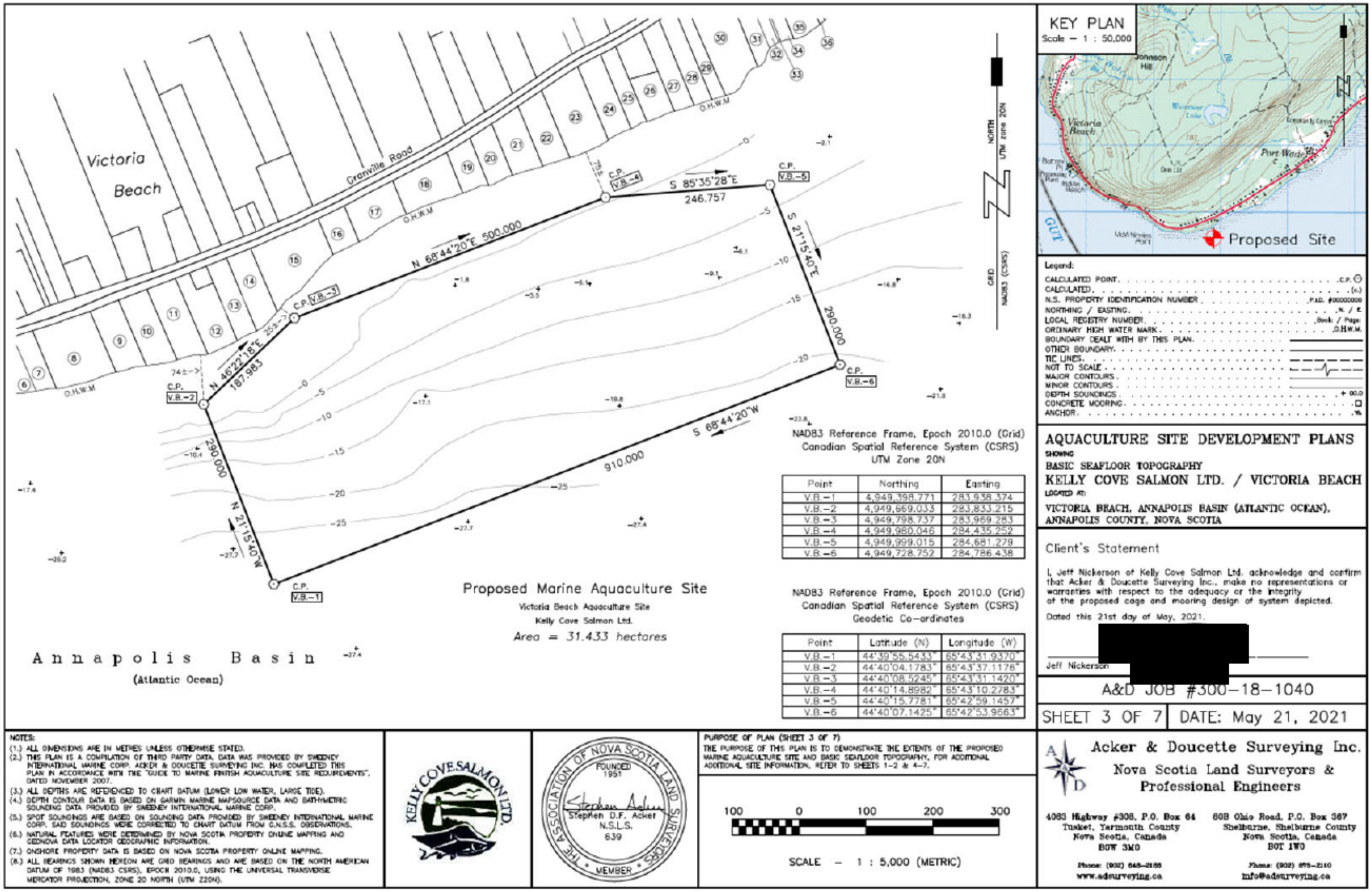
Parameter	Monitoring Requirements	Mitigation Threshold	Mitigation
Dissolved Oxygen	• Measured at 1-, 5-, and 10-m (or bottom of net) depths inside at least one stocked cage, at least once daily • Measured at 1-, 5-, and 10-m depths outside the cages, at least once daily • Daily record keeping	• When oxygen readings fall below 7.0 mg/L • Additional measures when readings fall below 6.0 mg/L	• Oxygen measures between 7.0 & 6.0 mg/L - Increase dissolved-oxygen monitoring to twice daily or more - Limit activity in the cages (reduce mort dives to once weekly if mort rates are < 0.05% per day, limit cage repairs/maintenance to essential work only) - Increase net cleaning activity if biofouling is an issue. • Oxygen measures below 6.0 mg/L - All measures listed above - Cease feeding - Attempt to determine cause of low dissolved oxygen
Temperature	• Measured at 1-, 5-, and 10-m (or bottom of net) depths, inside at least one stocked cage, at least once daily • Measured at 5-m depth outside the cages, at least once daily • Daily record keeping	• When temperature falls below 1.5˚C • When temperature rises above 14˚C	• Temperature below 1.0˚C - Limit activity in the cages (reduce mort dives to once weekly if mort rates are < 0.05% per day, limit cage repairs/maintenance to essential work only) - Cease feeding - Temperatures of 1.5 – 1.0˚C require caution and site-specific assessment. For sustained periods below 1.0˚C, maintenance rations may be assigned. • Temperature rises above 14˚C - Temperatures > 14.0˚C will affect consumption and need to be evaluated in conjunction with oxygen readings. Site specific protocols will be implemented, and guidelines established at temperatures > 15.0˚C. • Temperature rises above 18˚C - Oxygen supplementation if oxygen falls below 60% - Increase dive frequency to monitor mortality rates and health of the stocked fish - Adjust or stop feeding to reduce fish stress

Algae	Each site has its own risk of algal blooms; therefore, monitoring requirements are determined on a site-by-site basis, using history and best available knowledge as a gauge to establish the protocols Algal monitoring will take place at the site on a weekly basis from May to October: -the water samples are collected by the Site Manager at the surface of the water near the center of the farm -sample may be stored on ice depending on delivery time to Bridgewater -trained staff in Bridgewater will analyze and record algae with results sent to the Senior Fish Health Technician for review.	• When mortality is greater than 0.05% per day in the presence of a change in water turbidity, clarity, or colour there may be an effect of algal levels on the stock. Other indicators may include fish swimming or finning at the surface	• During plankton blooms, fish should not be fed, and site activity should be limited to decrease the fish's attention at the surface where the highest concentrations of plankton can be found during the day. Saltwater Management will advise on the mitigation practices based on the plankton identified. • Other mitigation strategies may include - Increased dive frequency - Increased algal monitoring - Investigation of cause of elevated mortality - Adjusted feeding schedules

4.1.10 Bathymetry

Basic seafloor topography around the Victoria Beach aquaculture site is present in Figure 34. Section **4.2 Baseline Monitoring** provides additional information.

Figure 34. Bathymetry of Site #1040 Shown with 5-m Isobaths



4.2 Baseline Monitoring

A baseline survey of the proposed lease area was conducted on May 28 and 29, 2019. The baseline survey report is entitled Victoria Beach Baseline Assessment Report and dated April 27, 2022 (**Appendix B**). The baseline survey was conducted in accordance with the NSDFA Standard Operating Procedures for the Environmental Monitoring of Marine Aquaculture in Nova Scotia (NSDFA 2021e) and the *Aquaculture Activities Regulations* (Government of Canada 2021c) Sections 8 and 9. Specifically, *Annex 7* in the *Aquaculture Activities Regulations* Guidance Document (Government of Canada 2018b) and *Section I: Survey for baseline information for new sites and expansion of existing sites* in the *Aquaculture Activities Regulations* Monitoring Standard state the federal government requirements for baseline monitoring (Government of Canada 2018c). It should be noted that at the time of the baseline monitoring, the 2018 version of the NSDFA Standard Operating Procedures was followed. There were no significant changes made to the way baseline environmental data was collected between 2018 and 2021.

4.3 Site Design

The Victoria Beach site was designed with acknowledgement of local conditions, including bathymetry, oceanographic conditions, and the benthic environment. Additional information was gathered during the baseline survey and is presented in sections **4.1.5 Currents**, **4.1.10 Bathymetry**, **4.2 Baseline Monitoring**, and **Appendix B Victoria Beach Baseline Assessment Report**. Details of the site design are presented in Figures 44 to 46 and section **7.2.3.1 Infrastructure**.

SECTION 5.0 THE OTHER USERS OF THE PUBLIC WATERS SURROUNDING THE PROPOSED AQUACULTURAL OPERATION

5.1 Description of Other Users

5.1.1 Adjacent Property Owners

Acker & Doucette Surveying produced aquaculture-site development plans, identifying adjacent property owners within 1,000 m of the proposed aquaculture lease for Victoria Beach #1040 (Figs. 35 and 36).

The proposed amendment will not adversely impact adjacent property owners or their access to the water.

Figure 35. Plan View of the Proposed Boundary Amendment of the Victoria Beach Aquaculture Site Showing Nearby Property Owners

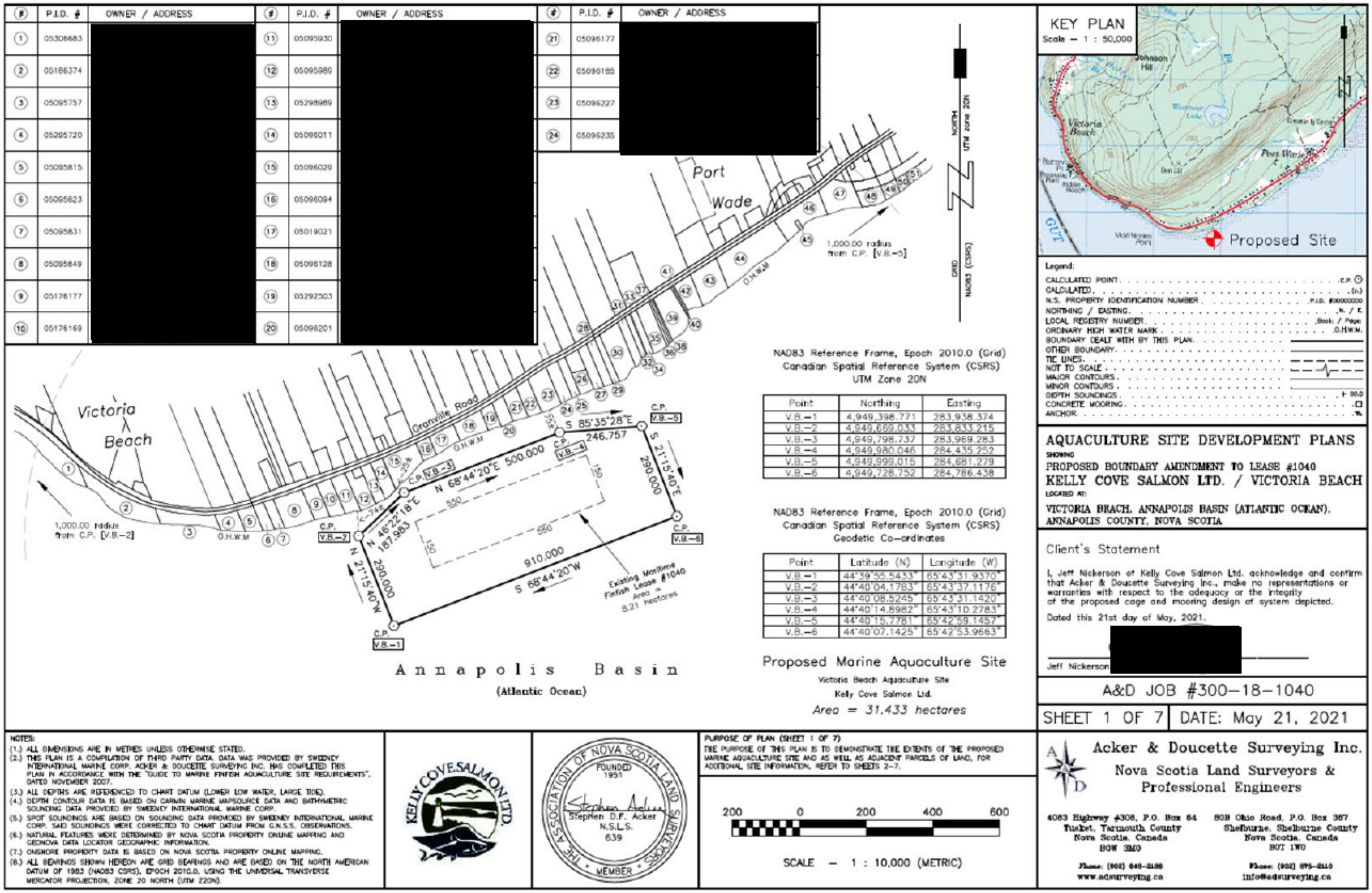
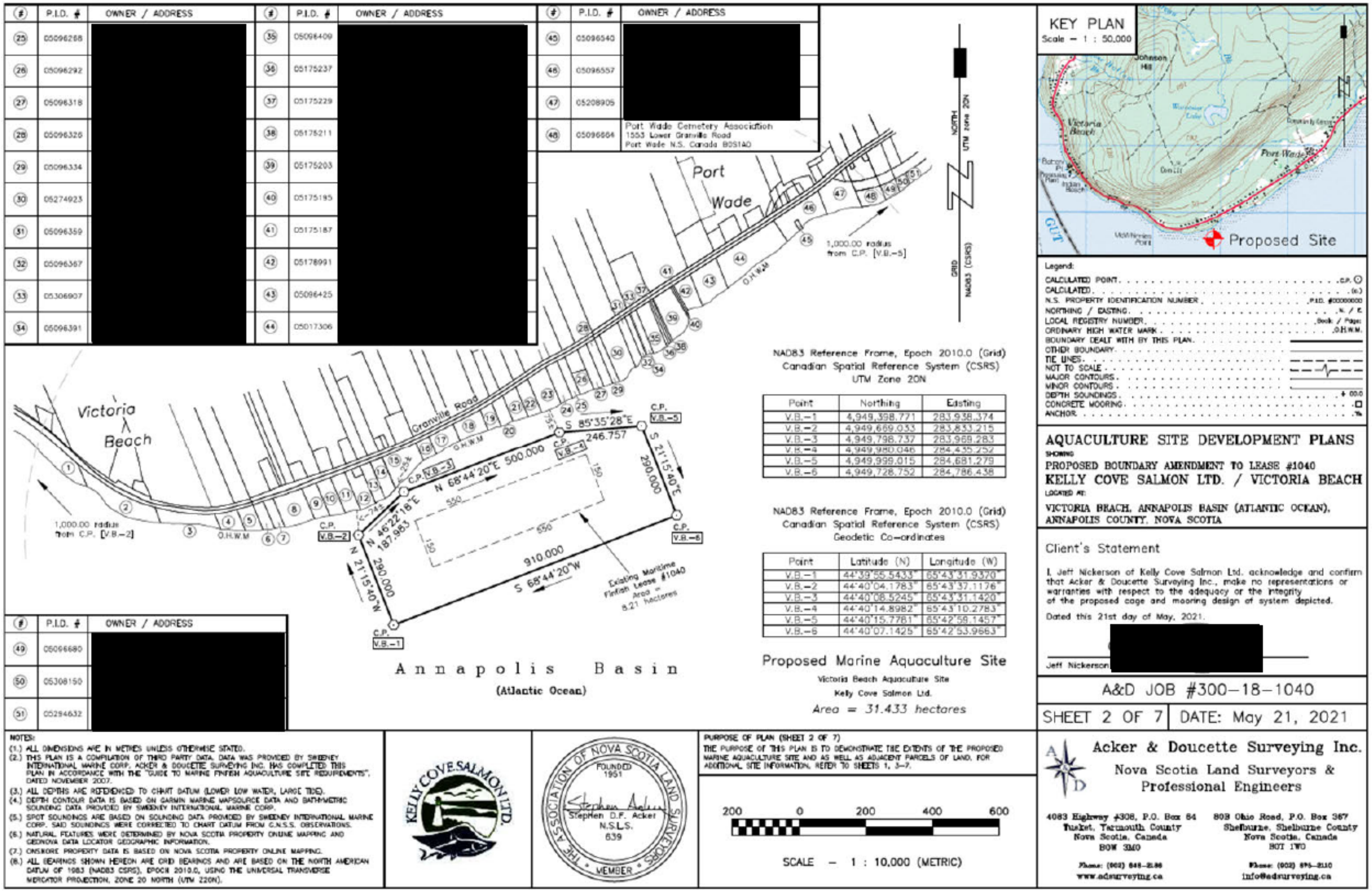


Figure 36. Plan View of the Proposed Boundary Amendment of the Victoria Beach Aquaculture Site Showing Nearby Property Owners



5.1.2 Pleasure Craft and Commercial Vessels

Within 5 km of the Victoria Beach site, there is one active fishing harbour (Fig. 35). Victoria Beach is a tiny fishing village on the shore of Digby Gut (Nova Scotia Tourism). The Port of Digby Fisherman's Wharf Harbour is just over 5 km from aquaculture site #1040, as is Larche Industrial Marine Ltd., which has two marine railways and two wharves on site.

The Digby ferry route is located west of the Victoria Beach aquaculture site. The *Fundy Rose* sails return trips daily from Saint John to Digby, with additional crossings during peak season (Bay Ferries Ltd. 2021). The ferry route is outlined in Figure 37.

All pleasure craft and commercial vessels must abide by navigation buoys and markers. The general route to enter and exit Annapolis Basin and navigational aids are presented in Figures 37 and 38.

Refer to section **8.2.2 Boat Traffic and Wharves** for additional information.

Figure 37. Current Wharves and Boat Landings near Victoria Beach Aquaculture Site

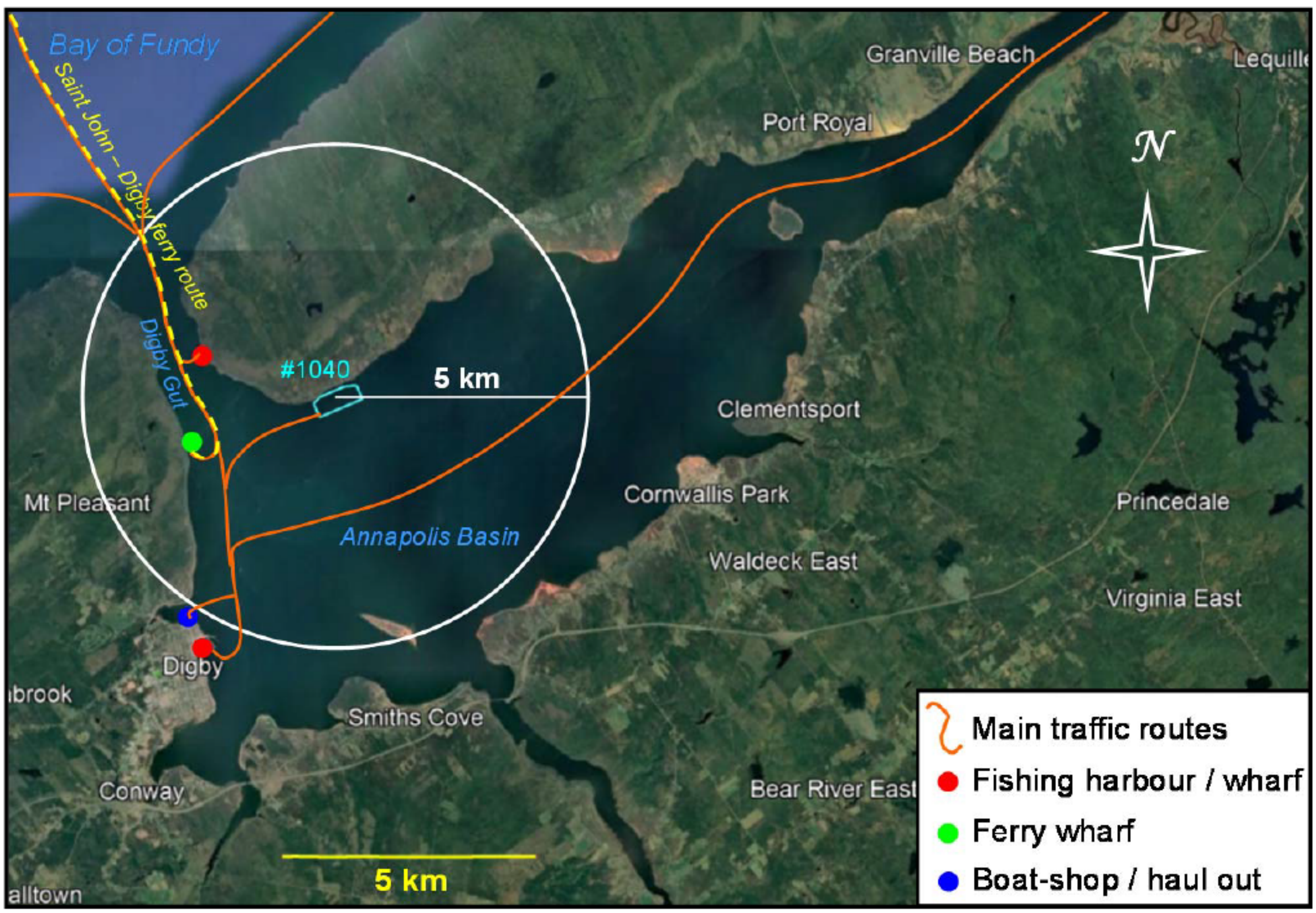
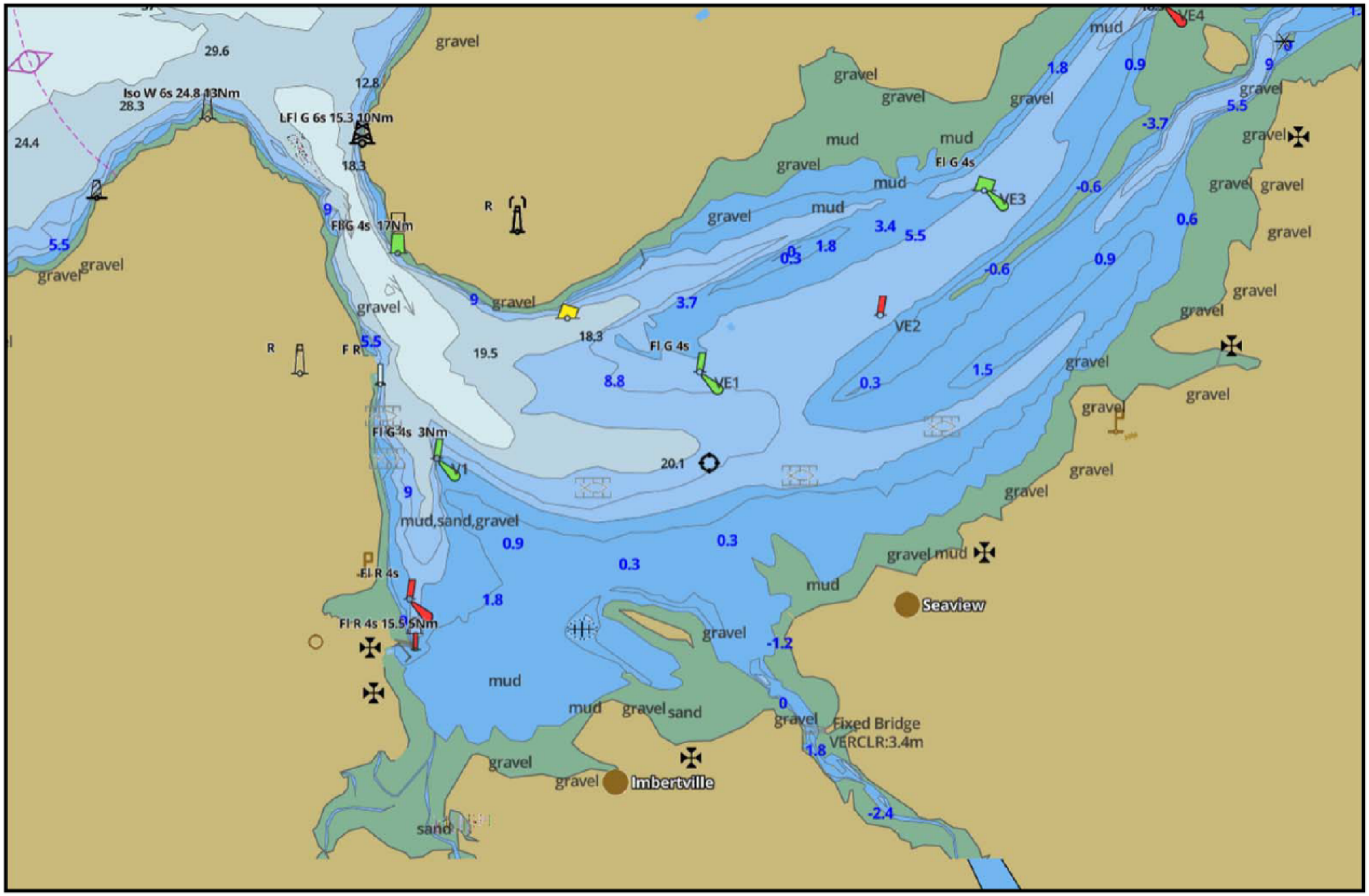


Figure 38. Navigation Aids in Annapolis Basin
Note: Figure was sourced from i-Boating (2021)

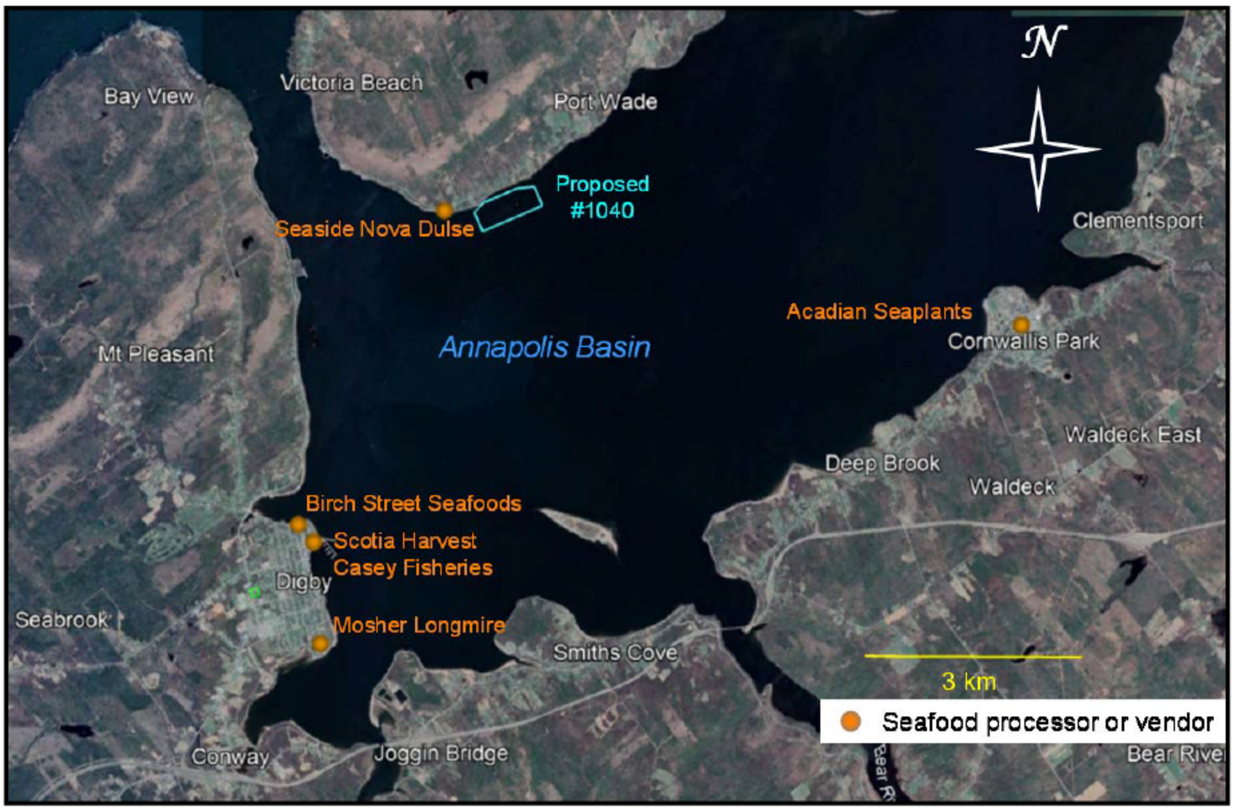


SW2016-060

5.1.3 Fish and Seafood Processors

Six seafood processors or vendors were identified within the area of the Victoria Beach site. Birch Street Seafoods Ltd. is located at 35 Birch St, Digby, NS and sells fresh seafood (Fig. 39). Scotia Harvest Inc. is a seafood wholesaler located at 144 Water St, Digby. Casey Fisheries Ltd. Is a seafood product preparation and packaging business located at 146 Water St. Mosher Longmire Fisheries Ltd., at 11 1st Ave, Digby, processes fish and seafood. Acadian Seaplants Limited has a research and development center at 4 Bren St, Cornwallis Park. Seaside Nova Dulse harvests and dries dulse. No known negative interaction has been identified between these companies and the existing Victoria Beach aquaculture site.

Figure 39. Fish and Seafood Processors and Markets around Annapolis Basin



5.1.4 Recreation and Tourism

Historic sites around Annapolis Basin include Victoria Beach (the western terminus of the Nova Scotia Pony Express), the Port-Royal National Historic Site, and various historic sites in Annapolis Royal.

The Upper Clements picnic park is approximately 12 km from the Victoria Beach aquaculture site. A picnic area is also available at the Annapolis Basin Lookoff Provincial Park, which is approximately 3.6 km to the southwest of site #1040. One boat-tour company was identified as operating in Annapolis Basin; Annapolis Basin Charter Tours offers fishing cruises, sunrise/sunset cruises, historic or scenic tours, and a shuttle service to remote picnic areas

(Annapolis Basin Charter Tours). Dockside Kayak Rentals rents kayaks and bicycles for self-guided tours around the Annapolis Basin.

According to alltrails.com (2021), there are several hiking trails around the Annapolis Basin, some curated and some not. The proposed North Mountain Provincial Park is within 5 km of the aquaculture site as is the Annapolis Basin Lookoff Provincial Park.

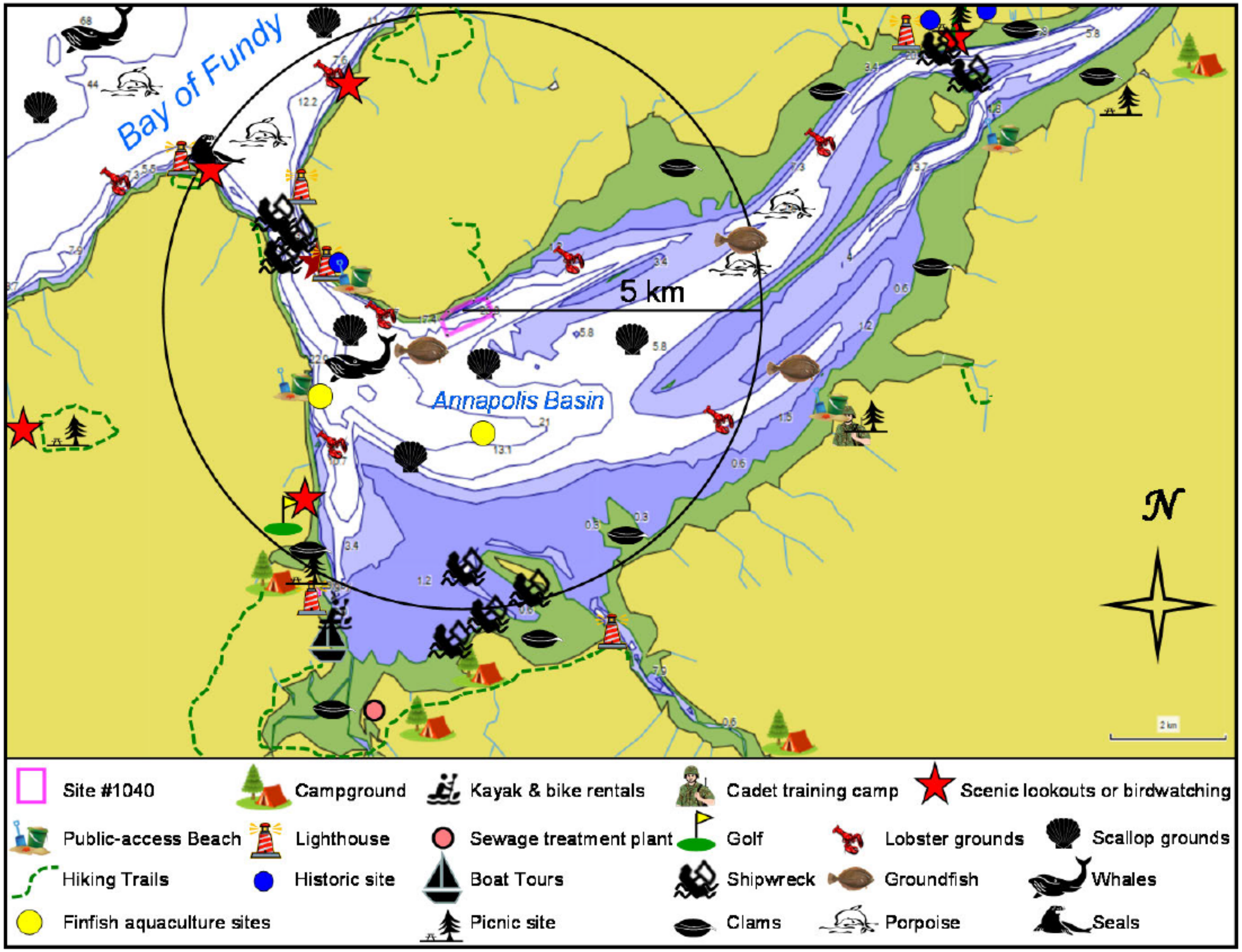
The Annapolis Basin is identified as migratory bird habitat (Nova Scotia Canada 2013a). Scenic lookouts or birdwatching sites are scattered along the coast. There are seven lighthouses between Point Prim and Annapolis Royal that attract tourists (Anderson 2021).

A few public beaches are along the shoreline of Annapolis Basin. Two are within 5 km of the Victoria Beach aquaculture site; Rattling Beach is approximately 2.7 km west-southwest of the Victoria Beach site, and Indian Beach is approximately 1.9 km west-northwest of site #1040.

Options for overnight accommodations are listed in section **5.1.5 Communities and Lodging**.

Figure 40 illustrates several tourist and recreational attractions near the Victoria Beach aquaculture site.

Figure 40. Resource Map of Annapolis Basin



5.1.5 Communities and Lodging

The Victoria Beach site is located approximately 4.7 km north-northeast of Digby and 17.5 km west-southwest of Annapolis Royal. The population of the town of Digby is 2060 (Statistics Canada 2017a) and the population of the town of Annapolis Royal is 491 (Statistics Canada 2017b).

In the town of Digby and the surrounding area, there are numerous accommodations available. Table 10 lists lodging options within 10-km of the proposed Victoria Beach boundaries.

Table 10. Lodging Options near Victoria Beach #1040

Type of Lodging	Lodging	Distance and Location from the Site	General Location
Hotel, Lodge, Inn, and Bed and Breakfast	Ocean Hillside Bed & Breakfast	3.2 km	Digby
	Admiral Digby Inn and Cottages	3.3 km	Digby
	Ocean Breeze B&B	3.5 km	Digby
	Shoreline Suites	5.1 km	Digby
	Dockside Suites	5.2 km	Digby
	Harmony Bed & Breakfast	5.5 km	Digby
	Seawinds Motel	5.6 km	Digby
	Siesta Motel	5.7 km	Digby
	Summers Inn	5.8 km	Digby
	Coastal Inn	6.4 km	Digby
	Hedley House Inn By The Sea	6.1 km	Smiths Cove
	The Harbourview Inn	6.1 km	Smiths Cove
	Butterfly Beach House Bed & Breakfast	6.3 km	Deep Brook
Resort	Digby Pines Golf Resort & Spa	4.3 km	Digby
	Villages of Mountain Gap Resort	6.3 km	Digby

Cottage or apartment	Ocean View Cottage	5.6 km	Digby
	Still Point Lodge & Cottages	5.7 km	Deep Brook
	Birch Villa Cottages	6.4 km	Smiths Cove
	Best-View Cabins	8.6 km	Clementsport
Campground	Port Wade Glamping Domes	2.3 km	Port Wade
	Digby Campground	5.3 km	Digby
	Fundy Spray Campground	6.9 km	Digby
	Jaggars Point Oceanfront Campground	6.0 km	Smiths Cove
	Bear River Millyard Recreation Campground & Camp Cottages	11.5 km	Bear River
	Upper Clements Cottages & RV Park	13.9 km	Upper Clements

5.1.6 Municipal, Industrial and Agriculture

5.1.6.1 Municipal

Residents and businesses have access to proper disposal of any residential, commercial, or industrial waste. Waste removal, which includes compost, recycling, and garbage, is available through the municipality of Digby. Residential waste is collected curbside on a scheduled day, every second week; organic waste is collected on alternating weeks, every two weeks (Municipality of the District of Digby 2021a). Residential hazardous materials such as corrosive cleaners and solvents, house and garden pesticides and herbicides, etc. should be dropped off at the transfer station in Seabrook for proper disposal. Electronic waste is not accepted at the transfer station and can be dropped off at the Enviro Depot location at Conway Workshop, at the end of Shreve Street. Digby Salvage & Disposal accepts all construction and demolition debris such as metal, shingles, wood, cement blocks, bricks, asphalt, and cardboard (Waste Check 2019a). Webbers Bottle Exchange, located in the town of Digby, is the nearest bottle exchange (Waste Check 2019b).

Municipal wastewater is one of the largest sources of pollution to surface water in Canada (Government of Canada 2020b). The Government of Canada manages the risks associated with effluent discharge under the Canadian Environmental Protection Act 1999 (Government of Canada 2021d). Municipal wastewater treatment plants operate in accordance with the Wastewater Systems Effluent Regulations, which have been established under the Fisheries Act and state minimum quality standards. A waste treatment plant located in Smith’s Cove services both the town of Digby and Digby County. A wastewater treatment plant in Cornwallis

Park services both Cornwallis Park and Deep Brook. A small wastewater treatment plant exists in Bear River, and the Town of Annapolis Royal is serviced by the Annapolis Royal Sewage Treatment Plant.

5.1.6.2 Industrial and Economic Drivers

Fishing and fish processing are the primary contributors to the Digby-area economy; however, the tourism and hospitality industries provide significant economic boost (Municipality of the District of Digby 2021b). According to Statistics Canada (2017a), the retail trade and the health-care-and-social-assistance field are the two industries that employ the greatest number of people in Digby. The accommodations-and-food-services industry ranks third. Refer to section **5.1.3 Fish and Seafood Processors** and section **5.1.4 Recreation and Tourism** for additional details.

In Annapolis Royal, the health-care-and-social-assistance field, the retail trade, and the accommodations-and-food-service industry are the industries that employ the greatest number of people, respectively (Statistics Canada 2017b).

5.1.6.3 Agriculture

According to the Statistics Canada 2016 census profile, 50 of 815 people in the Town of Digby were employed by the agriculture, forestry, fishing, and hunting industry (Statistics Canada 2017a). For the Town of Annapolis Royal, 0 of 160 people were employed in the agriculture, forestry, fishing, and hunting industry (Statistics Canada 2017b). A search of agricultural businesses in Digby and Annapolis Counties returned several results, but the closest identified agricultural business to the Victoria Beach aquaculture site was Hazel Grove Farm, which sells honey and mushrooms. Hazel Grove Farm is approximately 6 km southeast of site #1040.

5.1.7 First Nations Territories/Reserves

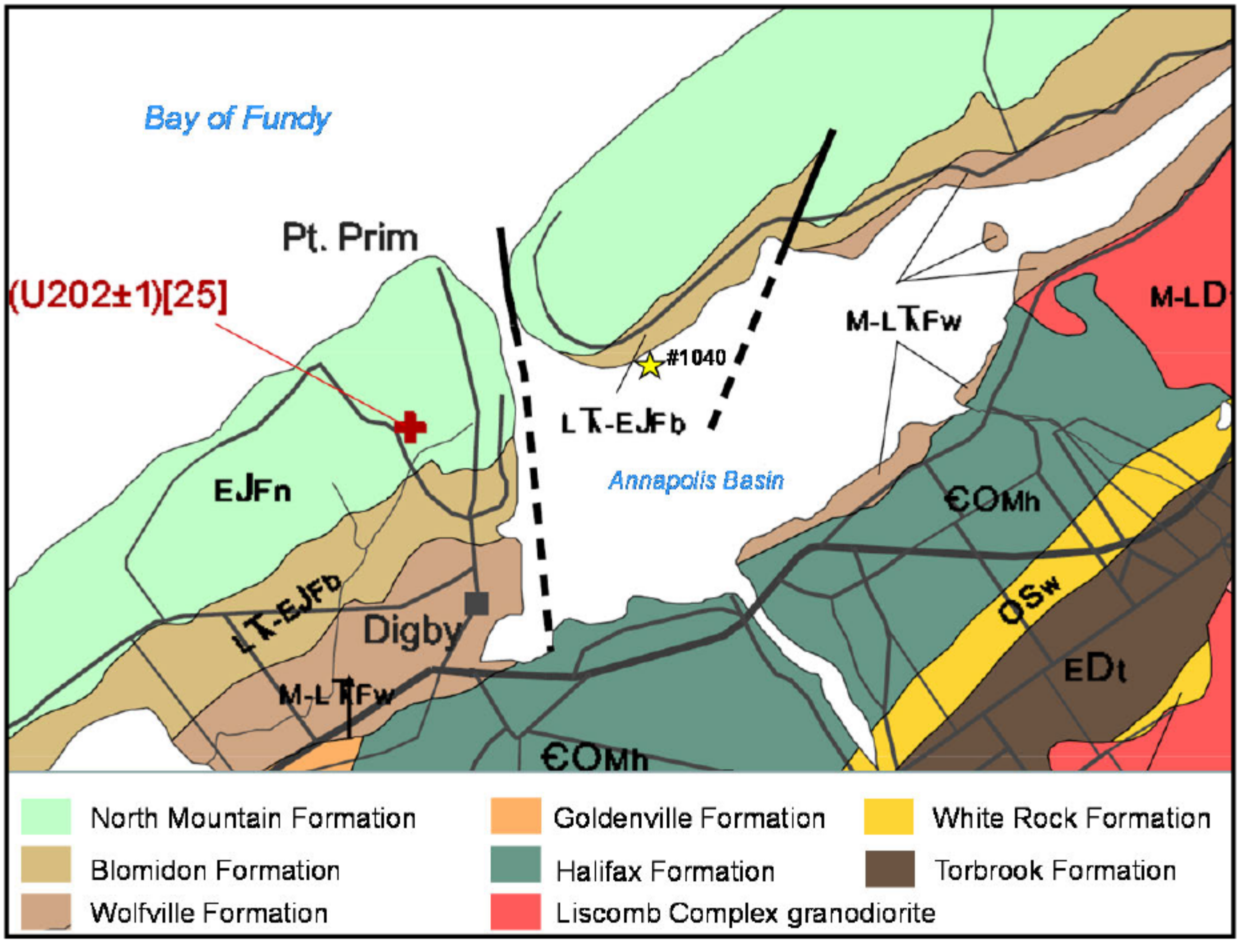
The closest First Nations communities to the Victoria Beach site are the Bear River First Nations reserve and the Annapolis Valley First Nations reserve, both are Confederacy of Mainland Mi’kmaq. According to the Bear River First Nation website (2016), the area of the reserve is 3.34 km^2 and has an on-reserve population of 108 individuals (off reserve population: 226). This reserve is approximately 13.8 km south-southeast of aquaculture site #1040. According to the Government of Canada (2019b), the Annapolis Valley First Nation had a population of 304 individuals. The Annapolis Valley reserve is approximately 95 km east-northeast of the Victoria Beach site.

5.1.8 Geology and Archaeology

Keppie (2000) mapped the shore immediately north of the Victoria Beach site as Blomidon Formation comprised of lacustrine playa, sand flat, and deltaic clastic rocks with minor aeolian sandstone and conglomerate (Fig. 41). White (2010) reports the same area as shale, siltstone, sandstone, limestone conglomerate, and basalt.

In the past, impacts to paleontological resources were assessed by the Nova Scotia Museum. An internal provincial review of new and existing aquaculture sites will be undertaken by Nova Scotia Communities, Culture, and Heritage (CCH) (S. Weseloh-McKeane, pers. comm.). In general, most cage-based aquaculture sites, like Victoria Beach, cause minimal damage to submerged archaeological resources as the anchors are the only portion of the site in contact with the seafloor.

Figure 41. Geological Map of Annapolis Basin
Note: Figure taken from Keppie (2000)



5.1.9 Shipwrecks

Several shipwrecks may be in the vicinity of the proposed boundary amendment; however, detailed locations or coordinates are not available. At least twelve vessels were reported stranded, wrecked, or foundered in Annapolis Basin, including the *James Muir*, the *Robert Leonard*, the *Marie Delphin*, the *Martha D. McLain*, the *Lizzie Wharton*, the *Clarence A. Shafner*, the *Ora*, the *Lorne B. Snow*, the *Ronald Eugene*, the *Meldon G.*, the *Wanda Elaine*, and the *Singer* (Maritime Museum of the Atlantic 2021).

In 1874, the *James Muir* was stranded due to stress of weather at Pond Cove, Bear Island. The barque was a partial loss.

The schooner called *Robert Leonard* was stranded and partially lost in 1879 at an undisclosed location in Annapolis Basin.

The schooner *Marie Delphin* ran aground and was stranded at Hardy's Point in 1894. The event resulted in a total loss.

In 1899, the schooner *Martha D. McLain* was wrecked at Sulis Point due to stress of weather during a fishing voyage, resulting in a total loss.

The schooner *Lizzie Wharton* was lost in a fire in 1901 at an unknown location in Annapolis Basin. Cargo accounted for $800 of the loss.

The schooner *Clarence A. Shafner* was stranded in 1902 when she broke her moorings. The event was only considered a partial loss.

The *Ora* was wrecked in Annapolis Basin in the winter of 1902 due to stress of weather; the brigantine was considered a partial loss.

In 1914, the schooner *Lorne B. Snow* was stranded during a fishing voyage, resulting in a partial loss.

The vessel *Ronald Eugene* was stranded in 1948 at Man of War Rock in Annapolis Basin. The event was considered a loss but not much is known about it.

The vessel *Meldon G.* foundered and was lost somewhere in Annapolis Basin in 1968 due to unknown reasons.

The fishing vessel, *Wanda Elaine*, was wrecked and lost after a fire in the engine room in April of 1972.

The *Singer*, a fishing vessel, was smashed and lost in November 1972 by heavy seas and stress of weather.

At least twelve other shipwrecks are recorded as having occurred in Digby Gut, including the *Caesar* (1710), the *Matilda* (1829), the *Matilda* (1841), the *Alice* (1886), the *Elizabeth* (1890), the *Clipper* (1897), the *E. Mayfield* (1899), the *Fleet Wing* (1907), the *Florence May* (1913), the *Sam Slick* (1916), the *General George C. Hogg* (1918), and the *General Biggar* (1954).

5.1.10 Important Habitats and Conservation Areas

The Annapolis Basin is identified as habitat for migratory birds (Fig. 42). The Basin is inhabited by bufflehead, common goldeneye, oldsquaw, common merganser, and common loon (F. MacKinnon, pers. comm.). Whales and dolphins occasionally stray into the Annapolis Basin

(Riley 2014, DFO 2020e). Bear Island, 4 km south of the Victoria Beach aquaculture site, contains a salt marsh and is considered migratory bird habitat for great blue heron, herring gull, great black-backed gull, double crested cormorant, and other, unclassified cormorant (F. MacKinnon, pers. comm.). Goat Island, near Upper Clements, is designated as habitat for great blue heron (F. MacKinnon, pers. comm.). A few marshes and swamps are within 5 km of site #1040, but all are located inland in areas that would not experience a direct influence of the marine farm.

The proposed North Mountain Provincial Park is located to the north of the Victoria Beach aquaculture site (Fig. 43). The proposed park consists of two parcels of land with frontage on the Bay of Fundy. It covers 63.8 ha and is considered valuable for hiking and coastal access in an area where there is limited Crown ownership (Province of Nova Scotia 2013b). The Annapolis Basin Lookoff Provincial Park is on the western side of the Basin, just north of Digby. It is a 1.6-ha roadside park that offers a day-time view of the Annapolis Basin (Province of Nova Scotia 2013c).

For additional information regarding important bird areas and habitats around the Victoria Beach aquaculture site, refer to section **5.2.4 Significant Habitat for Birds**.

Mitigation strategies in response to sensitive habitats/areas and species are present in section **5.3.1 Critical Habitat and Mitigation Plans for Wildlife** and the Wildlife Interaction Plan (WIP) of **Appendix C**.

Figure 42. Significant Species and Habitats
Note: Base map was obtained from the Province of Nova Scotia (2013a)

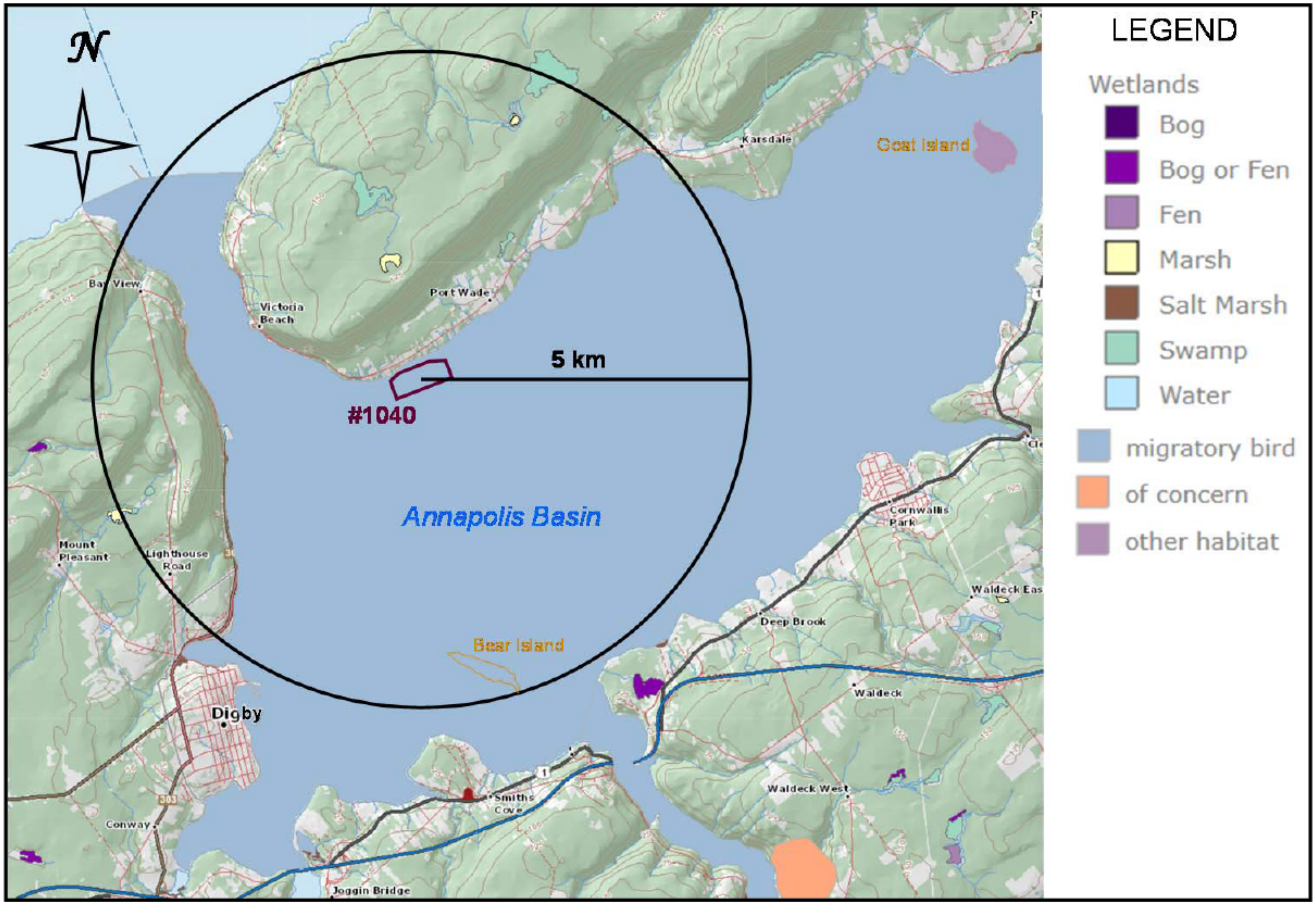
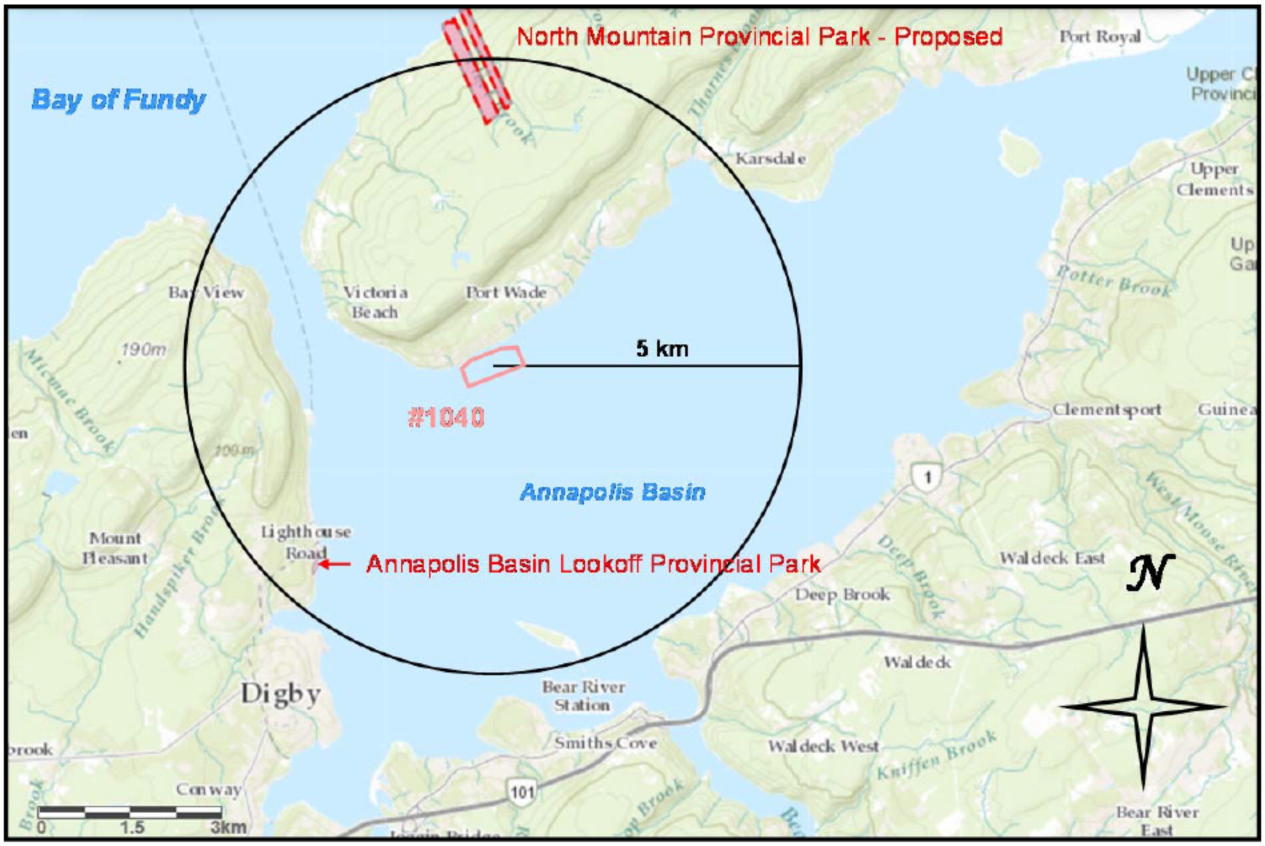


Figure 43. Parks and Protected Areas
Note: Base map was obtained from Nova Scotia Canada (2021)



5.2 Significance of Proposed Area to Wildlife

5.2.1 National Wildlife Area

Currently, there are 55 designated National Wildlife Areas (NWA) in Canada. A total of six NWAs are present in the province of Nova Scotia with a seventh (Isle Haute) in progress (Government of Canada 2019c); however, none of the NWAs are within 50 km of the proposed aquaculture site. The closest NWA is Isle Haute located in Cumberland County, 8 km south-southwest of Cape Chignecto.

5.2.2 Wetlands

In Canada, 37 sites have been designated as Wetlands of International Importance. Three are in Nova Scotia; however, none of the wetlands are within 50 km of the proposed aquaculture site (Ramsar 2014). The nearest Wetlands of International Importance is Southern Bight – Minas Basin.

5.2.3 Marine Protected Areas

As defined by Fisheries and Oceans Canada, Marine Protected Areas (MPAs) are parts of the ocean legally protected and managed to achieve the long-term conservation of nature. MPAs may allow some current and future activities, depending on their impacts to the ecological features being protected. They provide many benefits for Canadians, including environmental, social, and cultural contributions (Government of Canada 2021e). In 2019, the Government of Canada adopted a new approach to marine conservation; MPAs will now function similarly to national parks, enjoying a high level of environmental protection by including new standards that prohibit four key industrial activities: oil and gas activities, mining, dumping, and bottom trawling (Government of Canada 2019d).

The nearest MPAs to the proposed aquaculture site include the Gully, located 200 km off Nova Scotia and east of Sable Island, and the Musquash Estuary located 20 km southwest of Saint John, New Brunswick.

The Sable Gully (Government of Canada 2020c) is a submarine canyon formed by glacial erosion over thousands of years. Surrounding the Sable Gully is an important and highly functional area, in which several commercial fisheries are supported, and it is of great importance to the oil-and-gas industry. This MPA is a crucial habitat to several endangered or threatened species inhabiting the Scotian Shelf. Some of these species live in the Sable Gully year-round, including the northern bottlenose whale. Many endangered or threatened species, such as various species of sharks, tuna, marlin, and seabirds, are drawn to the area due to its copious amounts of plankton. The slopes and floor of the Sable Gully are known to have various crab species, sea pens, anemones, brittle stars, and a large variety of cold-water coral. Conservational efforts are in place as the area is used for continuous research and monitoring. The conservation efforts of Fisheries and Oceans Canada include the collection and analysis of data, regulatory monitoring of the shipping, fishing, research, tourism, and oil-and-gas activities in the surrounding area, development of regulation and industry codes, provision of educational activities at the Bedford Institute of Oceanography, and the evaluation and reporting required to produce a MPA management plan.

The Musquash Estuary is conserved by Fisheries and Oceans Canada with the help of the managers and owners of the surrounding area, including Ducks Unlimited Canada, the Eastern Habitat Joint Venture, the Nature Conservancy of Canada, the Province of New Brunswick, and the Government of Canada. Conservational efforts for the area include the production of a management plan to maintain the productivity and biodiversity and reduce any human-caused modification to the habitat.

In 2010, Fisheries and Oceans Canada announced a commitment to protect 10% of Canadian waters by 2020 (Government of Canada 2021f), with two areas of interest for MPAs in Nova Scotia including the Fundian Channel – Browns Bank and the Eastern Shore Islands. The nearest area of interest is the Fundian Channel-Browns Bank which is approximately 150 km south of site #1040 (Government of Canada 2020d).

5.2.4 Significant Habitat for Birds

Most of the species of birds in Canada are protected under the *Migratory Birds Convention Act* (Environment and Climate Change Canada 2017b). Several migratory marine birds, shorebirds, gulls, and waterfowl inhabit the waterways and shores of coastal Nova Scotia.

Migratory birds protected by the *Migratory Birds Convention Act* and associated regulations generally include all seabirds (except cormorants and pelicans), all waterfowl, all shorebirds, and most land birds, such as eagles, falcons, and hawks.

The Western Hemisphere Shorebird Reserve Network (WHSRN) has designated the upper beaches of the Bay of Fundy, including Shepody Bay and Cumberland Basin in New Brunswick and Cobequid Bay and Minas Basin in Nova Scotia, as a WHSRN site (WHSRN 2019). Cumberland Basin and Cobequid Bay are expansions of the Bay of Fundy WHSRN site, which is the only WHSRN site located in Nova Scotia.

The North Mountain is continuous with Digby Neck and is considered the main departure route for many migrating raptors, such as sharp-shinned hawks, broad-winged hawks, and peregrine falcons, in autumn (Nova Scotia Bird Society 1976).

Bird sightings specifically around the Victoria Beach aquaculture site have not been documented. However, the location of the farm falls within block 113 of the Canadian Wildlife Service (CWS) survey areas for which winter bird surveys were conducted between the years 2000 and 2010 (Fig. 44). Data provided by CWS (Table 11) shows the American black duck was the most common type of bird noted in block 113 followed by the long-tailed duck and unidentified mergansers. For additional information regarding important habitats for birds around the Victoria Beach aquaculture site, refer to section **5.1.10 Important Habitats and Conservations Areas**.

KCS operates with a WIP, which outlines all control measures and special requirements as they relate to wildlife encounters at the site. Birds are specifically addressed in the WIP (**Appendix C**).

Figure 44. Map of Canadian Wildlife Service Survey Area Block 113

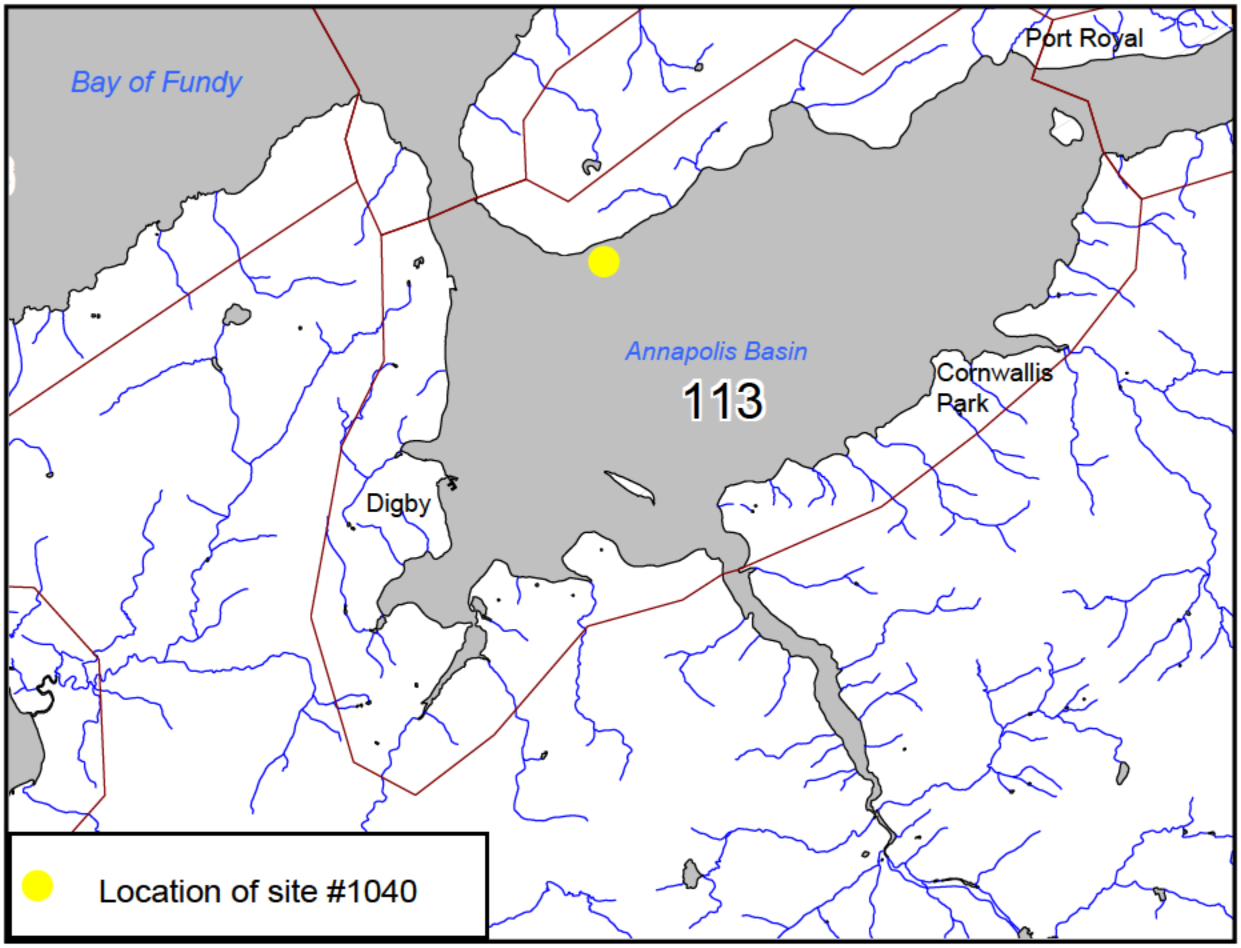


Table 11. Waterfowl Identified in Block 113

Bird Name	Canadian Wildlife Service – Block 113 Numbers of Sightings per Survey 02-Feb-00	16-May-00	04-Mar-04	26-Feb-07	18-Feb-09	22-Jan-10	Grand Total
American Black Duck		0	81	98	424	312	**915**
American Green-winged Teal	0	0	0	0	0	0	**0**
American Wigeon	0	0	0	0	0	0	**0**
Atlantic Brant	0	0	0	0	0	0	**0**
Barrow's Goldeneye	0	0	0	0	0	0	**0**
Black Scoter	0	0	0	75	61	137	**273**
Blue-winged Teal	0	0	0	0	0	0	**0**
Bufflehead	130	0	44	0	37	0	**211**
Canada Goose	44	0	0	0	0	0	**44**
Common Eider	0	0	5	47	18	0	**70**
Common Goldeneye	0	0	48	9	111	22	**190**
Common Loon	0	0	9	9	21	2	**41**
Common Merganser	11	0	0	0	0	0	**11**
Female Common Eider	2	0	0	0	0	0	**2**
Gadwall	0	0	0	0	0	0	**0**
Greater Scaup	0	0	0	0	0	0	**0**
Harlequin Duck	0	0	0	0	0	0	**0**
Hooded Merganser	0	0	0	0	0	2	**2**
King Eider	0	0	0	0	0	0	**0**
Lesser Scaup	0	0	0	0	0	0	**0**
Long-tailed Duck	0	0	306	224	88	0	**618**
Male Common Eider	2	0	0	0	0	0	**2**
Mallard	0	0	0	0	0	0	**0**
Northern Pintail	0	0	0	0	0	0	**0**
Northern Shoveler	0	0	0	0	0	0	**0**
Red-breasted Merganser	0	0	0	0	11	0	**11**
Ring-necked Duck	0	0	0	0	0	0	**0**
Snow Goose	0	0	0	0	0	0	**0**
Surf Scoter	0	0	0	0	8	0	**8**
Unidentified Cormorant	0	0	0	1	2	0	**3**
Unidentified Diving Duck	0	0	0	0	0	0	**0**
Unidentified Duck	0	0	0	0	0	0	**0**
Unidentified Goldeneye	5	0	0	0	0	0	**5**
Unidentified Merganser	0	0	91	317	139	1	**548**
Unidentified Scaup	62	0	52	192	33	0	**339**
Unidentified Scoter	0	0	2	85	0	0	**87**
Unidentified Teal	0	0	0	0	0	0	**0**
White-winged Scoter	1	0	0	0	0	0	**1**
Wood Duck	0	0	0	0	0	0	**0**
Grand Total	**257**	**0**	**639**	**1057**	**953**	**476**	**3382**

5.2.5 Significance of Proposed Area to SARA

The *Species at Risk Act* (SARA) protects species designated at risk by preventing destruction of their habitat and prohibiting harassment, capture, or harming/killing of listed species. There are several species found in Nova Scotia and the Atlantic Ocean that are listed by COSEWIC, the Government of Canada *Species at Risk Act*, or the Nova Scotia *Endangered Species Act* as either endangered, threatened, or of special concern/vulnerable. Tables 12 – 15 list those species, their status, and their occurrence in the area of interest. These tables could not be condensed to outline only specific species of the SARA list that are present around the Victoria Beach aquaculture site. Many of the animals listed are mobile and are included in the tables as species known to be within the general area of the site.

Table 12. Endangered Species in Nova Scotia and the Atlantic Ocean

Note: Unless otherwise specified, the information in the following table was derived from the Species at Risk Public Registry and associated pages (Government of Canada 2021h)

COMMON NAME	SCIENTIFIC NAME	COMMENTS
Endangered Species		
Beluga whale St. Lawrence Estuary population	*Delphinapterus leucas*	-Last COSEWIC designation (Nov 2014): endangered -This population occurs mainly in the St. Lawrence River estuary, concentrating around the mouth of the Saguenay River in summer -Threats include increased vessel traffic, noise, loss of habitat, and pollution -Protected under the federal *Species at Risk Act* (Schedule 1) and the *Marine Mammals Regulations*, which fall under the *Fisheries Act* -Very rarely spotted around Digby Neck/Brier Island (Brier Island Lodge and Restaurant)
Blue whale Atlantic population	*Balaenoptera musculus*	-Last COSEWIC designation (May 2012): endangered -Blue whales range widely, inhabiting both coastal waters and the open ocean. Individuals belonging to the Atlantic population are frequently observed in estuaries and shallow coastal zones where the mixing of waters ensures high productivity of krill -Protected under the federal *Species at Risk Act* (Schedule 1) and the *Marine Mammals Regulations*, which fall under the *Fisheries Act* - Very rarely spotted around Digby Neck/Brier Island (Brier Island Lodge and Restaurant)

Leatherback sea turtle Atlantic population	*Dermochelys coriacea*	-Last COSEWIC designation (May 2012): endangered -Atlantic Canada supports one of the largest seasonal foraging populations of leatherbacks in the Atlantic (Atlantic Leatherback Turtle Recovery Team 2006) -Protected under the federal *Species at Risk Act* (Schedule 1)
Loggerhead sea turtle	*Caretta caretta*	-Last COSEWIC designation (Apr 2010): endangered -Routinely found in Atlantic Canadian waters; usually associated with the warmer offshore waters of the Gulf Stream
North Atlantic right whale	*Eubalaena glacialis*	-Last COSEWIC designation (Nov 2013): endangered -Summer and fall occurrences in the offshore area called Grand Manan Basin -Protected under the federal *Species at Risk Act* (Schedule 1) and under the *Marine Mammal Regulations* of the *Fisheries Act* -Occasionally sighted at the entrance to the Annapolis Basin (DFO 2020e)
Red knot rufa Tierra del Fuego / Patagonia wintering population	*Calidris canutus rufa*	-Last COSEWIC designation (Nov 2020): endangered -Migratory stopovers are vast coastal zones swept by tides twice a day, usually sandflats but sometimes mudflats. In these areas, the birds feed on molluscs, crustaceans, and other invertebrates. The species also frequents peat-rich banks, salt marshes, brackish lagoons, mangrove areas, and mussel beds (Environment and Climate Change Canada 2017c) -Protected under the federal *Species at Risk Act* (Schedule 1) and the Nova Scotia *Endangered Species Act* -A regular spring and early fall migrant at Brier Island (Mills and Laviolette 2011), thus likely migrates past Annapolis Basin
Roseate tern	*Sterna dougallii*	-Last COSEWIC designation (Apr 2009): endangered -2 largest colonies are at The Brothers and Country Islands -Protected under the federal *Species at Risk Act* (Schedule 1), the federal *Migratory Birds Convention Act* and the Nova Scotia *Endangered Species Act* -Once an occasional breeder at a historic colony on Peter's Island (Mills and Laviolette 2011)

White shark	*Carcharodon carcharias*	-Last COSEWIC designation (May 2021): endangered -Occurs in both inshore and offshore waters; ranges in depth from just below the surface to just above the bottom, down to a depth of at least 1,280 m -It occurs in the breakers off sandy beaches, off rocky shores, and readily enters enclosed bays, lagoons, harbours, and estuaries but does not penetrate brackish or fresh waters to any extent -No federal or provincial laws explicitly protect white sharks in Canadian waters; however, it is given SARA Schedule 1 status

Table 13. Threatened Species in Nova Scotia and the Atlantic Ocean
Note: Unless otherwise specified, the information in the following table was derived from the Species at Risk Public Registry and associated pages (Government of Canada 2021h)

COMMON NAME	SCIENTIFIC NAME	COMMENTS
Threatened Species		
Bank swallow	*Riparia riparia*	-Last COSEWIC designation (May 2013): threatened -In the Maritimes, it is most common and widespread on Prince Edward Island and the Northumberland Coasts of New Brunswick and Nova Scotia -Considered endangered under the Nova Scotia *Endangered Species Act* -Historically bred around the Annapolis Basin, including the North Mountain (Stewart et al. 2015)
Barn swallow	*Hirundo rustica*	-Last COSEWIC designation (May 2021): special concern -Protected under the *Migratory Birds Convention Act* -Considered endangered under the Nova Scotia *Endangered Species Act* -Historical breeding on the North Mountain above Annapolis Basin was probable (Stewart et al. 2015)
Bobolink	*Dolichonyx oryzivorus*	-Last COSEWIC designation (Apr 2010): threatened -Suffered severe population declines since 1960's -Threatened by agricultural operations, habitat loss, and pesticide exposure -Considered vulnerable under the Nova Scotia *Endangered Species Act* -Historically bred around the Annapolis Basin, including the North Mountain (Stewart et al. 2015)

Canada warbler	*Cardellina canadensis*	-Last COSEWIC designation (Nov 2020): special concern -Found in a variety of forest types, but it is most abundant in wet, mixed deciduous-coniferous forest with a well-developed shrub layer -Protected under the *Migratory Birds Convention Act* and the *Canada National Parks Act* -Considered endangered under the Nova Scotia *Endangered Species Act* -Historical breeding on the North Mountain above Annapolis Basin was considered possible (Stewart et al. 2015)
Common nighthawk	*Chordeiles minor*	-Last COSEWIC designation (Apr 2018): special concern -Nests in a wide range of open, vegetation-free habitats including dunes, beaches, recently harvested forests, burnt-over areas, logged areas, rocky outcrops, rocky barrens, grasslands, pastures, peat bogs, marshes, lakeshores, and riverbanks; also inhabits mixed and coniferous forests -Protected under the *Migratory Birds Convention Act* and the Nova Scotia *Endangered Species Act* -Historical breeding on the North Mountain above Annapolis Basin was considered possible (Stewart et al. 2015)
Northern wolffish	*Anarhichas denticulatus*	-Last COSEWIC designation (Nov 2012): threatened -Extends from the Canadian portion of the Gulf of Maine north to the Bay of Fundy, the Scotian Shelf, the Grand Banks, Gulf of St. Lawrence, Northeastern Newfoundland Shelf, and Labrador Sea as far as the waters west of Greenland -Typically found offshore in water < 5^{o}C
Olive-sided flycatcher	*Contopus cooperi*	-Last COSEWIC designation (Apr 2018): special concern -Breeds in scattered locations throughout most of forested Canada -Most often associated with open areas containing tall, live trees or snags for perching -Protected under the *Migratory Birds Convention Act* -Considered threatened under the Nova Scotia *Endangered Species Act* -Historical breeding on the North Mountain above Annapolis Basin was considered possible (Stewart et al. 2015)

Table 14. Species of Special Concern in Nova Scotia and the Atlantic Ocean
Note: Unless otherwise specified, the information in the following table was derived from the Species at Risk Public Registry and associated pages (Government of Canada 2021h)

COMMON NAME	SCIENTIFIC NAME	COMMENTS
Species of Special Concern		
Atlantic wolffish	*Anarhichas lupus*	-Last COSEWIC designation (Nov 2012): special concern -Primarily inhabits the cold, deep waters of the continental shelf; prefers rocky or hard clay bottoms and uses areas with sandy or muddy bottoms only occasionally -May be present in the study area
Barrow's goldeneye	*Bucephala islandica*	-Last COSEWIC designation (May 2011): special concern -Protected under the *Migratory Birds Convention Act* -The Species at Risk Public Registry shows the entire coast of Nova Scotia as Barrow's goldeneye habitat -Occurs in sheltered areas along the coast and occasionally in ice-free rivers, such as the Annapolis (Robert et al. 2000)
Eastern wood-pewee	*Contopus virens*	-Last COSEWIC designation (Nov 2012): special concern -Protected under the *Migratory Birds Convention Act* -Considered vulnerable under the Nova Scotia *Endangered Species Act* -Possible breeding evidence on the North Mountain above Annapolis Basin (Stewart et al. 2015)
Fin whale	*Balaenoptera physalus*	-Last COSEWIC designation (May 2019): special concern -Associated with low surface temperatures and oceanic fronts during summer months; found from close inshore to well beyond the shelf break
Peregrine falcon *anatum* subspecies	*Falco peregrinus anatum*	-Last COSEWIC designation (Nov 2017): not at risk -Prefer open habitats, such as seacoasts, for hunting -Considered vulnerable under the Nova Scotia *Endangered Species Act* -Protected by the *Convention on International Trade in Endangered Species of Wild Fauna and Flora* - Appendix I -Noted on Bear Island (F. MacKinnon, pers. comm.)

Rusty blackbird	*Euphagus carolinus*	-Last COSEWIC status (Apr 2017): special concern -The breeding range of the rusty blackbird includes a vast portion of Canada; a very small number of rusty blackbirds winter, albeit sporadically, in the southern part of most Canadian provinces -Protected under the *Migratory Birds Convention Act* -Considered endangered under the Nova Scotia *Endangered Species Act* -Historical breeding evidence for Digby area (Stewart et al. 2015)
Savannah sparrow princeps subspecies	*Passerculus sandwichensis princeps*	-Last COSEWIC status (Nov 2009): special concern -Nests in heath-dominated terrain and in dense marram grass on coastal dunes and upper beaches (prefers heath areas) -Historical breeding evidence for Digby area (Stewart et al. 2015)
Short-eared owl	*Asio flammeus*	-Last COSEWIC designation (May 2021): threatened -Breeds sporadically in arctic areas, coastal marshes, and interior grasslands, where voles and other small rodents proliferate -Occasionally seen in coastal areas of Atlantic Canada

Table 15. Species with no SARA Status but with COSEWIC Designation in Nova Scotia and the Atlantic Ocean

Note: Unless otherwise specified, the information in the following table was derived from the Species at Risk Public Registry and associated pages (Government of Canada 2021h)

COMMON NAME	SCIENTIFIC NAME	COMMENTS
Species with no SARA status		
Acadian redfish Atlantic population	*Sebastes fasciatus*	-Last COSEWIC designation (Apr 2010): threatened -The Atlantic population of Acadian redfish extends across all Canada's Atlantic waters, except for northernmost areas
American eel	*Anguilla rostrate*	-Last COSEWIC designation (May 2012): threatened -Canadian range includes all fresh water, estuaries, and coastal marine waters that are accessible to the Atlantic Ocean -Blockage of migratory streams is a major threat to the species
American plaice Maritime population	*Hippoglossoides platessoides*	-Last COSEWIC designation (Apr 2009): threatened -Wide distribution throughout the North Atlantic -Overfishing and natural mortality are the main threats to the Maritime population

Atlantic bluefin tuna	*Thunnus thynnus*	-Last COSEWIC designation (May 2011): endangered -Occurs in the western Atlantic from Newfoundland to the Caribbean Sea; actively fished in Canadian waters from July through December over the Scotian Shelf
Atlantic cod Southern population	*Gadus morhua*	-Last COSEWIC designation (Apr 2010): endangered -Atlantic cod inhabit all waters overlying the continental shelves of the Northwest and the Northeast Atlantic Ocean -Commercial fishing is ongoing and contributes to the decline; there is evidence of an unexplained increase in natural mortality in the 4X portion of the designatable unit
Atlantic salmon Nova Scotia Southern Upland population	*Salmo salar*	-Last COSEWIC designation (Nov 2010): endangered -Acidification of freshwater habitats by acid rain is a major threat as is poor marine survival related to changes to the marine ecosystem
Atlantic sturgeon Maritime population	*Acipenser oxyrinchus*	-Last COSEWIC designation (May 2011): threatened -Occurs in rivers, estuaries, near-shore marine environments, and shelf regions to at least 50 m depth along the Atlantic coast of North America
Basking shark Atlantic population	*Cetorhinus maximus*	-Last COSEWIC designation (Nov 2009): special concern -Uses coastal, temperate waters -Mortality caused by fishing by-catch and boat strikes are cited as the major threats to the species
Cusk	*Brosme brosme*	-Last COSEWIC designation (Nov 2012): endangered -Is not found near the shore or at depths less than 20 to 30 m -Fishing is an important cause of mortality, especially as bycatch in cod, haddock, pollock, and halibut longline fisheries
Harbour porpoise Northwest Atlantic population	*Phocoena phocoena*	-Last COSEWIC designation (Apr 2006): special concern -Found primarily over continental shelves and occasionally in deeper water -Frequents bays and harbours, especially in the summer -Occurs in the Bay of Fundy

Hudsonian godwit	*Limosa haemastica*	-Last COSEWIC designation (May 2019): threatened -An Arctic-nesting shorebird often found flying over Atlantic coast lines during their migration to South America -Largest threats to populations are the loss or disturbance of suitable habitats and prey availability for both nesting and over-wintering locations -Protected by the *Migratory Birds Convention Act* in Canada and the *Migratory Bird Treaty Act* within the United States -A scarce migrant on Brier Island in late July to mid-August (Mills and Laviolette 2011)
Killer whale Northwest Atlantic population	*Orcinus orca*	-Last COSEWIC designation (Nov 2008): special concern -Very rarely spotted around Brier Island (Victoria Beach Lodge and Restaurant)
Lesser yellowlegs	*Tringa flavipes*	-Last COSEWIC designation (Nov 2020): threatened -Breeds in Canada's boreal region -Loss of wetland and intertidal habitat used during migration is a key concern -Protected by the *Migratory Birds Convention Act* -A sparse spring migrant but an abundant migrant in summer and fall on Brier Island (Mills and Laviolette (2011)
Lumpfish	*Cyclopterus lumpus*	-Last COSEWIC designation (Nov 2017): threatened -Can be found in the water column and near the seafloor in a variety of habitats -Fishing and destruction of inshore spawning and nesting habitat are suspected threats to the species
Porbeagle shark	*Lamna nasus*	-Last COSEWIC designation (May 2014): endangered -Can be found from the coast to the open sea -Protected by the *Oceans Act* and by the *Fisheries Act* under the terms of the *Atlantic Fishery Regulations, 1985* -Target fishing and by-catch of longline fisheries has resulted in the population decline and continues -Currently no fisheries management measures for this species

Sei whale	*Balaenoptera borealis*	-Last COSEWIC designation (May 2019): endangered -Sei whales range widely, encompassing all the world's oceans including the Scotian Slope and Shelf, particularly during the summer months. -Atlantic population follows large pelagic concentrations of zooplankton along the continental shelf -Nova Scotian stock protected under the United States *Endangered Species Act, 1973,* and the *Marine Mammals Regulations*, which fall under the *Fisheries Act*
Shortfin mako Atlantic population	*Isurus oxyrinchus*	-Last COSEWIC designation (May 2019): endangered -Found in both inshore and offshore waters -COSEWIC has identified fishing, especially pelagic long-lining, as being the most significant threat to the shortfin mako; there is no directed fishery for shortfin mako in Atlantic Canada, but it is caught as by-catch in other pelagic fisheries and is sought after for sport fishing -Managed under the Canadian Atlantic Pelagic Shark Integrated Fisheries Management Plan which allows for an unrestricted by-catch along with 100% dockside monitoring
Smooth skate Laurentian-Scotian population	*Malacoraja senta*	-Last COSEWIC designation (May 2012): special concern -One of the smallest species of skate endemic to the western North Atlantic -By-catch mortality contributes to population decline -No direct fisheries for this species but is taken as by-catch in fisheries directed towards groundfish -Population of the Laurentian-Scotian has accounted for 90% of the smooth skates in Canada, while covering 70% of the Canadian smooth-skate range -Area of abundance along the Scotian Shelf has drastically declined since the 1970s
Spiny dogfish	*Squalus acanthias*	-Last COSEWIC designation (Apr 2010): special concern -Inhabits Canadian waters ranging from Newfoundland to the Scotian Shelf, approximately 10 to 20% of those around southwest Nova Scotia migrate south into US waters in the fall and return in the spring (Government of Canada 2018d) -Widely distributed in temperate regions of the world's oceans and appears to be a habitat generalist; subject to both targeted and by-catch fishing mortality -Target of a directed fishery in Atlantic Canada, but the fishery is currently inactive (Government of Canada 2020e)

Striped bass Bay of Fundy population	*Morone saxatilis*	-Last COSEWIC designation (Nov 2012): endangered -Shubenacadie, Annapolis, and Saint John Rivers are historical spawning grounds, of which only the Shubenacadie is still used, but a native population in the Saint John River may still exist
Thorny skate	*Amblyraja radiata*	-Last COSEWIC designation (May 2012): special concern -Ranges widely and is one of the most common skate species in the Northwest Atlantic (Government of Canada 2018e) -Both a target of directed fisheries and caught as by-catch, although directed fisheries along the eastern Scotian Shelf stopped in 2005 (Government of Canada 2018e) -Regarded as over-fished and landing of this species is prohibited throughout the Gulf of Maine (Government of Canada 2018e)
White hake Atlantic and Northern Gulf of St. Lawrence population	*Urophycis tenuis*	-Last COSEWIC designation (Nov 2013): threatened -Fish of all sizes tend to move inshore in summer and to deeper water for winter -Overfishing is thought to be the main reason for the decline of the species and high levels of natural mortality impede recovery

5.3 Impacts to Other Users Including Wildlife

5.3.1 Critical Habitat and Mitigation Plans for Wildlife

KCS operates with a WIP that outlines all control measures and special requirements as they relate to wildlife encounters at the site (**Appendix C**).

<u>Leatherback Sea Turtle</u>

In 2006, the Atlantic Leatherback Turtle Recovery Team published a recovery strategy for the turtles in Atlantic Canadian waters. The recovery strategy document listed entanglement in commercial fishing gear, vessel collision from recreational boating and other ship traffic, marine pollution, and oil and gas exploration and development as potential threats contributing to mortality. A summary of the gear types thought to be the highest risk for entanglement included longline, gillnet, traps, and pots (Government of Canada 2021i). Aquaculture gear was not mentioned in the document, but it stands to reason that aquaculture equipment, including all lines, should be kept in good working order.

Mitigation: The leatherback sea turtle is protected under the *Species at Risk Act*, which makes it an offense to kill, harm, harass, capture, or take any individuals of a listed species. KCS will comply by these rules. If a leatherback sea turtle is spotted by any of the crew working on the aquaculture site, the Marine Animal Response Society (MARS) will be contacted at 1.866.567.6277 and provided details of the sighting.

Migratory Birds

Most species of birds in Canada are protected under the *Migratory Birds Convention Act*. Under the *Migratory Birds Regulations* (C.R.C, c. 1035; Environment and Climate Change Canada 2017b), it is an offense to disturb, destroy, or take a nest, egg, or shelter of a migratory bird, or possess a live migratory bird, or the carcass, skin, nest, or egg of a migratory bird except under the authority of a permit (Government of Canada 2021j).

Mitigation: KCS personnel will abide by the *Migratory Birds Convention Act* and the associated regulations

Roseate Terns

Two criteria have been used to identify critical habitat for the roseate tern in Canada (Environment Canada 2010). The first includes less than 10% of the Canadian population of roseate terns. These sites currently support more than 15 pairs of roseate terns. This includes North Brother, South Brother, and Country Islands. The second criterion includes tern colonies in areas that have supported small but persistent numbers of nesting roseate terns. The areas currently identified under this criterion include Sable Island and the Magdalen Islands. The closest known roseate-tern colony to the Victoria Beach aquaculture site is in Grand Passage; historically, there was a small colony of roseate terns on Peter's Island until about 2001 (COSEWIC 2009b, Mills and Laviolette 2011).

Mitigation: None of the areas identified as critical habitat are within 5 km of the aquaculture site; however, KCS will limit beach clean-up activities to the fall and winter months so as not to interfere with sensitive breeding, nesting, and fledging times (i.e., mid-April to mid-August). KCS employees will not kill, harm, or collect adults, young, or eggs of the roseate terns.

Sharks

The white shark is listed under Schedule 1 of the *Species at Risk Act*; it is illegal to kill, harm, harass, capture, take, possess, collect, buy, sell, or trade individuals of endangered, threatened, or extirpated species listed in Schedule 1 of the Act (Government of Canada 2021k). In Atlantic Canada, there are only two directed shark fisheries. One is a recreational fishery for the blue shark which is primarily in the form of annual derbies; the other is a commercial fishery, currently inactive, aimed at spiny dogfish (Government of Canada 2020e). The practice of finning, removing and retaining the fins and discarding the remainder of the shark at sea, was banned in Canadian waters in 1994 (Government of Canada 2020e).

Mitigation: KCS personnel will not attempt to attract, capture, or harass any sharks in any way.

Whales

The St. Lawrence Estuary population of beluga whales is at its southernmost limit of the species distribution. In summer, the species concentrates around the mouth of the Saguenay

River from Ile aux Coudres to Bic and as far up the Saguenay as Saint-Fulgence. Little is known about wintering grounds. Vagrants are sometimes seen as far away as New York (Hamilton 2018).

The blue whale remains listed under the *Species at Risk Act* as an endangered species throughout the Atlantic. A recent science advisory report (DFO 2018a) identified areas important to blue whales. The areas identified include the lower St. Lawrence Estuary, Mecatina Trough, South and Southwestern Newfoundland, the edge of the continental shelf, Honguedo Strait, and the Cabot Strait. These areas were identified based on their importance to the species for feeding and transit; none are near the Victoria Beach aquaculture site.

North Atlantic right whales have occurred throughout history in the coastal waters of the Atlantic, ranging from lower latitudes throughout winter for calving, and higher latitudes for feeding during the spring, summer, and autumn months (NOAA Fisheries Service 2022). Throughout these migrations, areas of high use include Coastal Florida and Georgia, the Great South Channel, Cape Cod Bay, the Bay of Fundy, and the Scotian Shelf (Brown et al. 2009, Government of Canada 2020f, NOAA Fisheries Service 2022).

Mitigation: Beluga, blue, and North Atlantic right whales are protected under the *Species at Risk Act*. KCS will comply with these regulations and will not attempt to harvest, kill, or harass any whales (such as blue whales, right whales, belugas, orcas, sei, etc.) that are seen during aquaculture activities. Should any whale in distress be noted by any of the crew members at the aquaculture site, the Marine Animal Response Society (MARS) will be contacted at 1.866.567.6277 and provided with details of the sighting. Vessels servicing the site will travel at a maximum speed of 9 knots to prevent damaging collisions between whales and aquaculture service vessels. This is below the recommended speed set by NOAA Fisheries Service for ships travelling through areas known to have whales present (i.e., 10 knots or less: NOAA Fisheries Service 2022).

5.3.2 Impacts to Other Users

5.3.2.1 Right to Navigation

Figure 45 provides information regarding navigation routes that are used by KCS while servicing the Victoria Beach aquaculture site. The layout of on-site equipment is provided in Figures 46 - 48. Please refer to section **5.1.2 Pleasure Craft and Commercial Vessels**, **Section 6.0 The Public Right of Navigation** and **8.2.2 Boat Traffic and Wharves** for additional information regarding the right to navigation around the Victoria Beach aquaculture site.

Figure 45. Marine Chart Showing KCS Vessel Route from Victoria Beach to Digby

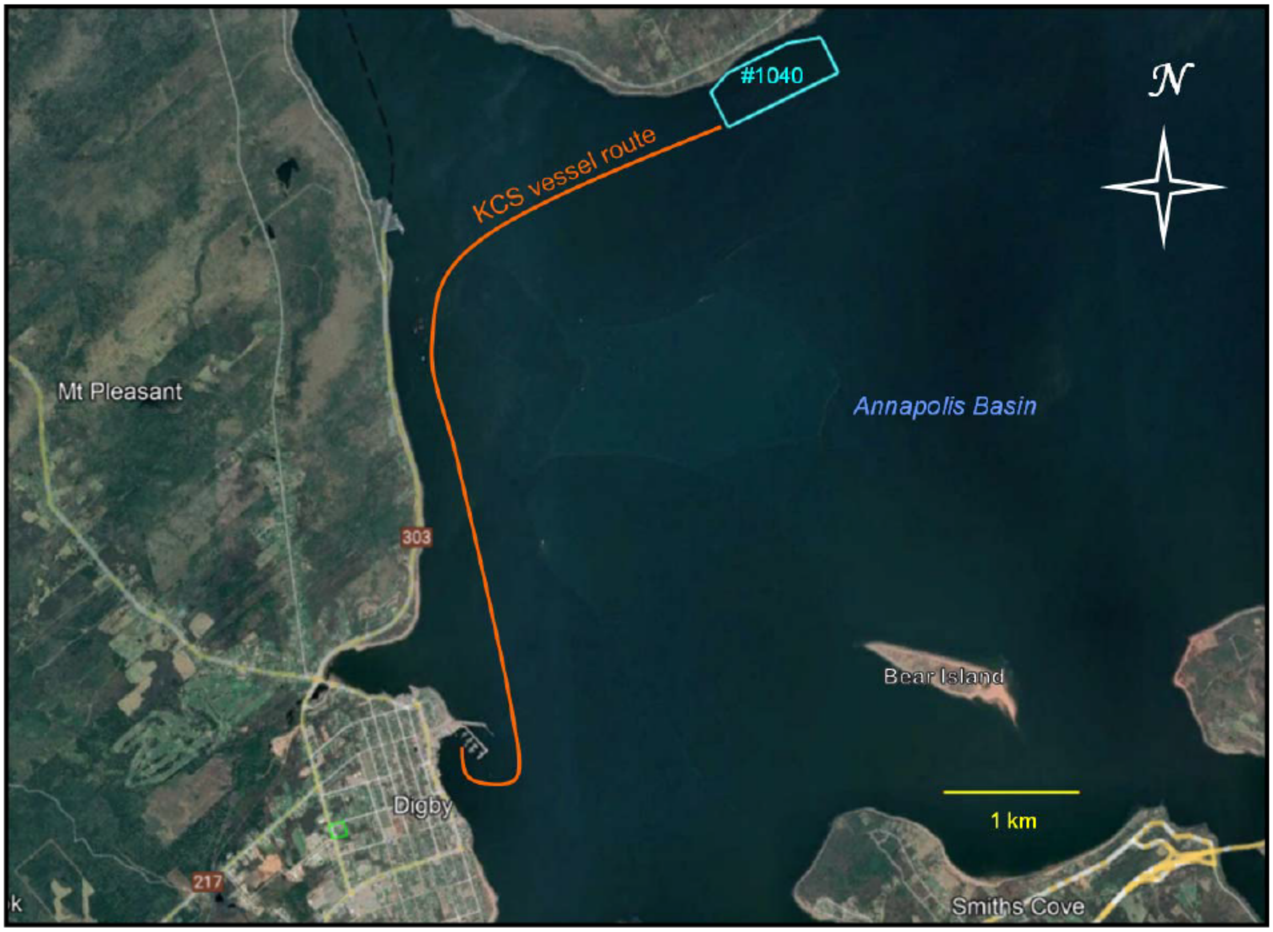


Figure 46. Victoria Beach Site Development Plan Showing Cage Configuration

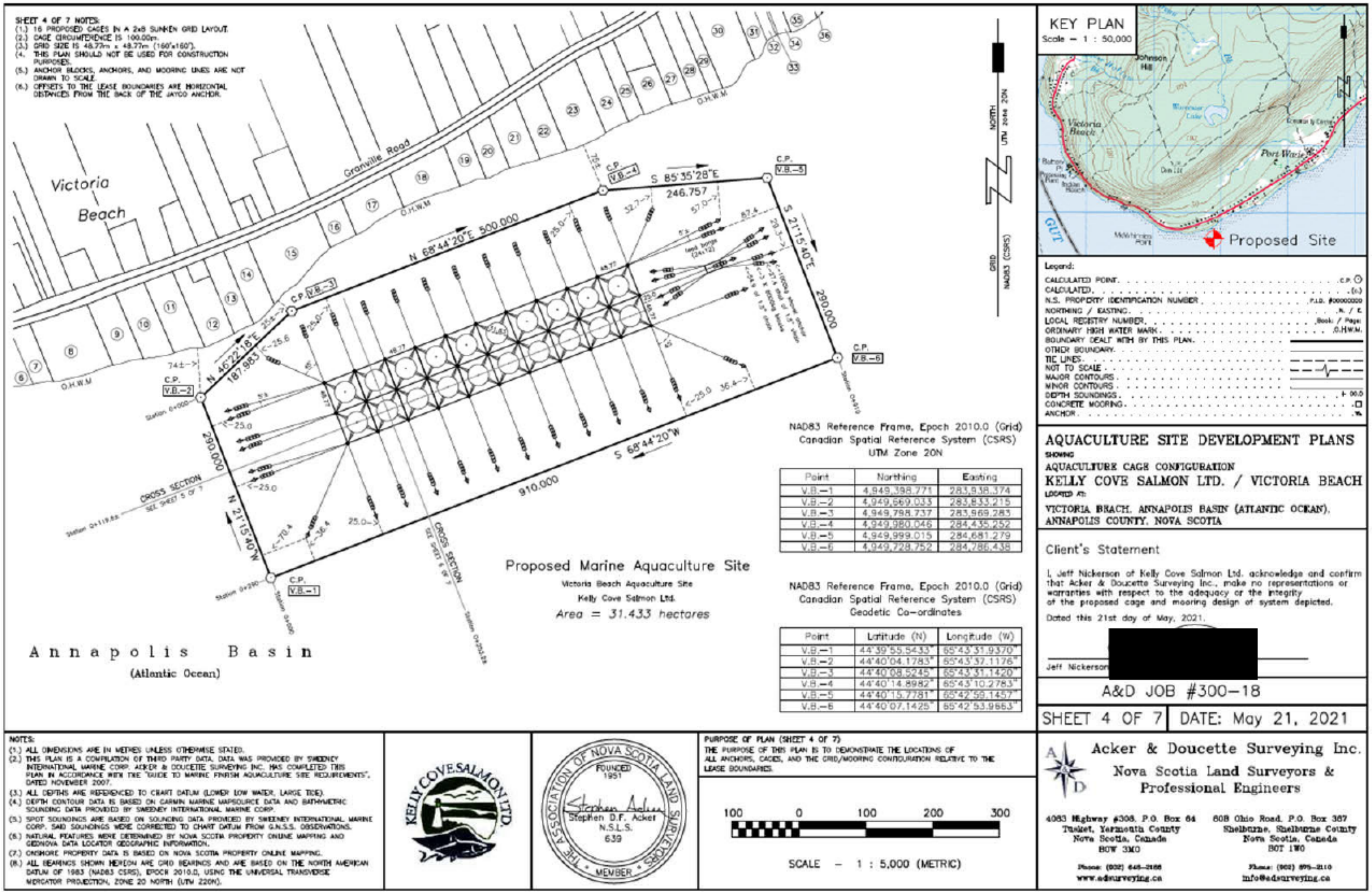


Figure 47. Victoria Beach Cross-Sectional Plan A

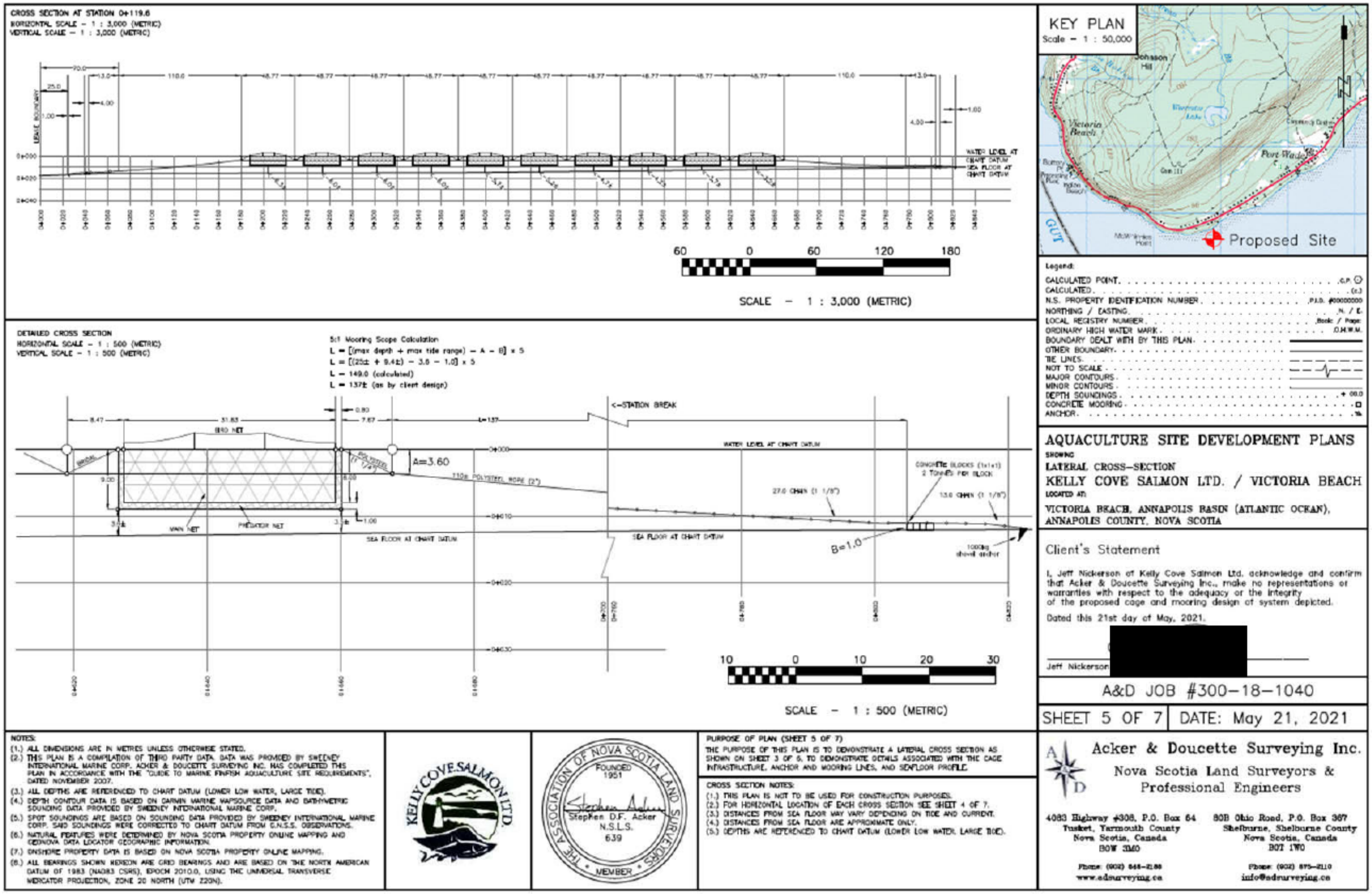
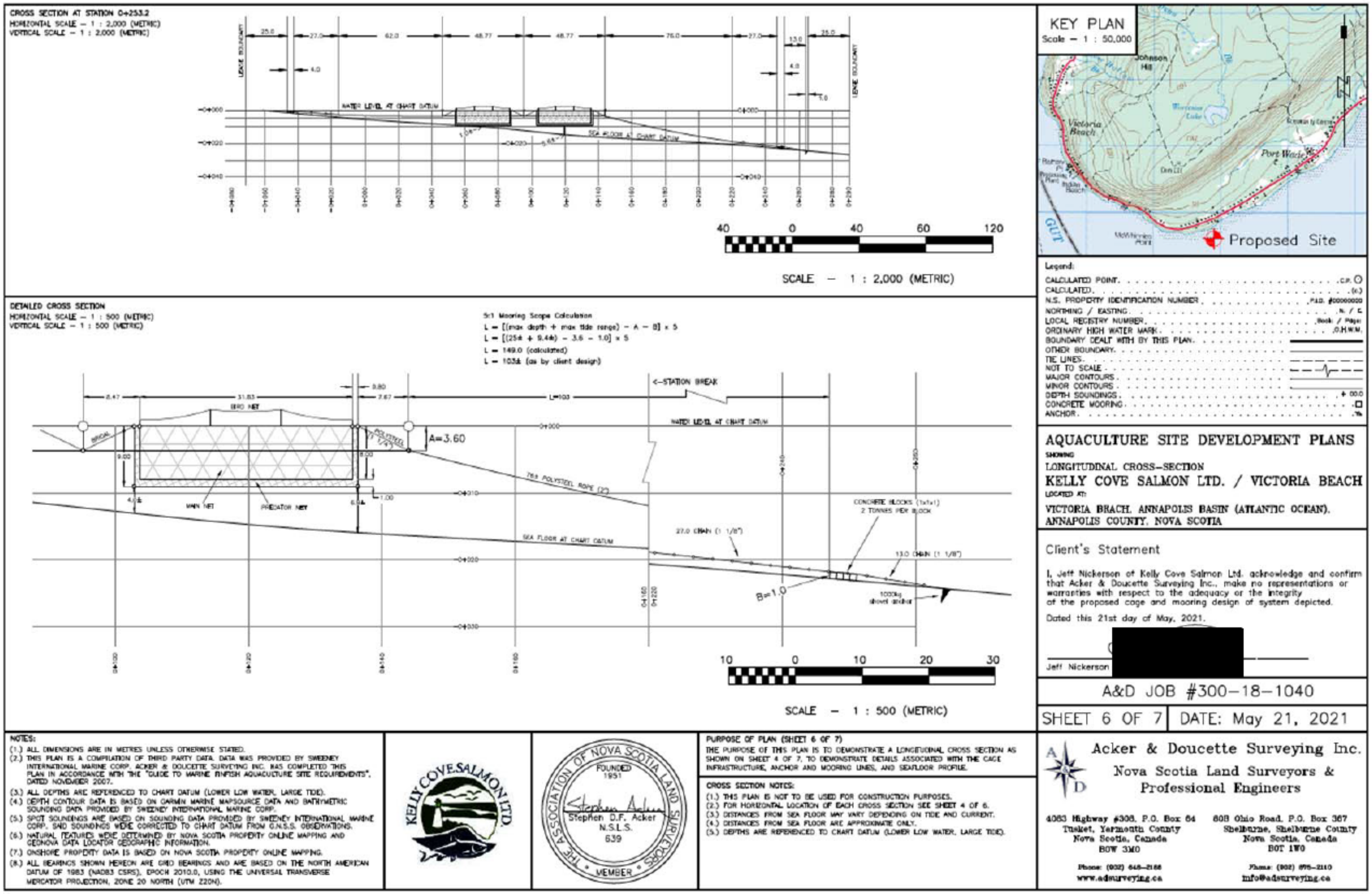


Figure 48. Victoria Beach Cross-Sectional Plan B



5.3.2.2 Esthetics

The Victoria Beach site is an existing site. The requested boundary amendment will not affect the visual appearance of the site other than the addition of a few more cages. The site is maintained in good working order in agreement with the site's FMP. Refer to **7.2.3.1 Infrastructure** for additional details.

5.3.2.3 Bird Activity

Seabirds, such as seagulls, are endemic to the Bay of Fundy and its sub-bays. They are common in the Annapolis Basin. Any activity on the water, which includes fishing and aquaculture, can attract opportunistic birds such as seagulls. These birds can become a nuisance for site operations, and they may become conditioned to seek food from human activities. KCS will continue to discourage bird activity at the site by using bird nets over the cages, implementing innovative feeding equipment, and keeping the feed in a closed hopper. Refer to **5.4.1 Wildlife** for additional details.

5.4 Impacts to Other Users Including Wildlife

5.4.1 Wildlife

Due to the environment in which KCS operates, wildlife interactions will be unavoidable – positive, neutral, or negative. Positive and neutral interactions may require management notification if the species is listed on a species-at-risk registry or other similar document.

Negative interactions, such as predators, should be noted to determine if there is an increase or decrease in activity. Any interaction must be reported. Interactions with birds and predators at a marine finfish site are to be avoided. Unwanted attention from birds and predators, such as seals, endangers the wildlife themselves, can present a nuisance to workers, may cause stress on the fish, and may pose biosecurity and fish-health risks.

Predator deterrence is key to containment management. Predator exclusion includes predator netting, bird nets, and containment nets. Site mortalities are to be contained in a secure, closed bin and removed promptly from the site. The containers are to be checked daily to ensure their integrity. Feed is to be stored inside, or, if outside, covered with tarps or stored inside a tub with a securely fastened lid. Routine, daily examinations of dead and live fish are conducted to inspect for signs of predator attack, which are noted. Divers are called in when deemed necessary to verify net integrity below the water if predator problems are detected.

To deter birds and to mitigate against interactions, each cage containing fish is equipped with a bird stand and net for the duration of the grow-out. These stands and nets remain in place during the production cycle but may be temporarily lifted during activities such as mortality dives, net washing, fish transfers, or treatments. KCS performs and documents surface inspections to ensure netting and gear are maintained in good working order. At minimum, weekly bird-net inspections are performed.

Predator nets surrounding the primary nets will be in use during the months of December to May to aid with predator deterrence. Predator nets will not be placed on the cages from May to December as predator presence is low. Removal of the predator nets on the cages during these months will aid in reducing the amount of biofouling on the cages.

Measures taken to protect fish from predators are always carried out in a manner that considers predator welfare and does not endanger the predator population.

The WIP contains prevention and control measures for wildlife (**Appendix C**).

5.4.2 People Interaction

Interaction with people outside of KCS is inevitable. Use of the Digby Wharf contributes to this. Interactions with people and organizations outside of KCS can raise concerns for biosecurity, pollution, and safety of the site staff.

Biosecurity is a key component to managing the risk of pathogen spread. Biosecurity helps mitigate outbreaks of disease through the control of personnel, traffic, vehicles, biologics, and equipment. Biosecurity standard operating procedures must be developed and used to mitigate risk and to manage activities to reduce stress in animals and to reduce the potential for pathogen spread. Biosecurity must be considered for all procedures and must be addressed within procedural descriptions. All sites have a wharf-usage biosecurity procedure, which considers other users of the wharf.

Also, the potential for pollution from other industries within Annapolis Basin exists. The Digby ferry operates near the site and there are fish processing plants around the Basin. Fishing and recreational boating occurs in the Basin, and there is a sewage treatment plant near The Joggins.

Responsible operation of a site includes consideration for neighbours in terms of noise and its potential for causing disruption. Sound attenuation is an important factor when purchasing any new equipment that will be used on the site – new equipment will be assessed for noise reduction opportunities. When possible, machinery will be placed in areas that will have the least amount of impact for other water- and shore-based users. KCS uses mufflers or noise reduction methods/materials on air blowers and diesel engines and minimizes activities that can create noise. It is KCS policy to turn off non-essential equipment, whenever possible, to reduce noise.

Visitors to the Victoria Beach site are welcomed and are expected to follow basic biosecurity and health and safety (H&S) rules. This aids in ensuring that all parties on the site remain safe. The Site Manager should confirm with the Area Manager that any visitor has approval to be on site if the Site Manager was not previously informed. All visitors must sign the logbook. Visitors must change their footwear prior to stepping on site; rubber boots will be provided from the office. All visitors must wear PPE including a PFD while travelling to and from the site and while on site, and the use of footbaths and proper hygiene is mandatory. By adhering to strict biosecurity, H&S rules, and visitor protocols, KCS provides a safe working environment for employees, visitors, and the fish on site.

KCS operates under a detailed safety management system (SMS). The SMS contains procedures for dealing with emergency preparedness and transportation. An emergency is classified as any situation that has the potential to cause harm to any employee, visitor, or infrastructure on site.

SECTION 6.0 THE PUBLIC RIGHT OF NAVIGATION

6.1 Navigation Protection Program Approval

6.1.1 Notice of Works

Transport Canada requires a notice of works form to notify the Navigation Protection Program (NPP) regarding a proposed work or change to an existing work in navigable waters. An application for approval has been filed via the online portal for the proposed boundary amendment of Victoria Beach. A completed and signed notice of works form with supporting documentation is present in **Appendix D** for reference. Acker & Doucette Surveying Inc. produced the aquaculture site development plans submitted with the signed notice of works. The plans include:

a. Proposed navigation-aids, to demonstrate the extent of the marine aquaculture site, as well as parcels of land adjacent to the lease. Property identification numbers (P.I.D. #) with corresponding owner names and addresses are also outlined in the plans
b. Depiction of the basic seafloor topography within the proposed lease boundaries
c. Demonstration of anchors, cages, and grid/mooring configuration location within the proposed lease boundaries
d. Lateral and longitudinal cross sections demonstrating cage infrastructure, anchor blocks, mooring lines, and seafloor profile, and
e. Proposed navigational and marking plan.

Each plan indicates the shape and position of the proposed lease, legal lease number, and the corner coordinates of the lease.

6.1.2 Project Description

The proposed lease incorporates all proposed aquaculture-related gear, above and below the water line. Installation of specific buoys to mark the lease area will be completed, as per Transport Canada's approval package.

SECTION 7.0 THE SUSTAINABILITY OF WILD SALMON

7.1 Identification of Local Salmon Populations

The abundance of the iconic Atlantic salmon, both globally, as well as in the Canadian Maritimes has undergone steep declines for several decades. Hundreds of research studies, conducted by thousands of researchers have attempted to identify the causative agents behind this alarming North Atlantic trend but, to date it is unclear what factor(s) are causing the continued decline. Numerous potential threats in both freshwater and marine habitats have been identified, yet conclusive scientific evidence remains elusive. These threats include but are not limited to, environmental change, exposure to contaminants, reduced habitat access, ecological community changes, aquaculture interactions, fisheries bycatch, and depressed population phenomena (Amiro et al. 2008, DFO 2010). However, recent expansive reviews by leading global salmon conservationists are increasingly indicating the likelihood of illegal, unreported, and unregulated (IUU) fisheries occurring outside the exclusive economics zones (EEZ) of the North Atlantic Ocean (Dadswell et al. 2021). This is deeply concerning, as salmon conservation efforts, to date, have largely ignored IUU as a causative agent, and that any remedy of this on-going threat will require significant international agreements and joint enforcements. Until such time, salmon populations within the North Atlantic basin, will remain vulnerable, despite significant conservation efforts and investments remediating rivers and the near shore environment. Regardless of the ultimate causative reason(s), many river populations in eastern Canada have become extirpated or are listed as endangered under the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).

The southwestern regions of Nova Scotia are divided into two Salmon Fishing Areas: SFA 21, and SFA 22 (Fig. 49). The Victoria Beach (#1040) site is located near Digby, Nova Scotia, in the Annapolis Basin, within SFA 22. The SFA 22 includes the traditional range of the Nova Scotia Southern Upland (SU) population of Atlantic salmon, as well as the Inner Bay of Fundy (IBoF) population of Atlantic salmon. The SU salmon populations differ from the IBoF stocks in that they migrate to the Northwest Atlantic off the west coast of Greenland and have a significant 2 sea-winter (2SW) component to their life history, while the IBoF population tends to remain in the Bay of Fundy/Gulf of Maine (DFO 1998). The associated watersheds are depicted in Figure 49 (DFO 2013b). Notable salmon rivers of SFA 22 connected to the Annapolis basin are the Annapolis/Nictaux/Round Hill, Bear, and Moose Rivers (Fig. 50). More distant (> 100 - 200 km) rivers of the SFA 22 include the Gaspereau, Stewiacke, Big Salmon, Upper Salmon, Point Wolfe, and Petitcodiac Rivers (ASF 2019, DFO 2010).

Historically, these regional rivers supported strong salmon populations (Dunfield 1985). DFO stock-status reports, most of which pre-date any significant local commercial aquaculture activity (mid 2000's), indicate an increasingly dire condition of the local stock. According to the DFO Science Stock Status Report D3-12 (1998), all commercial fisheries of wild salmon, due to reduced catches, were closed in 1985. Following subsequent local salmon declines, all remaining recreational and aboriginal fisheries were also closed by 1990. Extensive regional electrofishing surveys conducted in 2000 found remaining salmon in only 28 of 52 rivers surveyed (54%), and more recent surveys conducted in 2008/2009 indicated continuing decline, with remaining salmon in only 21 of 54 rivers surveyed (39%) (DFO 2011a). Although adjacent rivers of the Annapolis Basin watershed (Annapolis, Bear, Moose, Round Hill Rivers) likely retain some residual salmon populations (Smith 2021; Native Council of Nova Scotia Netukulimkewe'l Commission 2018, Bear River Historical Society; The Atlantic Salmon Conservation Foundation 2015), these watersheds have been severely degraded by centuries of silting and runoff from forestry and intensive agricultural activities, acid rain, commercial fishery dredging, as well as by substantial dams/barriers and sewer outfalls associated with human settlements along former salmon habitats. Indeed, the massive tidal power dam on the mouth of the Annapolis River has had a tangible, adverse effect on all anadromous fish. From a recent 2019 DFO report by Gibson, Fulton & Harper, the barrage and turbines presents an "extreme risk" to wild salmon, and all species of fish migrating into the Annapolis/Nictaux/Round Hill watersheds.

River acidification (low pH) is particularly recognized as a major contributing factor to the survival of freshwater stages of Atlantic salmon in Nova Scotia. The pH of river water samples collected since the 1980s indicates that several rivers in Nova Scotia were partially to heavily acidified (Lacroix and Knox 2005a, Watt et al. 2011). Both the Bear River and Annapolis River watersheds (Fig. 51) have pH classifications of 2 (pH 4.8 – 5.0), which is considered moderately impacted (DFO 2013b). Reductions in productivity for moderately impacted streams are estimated to be in the vicinity of 95%, but watersheds that are currently known to contain Atlantic salmon are considered priorities for allocation of critical habitat (DFO 2013b). The Round Hill watershed has more suitable pH, but no salmon were observed during surveys (DFO 2013b); however, salmon have been found in the Moose River, which has healthy pH values as high as 7.48 (The Atlantic Salmon Conservation Foundation 2015).

In November 2010, COSEWIC designated the Outer Bay of Fundy, Nova Scotia Southern Upland, and Eastern Cape Breton population assemblages as endangered (Government of Canada 2021h). However, the SARA status remains as "no status, no schedule". IBoF populations, including those in SFA 22, were listed as endangered under the *Species at Risk Act* (SARA) in 2003 (DFO 2010). Within SFAs 20 to 22, all rivers have been closed to recreational fishing as of 2010 (DFO 2018b).

Figure 49. Atlantic Salmon Fishing Areas of Atlantic Canada
Note: Figure was sourced from DFO (2015). White, numbered circles identify designated Salmon Fishing Areas.

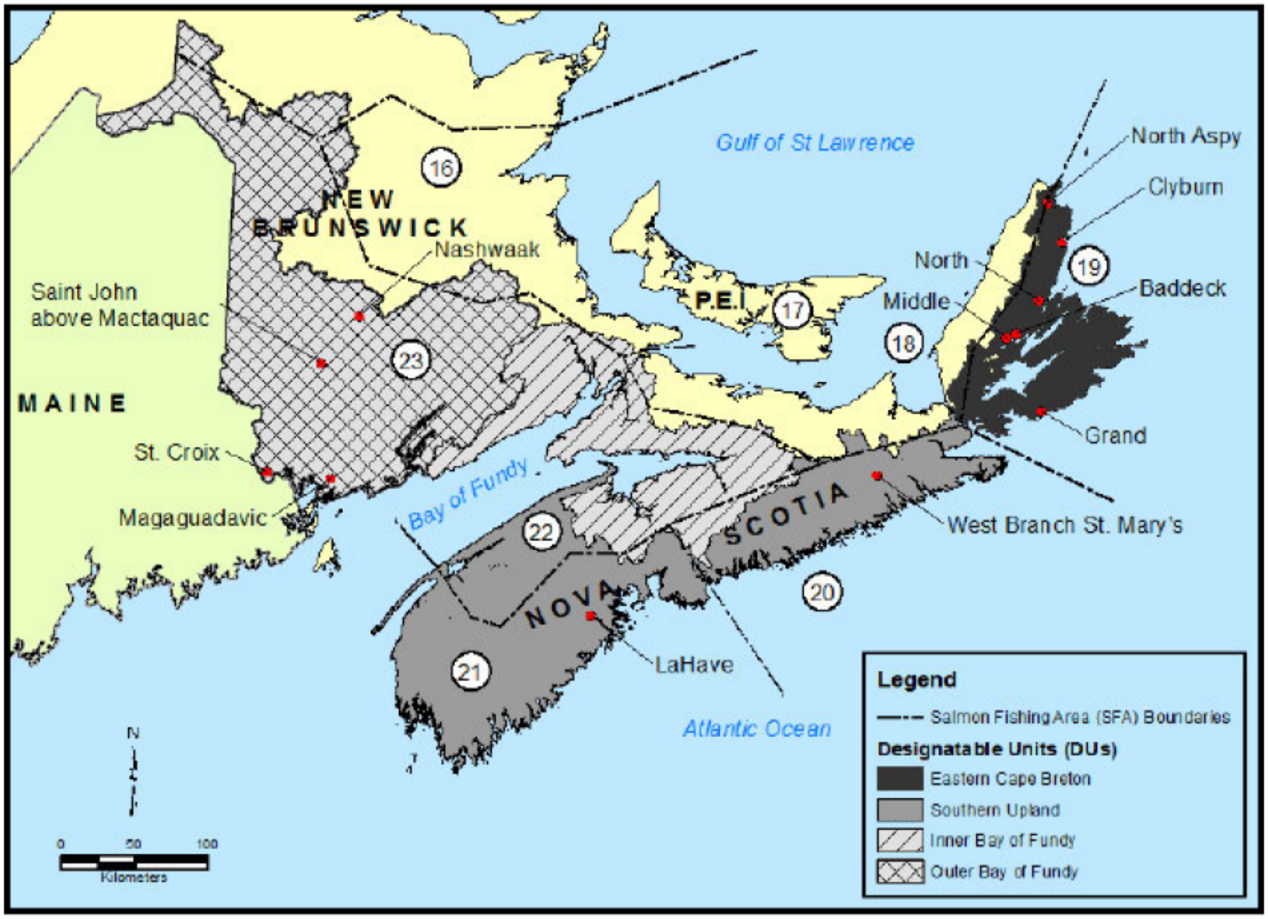
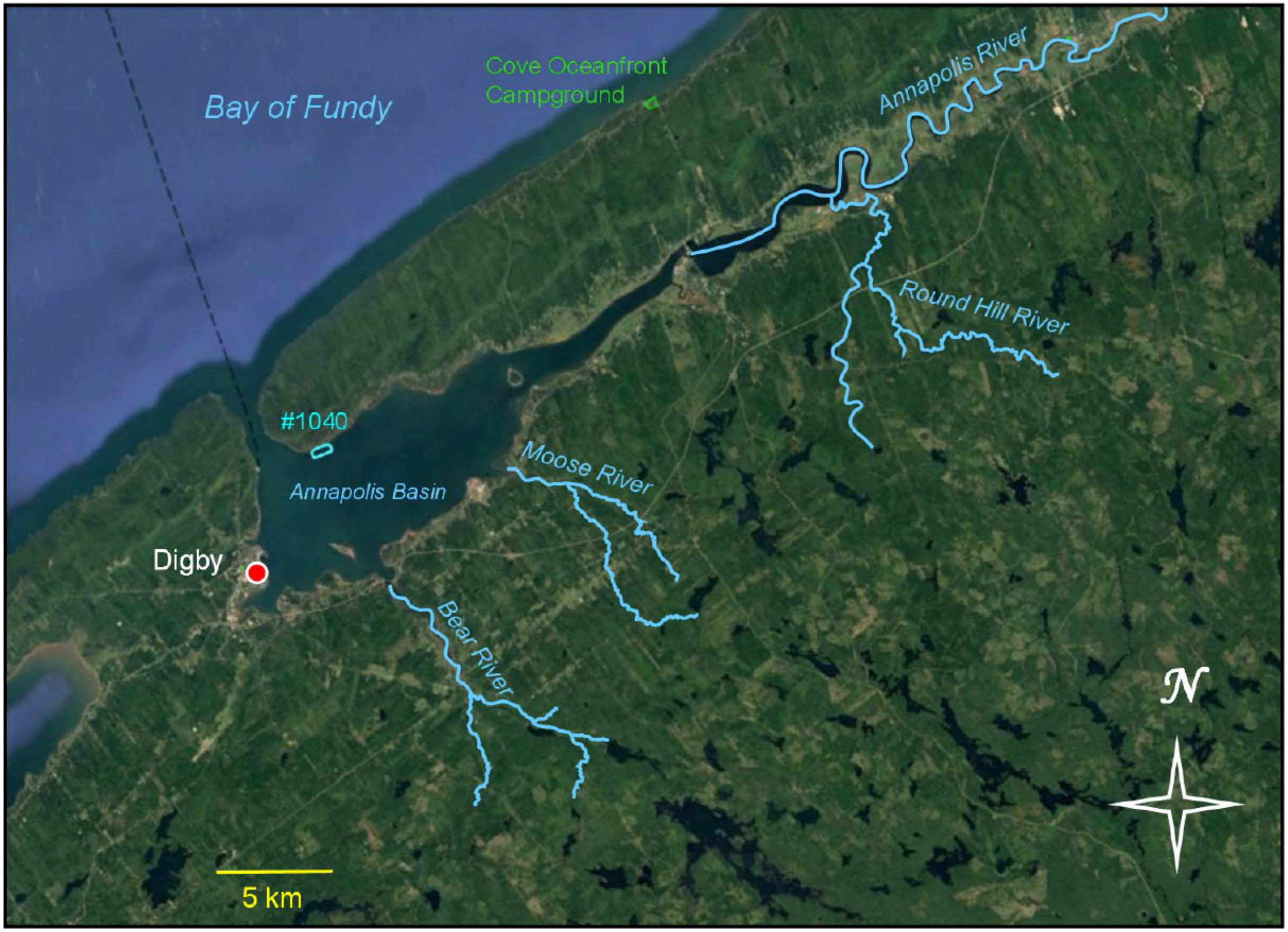
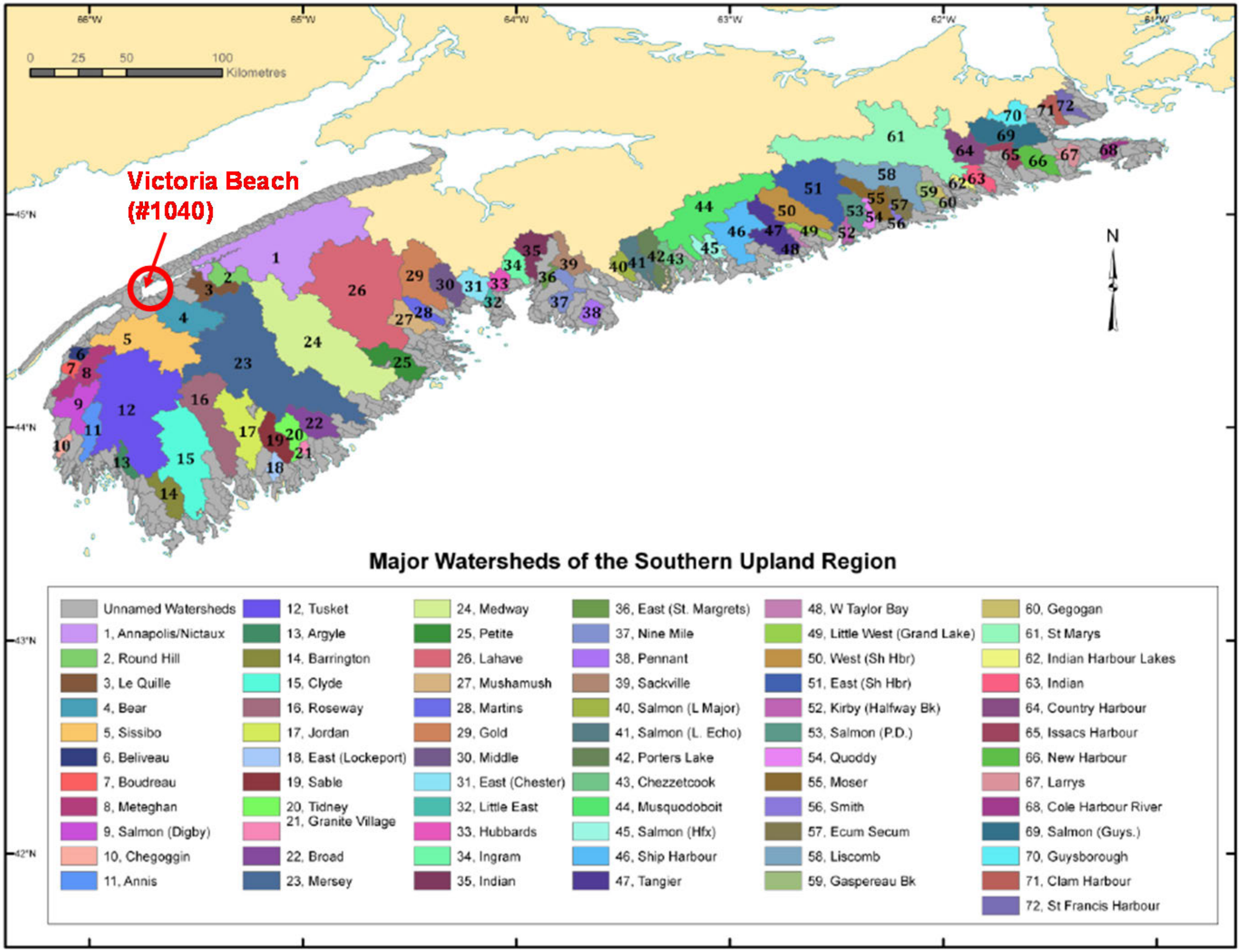


Figure 50. Potential Salmon Rivers around Annapolis Basin, Nova Scotia



SW2016-060

Figure 51. Major Watersheds of the Southern Upland Region
Note: Figure was sourced from DFO (2013b)



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7.2 Support of the Sustainability of Wild Salmon

7.2.1 Potential Impacts to the Wild Salmon Population

To reduce potential impacts to the wild salmon population, Doelle-Lahey panel suggested that a regulatory framework should deal more extensively with the prevention of escape and should require operators to adopt, implement, track, and report on the performance of a comprehensive containment system. Such a system should aim to prevent escapes to the greatest extent that is practicable, using best management practices and the best-available, commercially proven technologies.

The Victoria Beach site, distant from all known/potential wild salmon rivers, is located ~ 6 km from the mouth of the Bear River, ~ 9 km from the Moose River, and ~ 18 km from the Annapolis/Nictaux/Round Hill Rivers. Concerns that marine-based finfish aquaculture can harm wild salmon by increasing their exposure to sea lice infestation and diseases like ISA were also discussed in the Doelle-Lahey report. Currently, Nova Scotia farms tend to have very low lice loads usually not requiring treatment. By comparison, past and present surveys of lice on wild salmon, either very distant from aquaculture operation, or even prior to the establishment of salmon aquaculture (Templeman 1967; reviewed by Dadswell et al. 2021), show natural sea-lice loads can be 10x that found on untreated farmed salmon. Although there have been reports of sea lice affecting post-smolt ability to successfully return as adults, this appears to only occur in regions where post-smolts must navigate a complex of multiple farms, situated in narrow passageways, such as occurring in Scotland and Norway (Butler and Watt 2003, Greaker et al. 2020). However, in regions such as Victoria Beach site, where post-smolts can rapidly migrate to sea, sea-lice infestations, and therefore the potential to negatively impact post-smolt survival, is absent or negligible at worst (Carr and Whoriskey 2004, Lacroix and Knox 2005b). In addition, the temporal management of the salmon farms reduce potential effects upon post-smolt (as outlined below). Current research also suggests that farmed salmon are more likely to contract pathogenic strains of ISA from wild salmon, which are more resistant (Doelle and Lahey 2014). Lastly, according to Fisheries and Oceans Canada (DFO 2013c) there have been no proven cases of the transmission of sea lice or ISA disease to wild populations from aquaculture sites.

In stewardship of the nearshore environment, and recognizing potential risks to wild salmon in Nova Scotia, KCS has adopted many measures, best-practices, and state-of-the-art technologies known to greatly reduce potential impacts to wild salmon. Unlike many other global salmon-growing regions, with multiple salmon farming organizations operating in concert, and poor oversight by government regulators, Nova Scotia benefits from strong regulatory oversight and an industrially proven “bay management area” (BMA) approach to farming. Specifically, all BMA farms are collectively and spatially managed as units, which means they are stocked, maintained, and harvested as a single but spatially distributed farm. As is proven practice with terrestrial livestock farms, KCS salmon farms are stocked and harvested simultaneously as a single age class. This has been shown to mitigate risk of disease outbreaks on farms, and more importantly, reduces risks to any wild salmon. All stocked salmon smolt are delivered from land hatcheries, fully vaccinated for known salmon diseases (e.g., furunculosis, vibrio, etc.), as well as have a Certificate of Health for Transfer (COHFT) and are free of sea lice at the time of stocking to the sea cages. Constant and vigilant monitoring and applying approved treatments by accredited veterinarians, with oversight by provincial specialists, maintains both the health and welfare of farmed salmon, as well as mitigates disease transference risk to Nova Scotia wild salmon. Farms are also managed temporally to avoid any wild salmon interactions. For instance, farms are stocked (early summer) after the period (early spring) that the vulnerable wild salmon smolts would have migrated from nearby rivers. During the first year at sea, sea-lice numbers are generally very low, thus presenting a very low risk to any native wild salmon in the area. During late fall and winter of the second year at sea, when farm sea-lice numbers can become problematic, farmed salmon are harvested, also removing all attached sea lice from the area. The winter harvest thus acts to eliminate any potential exposure risk to juvenile wild salmon that may emerge from nearby rivers later in the early spring. Furthermore, salmon returning to spawn spend relatively little time in nearshore/estuarine areas (e.g., timing the ebb tide, waiting for dusk/dawn periods, acclimate to fresh water, etc.). Any sea lice picked up by passing wild adults during their spawning period would be naturally cleared when they enter freshwater upon their return to natal rivers and streams. Lastly, any subsequent risk to sea-returning spawned adults would similarly be very low due to typically very brief nearshore periods during post-spawning seaward migrations

KCS has made significant investments into both research and capital equipment for green-based thermo-mechanical sea-lice treatment technologies, cleaner-fish-based biocontrol of sea lice, and the use of approved natural products and/or medicated feed to control and remove lice from farmed salmon, and indirectly, the local environment. Future operation of the under-construction Centreville, NS “post-smolt salmon hatchery” will further mitigate any potential risks to local wild salmon of Nova Scotia. Planned as the largest recirculating aquaculture system (RAS) in Atlantic Canada, juvenile farmed salmon will be reared on land much longer (from 1.5 to 2.5 years), in complete isolation from wild salmon and any at-sea diseases. This post-smolt facility will also reduce the time farmed salmon spend at sea from the traditional 2 years to potentially as little as 1 year. As disease and pests mostly affect fish during their second year at sea, this large investment will not only improve the performance of the farmed salmon it should also further reduce any remaining concerns of the impact of farmed salmon to nearby wild-salmon populations.

Accidental farmed-salmon escapes and potential breeding with wild-salmon populations (introgression) are both concerns for wild-salmon conservation and KCS’ business continuity. Proactively, KCS is constantly improving aquaculture practices with new and proven technologies. KCS routinely provides updated training and refreshes the knowledge of their operators in the leading best practices. Cage integrity is addressed with state-of-the-art, engineered netting and anchoring materials, extensive computational modelling of real and potential farm environments, regular and frequent failure testing, and replacement of critical components and materials. Farms in Nova Scotia are managed by experienced teams, with a demonstrated, excellent track record for site integrity and performance. Additionally, KCS is consistently developing new protocols to suit changing conditions, allowing it to adaptively manage operations for over 25 years in Nova Scotian waters. Lastly, KCS operates under full transparency regarding any real or potential escape events, communicating to government immediately as is required.

KCS continues to engage Nova Scotian public institutions, such as the Nova Scotia Community College and Dalhousie University, to assess best practices and management strategies, evaluate and deploy leading farm technologies, and co-develop world-leading aquaculture research, training, and certifications for both existing staff and future employees of KCS. Further, in collaboration with the Province of Nova Scotia, DFO, and several not-for-profit groups, KCS has recently begun the deployment of a proven genetic-identity program, currently in use in the State of Maine, to definitively identify any salmon suspected of being an escaped farmed fish. Data-driven tools such as these are important for collective goals towards salmon conservation and to elevate the general public's accurate understanding of robust, modern salmon aquaculture.

7.2.2 Restoration Efforts

Hatchery/biodiversity facilities have been operating for decades throughout the natural range of Atlantic salmon for use in mitigation and stock-enhancement strategies. To bolster imperiled populations, traditional recovery strategies include a rearing-and-release component with hatchery-reared salmon releases at several life stages (i.e., fry, juveniles, smolts) (Jonsson and Jonsson 2006). This involves the capture of returning wild adult salmon and/or collecting juveniles/smolts and rearing them to maturity in hatchery/biodiversity facilities. Salmon are manually spawned and eggs reared in artificial environments. Rearing environments in hatcheries/biodiversity facilities are highly atypical of their wild counterparts, often resulting in a reduced capacity of released fish to become established in the wild (Youngson and Verspoor 1998). Juvenile Atlantic salmon produced in traditional breeding programs, even with a limited period in captivity, do not meet the criteria necessary to ensure the preservation of the ecological integrity of the species (Metcalfe et al. 2003, Blanchet et al. 2008). As a result of spending a greater proportion of their life in captivity, the reproductive success of hatchery-reared salmon for conservation is greatly reduced (Fleming et al. 1996) and has not resulted in the recovery of salmon abundance. As outlined below, KCS and its parent company Cooke Aquaculture Inc. are engaged in an innovative program that has successfully taken a different approach to enhancing the reproductive success of wild salmon.

7.2.2.1 Past and Current Regional Restoration Efforts

Nova Scotia has a rich history and active participation in salmon enhancement and, more recently, restoration. The Mersey Biodiversity Facility, near Milton NS, was once one of only two federal fish hatcheries in the province of Nova Scotia. The facility was tasked with the recovery efforts of both wild Atlantic salmon and Atlantic whitefish (Whitelaw et al. 2015). The Department of Fisheries and Oceans closed this facility in 2012, with it being fully decommissioned in 2014. The closure of the Mersey Biodiversity Facility greatly reduced restoration efforts of wild salmon in Nova Scotia, as only one remaining federal fish hatchery in the province (Coldbrook) was kept. Further, without redundancy measures in place, even a minor issue at the single facility could cease all wild-salmon production in the province, risking a loss of the maintained genetic diversity.

Currently in the Annapolis Basin, the Clean Annapolis River Project (CARP) has conducted work on the Fales and Round Hill Rivers to restore salmon habitat (Pickrem 2019, CARP

2021a). CARP has completed sub-watershed plans for the Nictaux River, Black River, and Moose River sub-watersheds and is currently in the process of developing plans for the Round Hill River and Fales River sub-watersheds (CARP 2021b).

7.2.2.2 Cooke Aquaculture Inc. (CAI) Restoration

Leadership by CAI towards salmon conservation in Atlantic Canada is demonstrated by its founding role in the Fundy Salmon Recovery (FSR) project. CAI helped develop and operate the world's first Wild Salmon Marine Conservation Farm on Grand Manan Island, New Brunswick. This on-going project is a collaboration of community, academic, government, First Nations, and industry stakeholders to protect and restore severely threatened IBoF salmon. FSR is the first project in the world to rear wild-origin salmon within a marine conservation farm (operated by CAI) and subsequently return mature adults back to their natal river to spawn naturally. FSR is built on research demonstrating the immense value of early wild exposure on Atlantic salmon development and fitness (Clarke et al. 2016).

Given the dramatic loss of wild salmon, largely documented to occur following entry to the sea (reviewed by Dadswell et al. 2021), the primary objective of the FSR program is to bypass the observed, high at-sea mortality and re-establish natural spawning within native rivers. This novel strategy captures a subset (~ 10%) of the out-migrating smolts during their departure from a given river. These smolts are then transferred and reared to maturity in the world's first Marine Conservation Farm, located in Dark Harbour on the island of Grand Manan, NB. Modified sea cages, operated by CAI, allow smolts exposure to the ocean environment while relieving pressure of predators and food scarcity. CAI supplied and installed custom-designed conservation cages, and are the daily caretakers of the wild fish, providing them with proper nutrition, health monitoring, and equipment maintenance. The fish are fed specialized diets developed by nutrition experts specifically for wild salmon, to promote natural growth and maturity. When the salmon have grown to sexually maturity, they are transported by CAI and safely released in significant numbers (~ 1000 - 2500 mature adults annually) into their home rivers in the Fundy National Park and Petitcodiac watersheds to spawn naturally. The success of releasing marine-raised adult salmon is being assessed by tagging and tracking these adults to monitor at-sea survival, spawning and reproductive performance, and ecological benefits.

This novel approach to salmon conservation has already produced unprecedented results. It is suspected that by protecting some of these smolts from the IUU fisheries, at-sea predators, or another unknown at-sea loss, conservation sea-cage-raised wild salmon, once returned to native rivers as adults, are far more effective at generating successful river-reared juveniles than what traditional, human-biased hatchery practices can produce. Despite the historic collapse and virtual extirpation of these river populations, since its beginning in 2015, FSR has successfully released over 8000 critically endangered IBoF Atlantic salmon back to their natal rivers, with 2021 seeing record numbers across the board. Fundy National Park recorded its largest ever, completely wild-produced smolt run. The Upper Salmon River in Fundy National Park is the only IBoF river with exclusively wild-produced juvenile salmon, at densities approaching what was present in the pre-collapse era. Finally, with 216 adult salmon returning to Fundy National Park, this marked the largest natural salmon returns in over three decades [redacted]

[redacted], Fundy Salmon Recovery). The project continues to this day, and stakeholders, excited by the success of this approach, have plans to expand this proven strategy to salmon conservation with other willing community groups and, potentially, from nearby Southern Uplands populations.

For example, in February 2019, KCS met with the Medway River Salmon Association to discuss a partnership on a project like the FSR project. The meeting indicated another potential collaborative effort could be formed to improve remaining salmon numbers in the nearby Medway River. Early collaboration has been towards financial support to gather baseline information of river conditions, restoration viability, student sponsorship, and the purchase of a project salmon-smolt wheel.

Similarly, KCS has had forward-thinking discussions with other Park Canada representatives from the Cape Breton Highlands National Park, who have expressed interest in establishing a much larger program involving the creation of a Nova Scotian wild-salmon conservation farm, which could simultaneously assist in the recovery of multiple endangered river populations across the province. Further goals of this plan would include creating designs, procedures, education, and hands-on training for other groups wishing to establish similar but more local conservation facilities. KCS feels strongly that training and knowledge transfer of this now-proven approach could be the best chance to facilitate lasting recovery of the iconic Atlantic salmon and highlights its commitment to meaningfully contribute to this cause.

7.2.3 Mitigation Efforts and Regulatory Requirements

Several mitigation measures can be employed to reduce the potential impacts of salmon aquaculture on wild salmon populations. A list of priority objectives to reduce the risk of interactions between wild and farmed salmon was provided by Fisheries and Oceans Canada (1999) and updated by DFO (2008). They are as follows:

1) Improved containment, including contingency plans and a reporting system for escaped fish, as well as marking of infrastructure and fish
2) Improved fish-health management including contingency plans and a reporting system for specified disease and parasite outbreaks
3) Improved effluent management
4) Improved risk assessment to determine appropriate donor stocks (including consideration of alternative species) and site selection for hatcheries and salmon farms, and improved enforcement
5) Enhanced education and training of aquaculture workers, particularly relative to containment and farm/hatchery management
6) Use of sterile fish
7) Use of predator nets at all aquaculture sites and reporting of significant predator attacks. Use of predator deterrence devices such as acoustic pingers at all aquaculture sites, though risks to other species and effectiveness would have to be investigated prior to implementation.

Aquaculture licence holders of marine finfish sites must comply with the *Aquaculture Management Regulations* for Nova Scotia (Schedule A – Regulations Respecting Aquaculture Management made by the Governor in Council under Section 4 Chapter 25 of the Acts of 1996, the *Fisheries and Coastal Resource Act*). A detailed FMP is required to outline the company's policies for fish-health management, containment management, farm operations, and environmental monitoring. The FMP is reviewed by NSDFA to ensure compliance with the *Aquaculture Management Regulations*. KCS policies outlined in the FMP address priority objectives 1, 2, 3, 5, and 7, as listed above, to reduce the potential impacts of salmon aquaculture on wild-salmon populations. Points 4 and 6 are beyond the control of KCS.

7.2.3.1 Infrastructure

An essential component of a marine finfish farm is containment. Equipment and infrastructure must be capable of withstanding the prevailing environmental factors. Any mechanical damage from ill-repaired or ill-suited equipment/infrastructure can become a fish health and containment concern. Figures 44 to 46 show the cage and mooring infrastructure. Upon approval of the boundary amendment, NSDFA will be provided with engineer-stamped drawings for all cage and mooring infrastructure.

All moorings, cages, containment nets, and predator nets meet best management practices and are engineered to meet the expected conditions of the location. Table 16 presents the specifications of the infrastructure on the Victoria Beach aquaculture site.

Moorings and Grid

GMG Fish Services Ltd (GMG), a sister company to KCS, provides the moorings for installation. The moorings and materials were engineered based on modelling completed by KCS Engineers, using site specific oceanographic data to ensure that all components will withstand expected conditions. Each area of the grid was designed to withstand different maximum loads, using modelling with built-in safety factors. The materials and breaking strengths and specifications for the components of the grid system are outlined in Table 17.

Table 16. Infrastructure Specifications at the Victoria Beach Aquaculture Site

Infrastructure	Component	Size/Specification	Material	Operating Pressure (water @ 23°C)	Average Inside Diameter	Minimum Wall Thickness	Average Weight (lbs/ft)
Moorings	Anchor lines	2” 8 strand, MBS 80,689 lbs (36,600 kg)	Polysteel				
	Grid lines	2” 8-strand, MBS 80,689 lbs (36,6000 kg)	Polysteel				
	Compensator buoys	CB4,400 lbs and CB 2,000 lbs	HDPE				
	Chain	1⅛” open-link chain, MBS 100,000 lbs	Alloy Steel				
	Shovel Anchor	2,000 kg (200,000 kg holding power)	Alloy Steel				
	Thimbles	2” Galvanized Heavy Duty	Heavy-duty steel hot-dip galvanized				
	Shackles	SWL- 9.5-Ton 1⅛” screw-pin shackle	Safety ratio 5:1 (47.5)				
	Grid plates	11½”-diameter, 1”-thick plate	High grade steel AR 400F				
	Bridal grid plates	13x14x1” plate	High grade steel AR 400F				
	Concrete Blocks	8,000 kg (64,000 kg holding power)	Concrete				
Cages (HDPE)	Bird Stand	110 mm (Series 125 PE3608)		125 psi	93.60 mm	7.97 mm	1.74
	Float Pipe	315 mm (Series 80 PE3608)		80 psi	284.60 mm	15.00 mm	9.61
	Brackets	6” (DR 17 PE4710)		125 psi	5.80”	0.390”	3.35
	Handrail	5” (DR 17 PE4710)		125 psi	4.87”	0.327”	2.36
	Weight Ring	6” (DR 11 PE4710)		200 psi	5.35”	0.602”	4.99

Table 17. Materials and Breaking Strengths/Specifications for the Components of the Grid System

Grid System Component	Specifications	Breaking Strengths
Screw-pin shackle	1⅛" SWL 9.5-T safety factor ratio of 5:1	47.5 T
Grid plates		179,000 lbs (81,363 kg)
Rope	2" 8-strand polysteel rope	MBS 80,689 lbs (36,676 kg) each line
Chain	1⅛" open link chain	MBS 100,000 lbs (45,359 kg)

Nets

Containment and predator nets must meet the breaking-strength requirements outlined in the BC *Fisheries Act*, *Aquaculture Regulation*, B.C. Reg. 78/2002, deposited April 19, 2002. The minimum specifications of containment nets and predator nets used at Victoria Beach are reported in Tables 18 and 19, respectively. Both containment and predator nets were determined to be adequate based on product testing completed by GMG. The net life cycle depends on a variety of factors; however, it is not company policy to limit a net simply by age but rather its strength. Likewise, a net may be retired due to the number and/or severity of repairs required but with passing breaking-strength scores. Nets that do not meet the breaking-strength testing requirements are retired.

All nets (smolt, market, bird, and predator) are given a unique identifier. The history and maintenance of each net is maintained by GMG. Each net, new or repaired, is tested by trained personnel at GMG prior to installation at a site. GMG follows established testing protocols and breaking-strength requirements, which are specific to the materials used. The procedures used are in alignment with the NSDFA requirements.

The nets are repaired immediately with the on-site net-repair kit once wearing, weakness, or holes have been identified. KCS has a documented repair procedure, which has been accepted by NSDFA. All repairs must be recorded in the net-specific history record.

Table 18. Minimum Specification Requirements for All Nets Used on the Site

Net Type	Brand Name	Mesh Stretched Opening (mm)	Material	Mesh Strength/ Rating (kg)	Diameter of Mesh Material (mm)
Smolt	Star K (Knotless)	26 ± 1	HDPE Fiber	130	4.2 (360 Ply)
Market	Star Market	57 ± 2	HDPE Fiber	130	4.2 (360 Ply)
	Sapphire UC	57 ± 1	HDPE Fiber with Ultra Core	150	2.6

Note: HDPE – High Density Polyethylene

Table 19. Predator Net Specifications

Net Type	Brand Name	Mesh Stretched Opening (mm)	Material	Mesh Strength/ Rating (kg)	Diameter of Mesh Material (mm)
Predator	Sapphire UC	150 ± 1	HDPE fiber with Ultra Core	380	3.8
Bird net	Star Knotted	35 ± 1	HDPE fiber	90.72	1.9 mm (#21)
	Plateena/Dyneema	51 ± 1	UHMWPE fiber	91	1.5 (1600+800D/6 Bar)
	Plateena/Dyneema	51 ± 1	UHMWPE fiber	91	1.5 (2400D/2 Bar)
	Plateena/Dyneema	51 ± 1	UHMWPE fiber	95	1.6 ([1600+1360]/1x2)
	PPMF/MFPP	25.7 ± 1	PPMF fiber	77	2.5 (1000D/18 Ply)
	PPMF/MFPP	51 ± 1	PPMF fiber	77	2.5 (1000D/18 Ply)
	PPMF/MFPP	51 ± 1	PPMF fiber	105	3 (1000D/24 Ply)
	Bird Net – Sapphire	35 ± 1	HDPE fiber	110	1.7
	Shogun – Smolt BN	35	HDPE	93	400/38
	Shogun – Market BN	57	HDPE	106	400/38

Notes: PPMF – polypropylene multi-filament
UHMWPE – ultra-high-molecular-weight polyethylene

7.2.3.2 Containment Strategy

Fish

Fish stocked at Victoria Beach will be approximately 150 g at entry to sea water (Table 2). KCS ensures that the fish size is adequate not only for fish health and survival but to prevent containment breaches due to inappropriate netting size in relation to fish size. The use of proper-sized mesh is important for a variety of reasons. Mesh size that is too small could cause poor water quality, inadequate dissolved oxygen, poor water movement within the cage, and increased biofouling. The use of mesh size that is too large could result in fish caught in the mesh or a way for fish to escape. Industry's best practices are used to determine the net-changing strategy for mesh size (Table 20). The net-mesh sizing strategy was determined to be adequate based on thirty years of experience with fish farming in Atlantic Canada and exceeds the guidelines proposed by research conducted at Memorial University of Newfoundland Marine Institute in March 2000.

Table 20. Net Changing Strategy for Mesh Size

Average fish size (g)	Minimum fish size (g)	Mesh size (inches)
120	50	1⅛
600	450	2¼

Infrastructure and Equipment

Moorings and anchors will be inspected prior to the stocking of a new production cycle. This may include removing them from the water and visually inspecting prior to redeployment. Once installed, the grid system, moorings, and anchors will be inspected every 6 months, unless otherwise required. After a change in tension, a shift in the array, or a significant storm event, the moorings and anchors will be visually inspected at depth using divers or ROV. Any issues and their causes will be identified and corrected as soon as possible. All inspections and corrections/repairs are recorded by KCS in a central data base.

Above-water inspections will be continuous as staff work on the site daily. Any net repairs will be recorded in the on-site net-repair record. In addition, formal inspections will occur on a weekly basis for surface components, and they will be recorded in the surface-inspection record. This inspection examines compensator buoys, visible portions of the grid, shackles, thimbles, float collars, stanchions, jump-net rails, above-water nets (containment, bird), attachment of nets, and site markers.

Underwater inspections will be conducted every six months using divers and/or an ROV. Additionally, cameras placed in each of the cages on site can be used to ensure all below-water infrastructure is being monitored and maintained. Additionally, maintenance barges will be used to lift the components to the surface for visual inspection at the end of each production cycle when the site is fallowed. Any weaknesses in the containment structure will be repaired as soon as possible and recorded. Suspected underwater irregularities, damage, or points of wear will be investigated and repaired as soon as possible and recorded in the on-site net-repair record. Furthermore, below-water net inspections will be formally completed every 60 days. A below-surface-inspection checklist is to be completed.

Severe Weather

Severe weather can greatly impact the containment structures. Cage location, relative to wind direction and land, and other variables can affect the level of impact. Events that trigger management measures at Victoria Beach include high winds more than 40 knots, cold water temperatures below 1.5^{o}C, warm water above 18^{o}C, and dissolved oxygen below 6.2 mg/L.

The Site and Area Managers will track forecasts to determine if a weather event may impact the site. The Site Manager will ensure that reasonable preparations are made by all site workers in response to an impending severe-weather event. Site workers will monitor oxygen and water temperature daily to track environmental data, and KCS will follow the guidelines set out in Table 10.

Time permitting, additional, above-water inspection of the net pens will take place (in addition to daily, routine inspections) prior to a predicted event, and any appropriate actions (potential reinforcement) will be taken to ensure the system is ready for the impending weather. Time permitting, additional, below-water inspection of the net pens will be conducted (in addition to weekly, routine inspections), if the Site Manager believes it to be necessary.

Staff will conduct above-water inspections after a severe weather event. These inspections will take place either the day after a severe weather event or as soon it is safe for the crews to return to work following the weather event.

Inspection of the net pens below water will occur at the next scheduled mortality dive following the severe weather event or sooner, if the Site Manager believes that the net pens need inspection earlier. This extra inspection will either occur the day after the severe weather event or as soon as it safe for staff to return to work on the site.

Immediately after a severe weather event, a detailed evaluation of damage(s) will be conducted. A complete list of repairs will be created. Repairs will then be prioritized and tracked until completed. In some instances, temporary repairs may take place until permanent repairs can be completed.

Mortality Collection

The procedure to collect mortalities at the Victoria Beach site has been approved by NSDFA as outlined in the site's FMP. The procedure considers containment risks. Note, the mortality collection schedule varies depending upon the age of the fish. During smolt entry and the first few weeks post entry, the frequency of mortality collection may increase. After these production milestones, mortality collection occurs once per week unless there is a fish-health event identified.

Harvesting

NSDFA has approved harvesting procedures at the Victoria Beach site as outlined in the site's FMP. The procedure considers fish health and welfare, biosecurity, and containment risks.

7.2.3.3 Hazard Assessment for Containment Management

Potential containment-management hazards that may occur throughout the production cycle at Victoria Beach and strategies to prevent their occurrence have been identified. This information is contained in the FMP and summarized below (Table 21). The FMP has been approved by NSDFA.

Table 21. The Operational Process Steps with the Potential Containment Hazard and the Measures to Control Hazards

Potential Containment Hazard	Operational Process Step(s)	Is the hazard significant? (Y/N)	Is it reasonable to occur? (Y/N)	Measures to Control Hazard
Weak or incorrectly attached equipment	• Stocking - fish transport shore to boat • Stocking - fish transport boat to cage • Harvest - fish transport cage to boat • Harvest - fish transport boat to shore	Y	Y	Controlled with fish transport, smolt delivery, and harvesting standard operating procedures; approved by NSDFA
Fish release during transfer to and from well boat	• Stocking - fish transport boat to cage • Sea lice treatment • Splitting / Transfers • Harvest - fish transport cage to boat	Y	Y	Controlled with well-boat treatment procedures and splitting / transfers standard operating procedures; approved by NSDFA
Fish release during transfer from well boat	• Harvest - fish transport boat to shore	Y	Y	Controlled with well-boat treatment procedures standard operating procedures; approved by NSDFA
Fish too small for mesh	• Stocking of cages • Net change	Y	Not without prior knowledge	Controlled with COHFT and review of production plan with NSDFA. Also controlled with net mesh sizing strategy; approved by NSDFA.

Hole in net due to chafing or other equipment wear	• Grow out	Y	Y	Controlled with equipment maintenance and inspection requirements; approved by NSDFA
Predator attacks	• Grow out	Y	Y	Controlled with predator netting and farm husbandry
Storms	• Grow out	Y	Y	Cannot be controlled during production. Reduced risk with emergency plans; approved by NSDFA
Net washing	• Grow out	Y	Y	Controlled with biofouling control plan and net washing protocols; approved by NSDFA
Fish jumping out of transfer net	• Sampling (fish health, sea lice counting, biomass estimates)	Y	Y	Controlled with weight-sampling-by-hand standard operating procedure; approved by NSDFA
Fish released due to insecure new net	• Net change	Y	N	Controlled by net-changing standard operating procedure; approved by NSDFA
Net not removed properly	• Net change	Y	N	Controlled by net-changing standard operating procedure; approved by NSDFA
Not dropping the net properly for diver entry may allow fish escape	• Mortality and maintenance dives	Y	N	Controlled by mortality-removal standard operating procedure; approved by NSDFA
Not closing the net after dive entry may allow fish escape	• Mortality and maintenance dives	Y	Y	Controlled by mortality-removal standard operating procedure; approved by NSDFA

Fish released from collection bags/equipment	• Mortality and maintenance dives	Y	Y	Controlled by mortality-removal standard operating procedure; approved by NSDFA
Last fish in cage difficult to see and may be released if net is dropped prior to emptying	• Harvest - fish transport cage to boat	Y	Y	Controlled by harvesting, seining, and corking standard operating procedures; approved by NSDFA

7.2.3.4 Breach Response

All sites have an emergency response plan to address a breach as outlined in the site's FMP. The plan considers the areas of potential impact and respects all federal and provincial regulations and licencing requirements. After a breach of containment is confirmed or suspected, NSDFA is notified as soon it is safe or possible to do so. If the cages or nets have been damaged or compromised by an unusual event such as vandalism or boat collision, KCS' escape-and-response procedures will be followed. These procedures have been approved under the Best Aquaculture Practices (BAP) certification. Situations such as interactions with vessels, marine mammals, or other users will require specific handling, and the best course of action is determined in consultation with senior management and/or regulatory bodies.

Section 8.0 The Number and Productivity of Other Aquaculture Sites in the Public Waters Surrounding the Proposed Aquacultural Operation

8.1 Identification of Other Aquaculture Sites

There are six aquaculture sites less than 5 km from the Victoria Beach site. Marine finfish aquaculture sites #1039 and #1041 are licenced/leased to KCS for producing Atlantic salmon; however, only one (#1039) has been recently operational. Bear River First Nation is the lease/licence holder of the three experimental shellfish sites (#5003, #5004 & #5005). They are licenced for American oyster. The remaining site, #1042, is issued to Innovative Fisheries Products Inc. and is licenced for sea scallop, bay scallop, American oyster, and European oyster (Fig. 52, Table 22).

Figure 52. Marine Chart Showing Other Aquaculture Operations within 5 km from Victoria Beach #1040
Note: Figure was sourced from NSDFA (2021a)

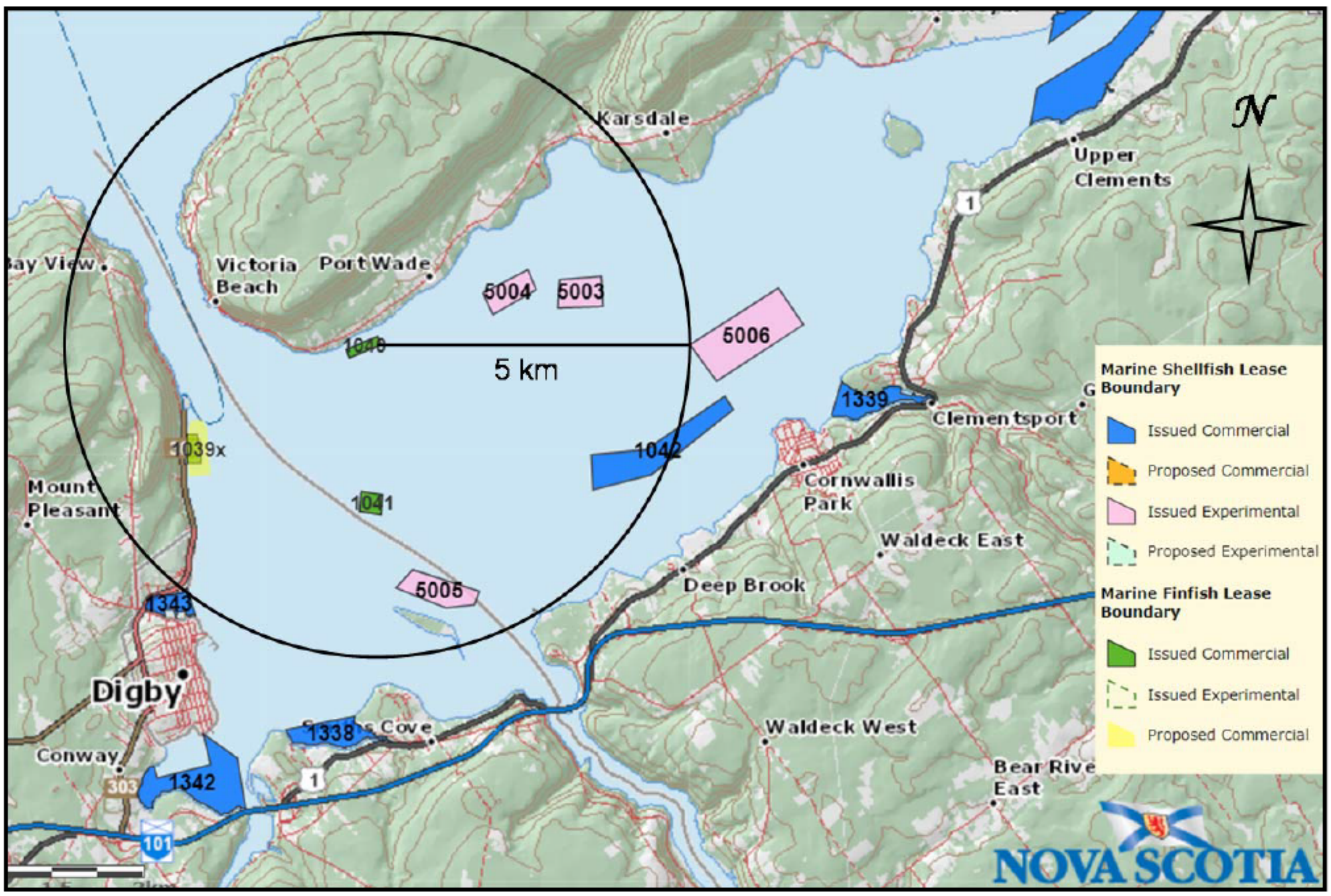

Table 22. Straight-line distance from Victoria Beach #1040 to finfish aquaculture sites within a 5-km radius

Site #	Approximate Distance from Victoria Beach (km)	Species	Owner
1039	3	Atlantic salmon, rainbow trout, Atlantic halibut, Atlantic cod, haddock	Kelly Cove Salmon Ltd.
1041	2.5	Atlantic salmon	Kelly Cove Salmon Ltd.
1042	4	sea scallop, bay scallop, American oyster, European oyster	Innovative Fisheries Products
5003	3	American oyster	Bear River First Nation
5004	2	American oyster	Bear River First Nation
5005	3.5	American oyster	Bear River First Nation

8.2 Interactions with Other Aquaculture Operations

Site #1040 is not part of an Aquaculture Management Area (AMA) for the purpose of managing the health of aquatic animals. KCS agrees to establish an AMA agreement(s) with other licence holders if required by the Minister. However, KCS operates with a company management stocking/harvesting plan that follows similar principles to an AMA.

8.2.1 Environmental Conditions

Based on Canadian Hydrographic Service (Fisheries and Oceans Canada 2022) tide tables for Digby (Station #00325), the predicted highest high tide for 2022 is 8.9 m and the lowest low tide is 0.1 m, giving a maximum tidal range of 8.8 m. However, storm surges, should they co-occur with the highest high water, could result in higher water levels.

Collection of local current speed and direction data throughout the water column was carried out between September 8 and October 17, 2011, using a 300-kHz Teledyne RDI Workhouse Sentinel ADCP deployed by SIMCorp. The most common direction of flow was to the west (i.e., between 265° and 275°), with a weaker and less-frequent reciprocal current flowing between 75° and 85°. Mean current speeds were 23.7 cm/s near bottom and 41.0 cm/s at the surface. The most frequently observed speed class, throughout the water column, was 24.0 - 32.0 cm/s, and current velocities below 7.0 cm/s represented 6.8% of the measurements. Current velocities below 35.0 cm/s accounted for 60.1% of data points recorded throughout the deployment. Refer to section **4.1.5 Currents** and **Appendix B Victoria Beach Baseline Assessment Report** for addition information on currents.

Annual environmental monitoring of Victoria Beach is conducted in accordance with the NSDFA Standard Operating Procedures for Environmental Monitoring of Marine Aquaculture Sites in Nova Scotia. Victoria Beach has returned Oxic classifications, or passed under the hard/mixed bottom protocols, for the last five years, indicating this site is stocked and managed sustainably.

8.2.2 Boat Traffic and Wharves

Site #1040 is located on the northern side of Annapolis Basin, near Digby Gut. This site does not pose a navigational risk or impedance to other water users since it is situated near the shore and the farm gear and structures are marked in accordance with NPP requirements.

The Digby Wharf accommodates community vessels including fishing vessels and working vessels from the KCS sites of Victoria Beach (#1040) and Rattling Beach (#1039) (Figs. 35 & 43).

At the present time, KCS is the only finfish aquaculture company using the above wharf.

Diseases and parasites can be spread by the movement of live fish (both farmed and wild), dead fish, humans, animals, or equipment to or from farms. Threats from diseases or parasites can be minimized through following good management and biosecurity practices. Footbaths are used upon entering and exiting the site vessel. All equipment is disinfected prior to transfer to the Victoria Beach site. Site crews are made aware of internal biosecurity protocols regarding staff and equipment movement from site to site and from public locations to the site.

Visitors to the Victoria Beach site are welcomed and are expected to follow KCS' biosecurity and health and safety rules. The Site Manager should confirm with the Area Manager that a visitor(s) has approval to be on site if the Site Manager was not previously informed. If a site has a fish-health concern, visitors will not be allowed on site – unless granted permission by Saltwater Management or the Fish Health Manager. Visitors must sign the logbook. Unannounced visitors such as government inspectors should also be reported to management. Visitors must change their footwear prior to stepping on site; rubber boots will be provided from the office. Special exemptions may be given in the instances of unexpected inspections, large group tours, or if the visitor(s) are low risk and will not be handling fish or involved in farming operations. All visitors must wear a PFD provided by the office while on site, and the use of footbaths and proper hygiene is mandatory. Section **5.4.2 People Interactions** contains further information regarding biosecurity.

Refer to sections **5.1.2 Pleasure Craft and Commercial Vessels** and **5.3.2.1 Right to Navigation** for additional information.

8.2.3 Shellfish and Atlantic Salmon Aquaculture

While there are shellfish farms around Victoria Beach, this would not cause concern for either industry as there are no direct interactions between shellfish and Atlantic salmon aquaculture, specifically related to disease transfer.

List of Contacts

Table 23. Contacts

Contact Name	Affiliation	E-mail	Phone	Date of Contact	Reason for Contact
Alex Campbell	DFO – Policy & Economics	CommercialData.XMAR@dfo-mpo.gc.ca	(902) 399-8507	Apr 28, 2021	Landings data (Fisheries)
Dave Eberhard	DFO - Commercial Data, Policy & Economics	CommercialData.XMAR@dfo-mpo.gc.ca	(902) 440-0392	Feb 22, 2022	Landings data (Fisheries)
Andrew Hicks	Environment Canada	Andrew.Hicks@ec.gc.ca	(506) 364-5138	Apr 28, 2021	Bird Surveys
Justin Huston	NSDFA	hustonje@gov.ns.ca	(902) 424-2996	May 11, 2007	Rockweed harvesting
Carl MacDonald	DFO	Carl.MacDonald@dfo-mpo.gc.ca	(902) 426-1488	Sep 28, 2011	Fisheries
Frances MacKinnon	NSDNRR	Frances.MacKinnon@novascotia.ca	(902) 679-6145	Feb 1, 2022	Significant habitats
Colin O'Neil	DFO – Policy & Economics	Colin.ONeil@dfo-mpo.gc.ca	(902) 426-6296	Oct 18, 2016	Fisheries
[redacted]	University of New Brunswick, Canadian Rivers Institute, & Fundy Salmon Recovery Project	[redacted]	[redacted]	March 2022	Wild Atlantic salmon
Wendy Vissers	NSDFA	Wendy.Vissers@novascotia.ca	(902) 526-3617	Jun 8, 2021	Rockweed licences
Sean Weseloh McKeane	Communities, Culture and Heritage	Sean.WeselohMcKeane@novascotia.ca	(902) 424-6475	Jun 12, 2016	Archaeological resources

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APPENDIX A

Public Engagement Materials

Cooke Aquaculture

Boundary Amendment: Victoria Beach #1040

Report on Victoria Beach Public Engagement July 22, 2021

1.0 Introduction

Kelly Cove Salmon Ltd. (KCS) is the farming division of Cooke Aquaculture which has been operating in Atlantic Canada for 37 years. Kelly Cove Salmon began in 1985 with a single marine cage site containing 5,000 salmon. And over the years has expanded its facilities, product lines, and distribution networks to become fully integrated within its aquaculture operations.

Kelly Cove Salmon has been operating in Nova Scotia for almost 18 years. The company currently holds 13 leases and by 2017 had expanded its production to almost $100 million. Cooke Aquaculture has always been committed to working with local suppliers. In 2017, Cooke purchased approximately $231,000,000 of goods and services from 1269 local small, medium, and large businesses in Atlantic Canada, 309 of which were Nova Scotia companies.

Kelly Cove Salmon Ltd. is currently undertaking a boundary amendment for the Victoria Beach marine farm #1040. While public engagement is a requirement of the boundary amendment process, engaging with stakeholders and having an open dialogue in the communities where we operation is very important to KCS.

An open-house meeting was held at the Lower Granville Hall on July 22, 2021, to engage stakeholders and provide information on KCS' boundary amendment plans. Due to Covid-19 Public Health guidelines at the time the event was planned, anyone wishing to attend the open house needed to pre-register, and were able to do so through the www.aquaculturegrowsns.ca website or by calling the KCS office in Bridgewater. The open house was scheduled from 1:00 PM - 8:00 PM, with time slots given each hour for a 45-minute period with a maximum of 20 people each slot.

This report will discuss the format and outcome of the public-engagement strategy put forth by Kelly Cove Salmon Ltd.

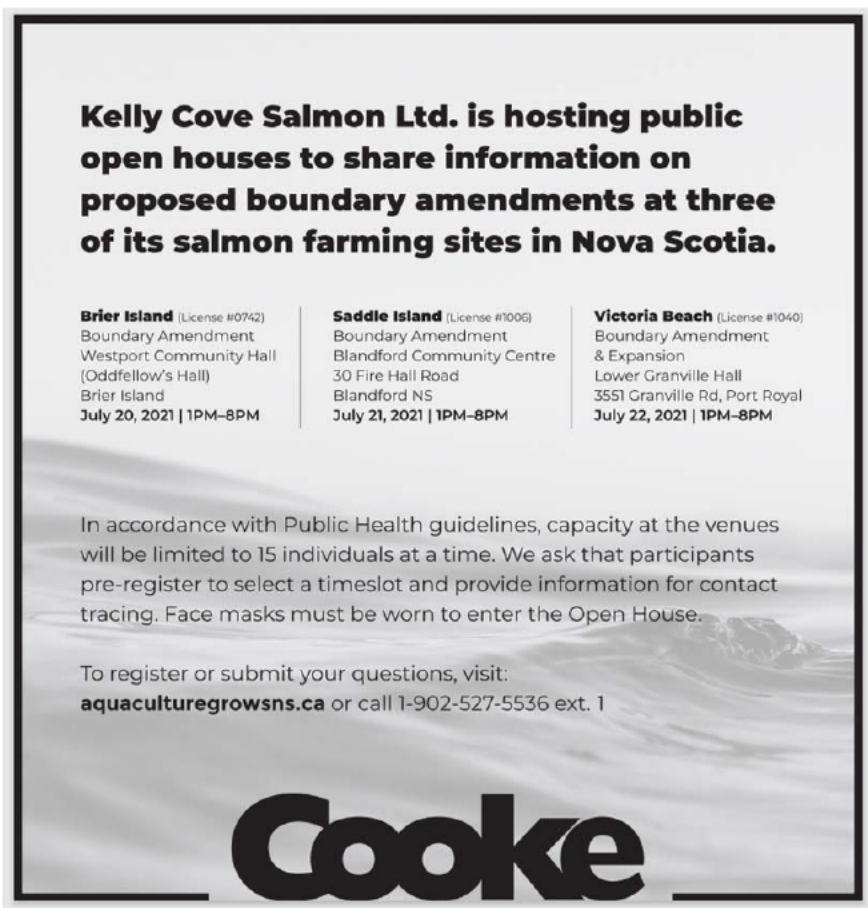
2.0 Public Meeting

On Thursday, July 22, 2021, KCS held a public open house meeting at the Lower Granville Hall located in the community of Port Royal. The open house took place from 1:00PM - 8:00 PM. There were 32 participants who attended the event. KCS was able to accommodate everyone who wished to attend.

2.1 Community Open House Advertising

The open house was publicized by radio broadcasting on CKDY on-air in Digby. Kelly Cove Salmon purchased four 30-second advertising spots each day during the period of July 12-18, 2021. There were newsprint ads published in the Tri-County Vanguard on July 7 & 14 and The Chronicle Herald on July 10, 14 and 17.

Figure 2.1.1 Cooke Aquaculture Community Open House ad published in the Vanguard & Chronicle Herald.



Three weeks prior to the open house, signs were posted throughout the neighbouring communities of Victoria Beach detailing the Cooke Aquaculture Inc. Community Open House. These notices were posted at the local community halls, general stores, and gas stations. (See Appendix A for illustrations).

2.2 Open House Structure

Kelly Cove Salmon had representatives from its Saltwater Operations, Environmental Monitoring, Public Relations, Compliance, Human Resources, and Business Development departments. Tables were set up with posters illustrating the proposed boundary amendment, a model cage was on site, job applications, and reading materials on salmon farming and Cooke's global operations were available to take home.

2.3 Public Feedback from Open House

In accordance with the Aquaculture Licence and Lease Regulations for Nova Scotia made under Section 64, Chapter 25 of the Acts of 1996, the ***Fisheries and Coastal Resources Act***, scoping is required for new marine applications and boundary amendments. During the scoping process all information collected must be collated on the eight factors to be considered in decisions related to marine aquaculture sites:

(a) The optimum use of marine resources.
(b) The contribution of the proposed operation to community and Provincial economic development.
(c) Fishery activity in the public waters surrounding the proposed aquaculture operation.
(d) The oceanographic and biophysical characteristics of the public waters surrounding the proposed aquaculture operation.
(e) The other users of the public waters surrounding the proposed aquacultural operation.
(f) The public right of navigation.
(g) The sustainability of wild salmon; and
(h) The number and productivity of other aquaculture sites in the public waters surrounding the proposed aquaculture operation.

The following table outlines the questions, concerns, and comments from the attendees of the public meeting:

Table 2.3.1 Questions and comments expressed during the Open House

Questions	Factor to be Considered	Response
Are you supposed to be paying fines for not being on your lease?	NA	No, in the early days of finfish aquaculture the cage structures were to be in the lease not the anchors and moorings. In 2015, the government changed this and required all equipment including the anchors and moorings to be included within the lease area. Operators were given until October 26th, 2016, to either apply for a boundary amendment or to move all of the equipment to within the original lease area. KCS applied for a boundary amendment.
How did you advertise the meeting?	(e)	The open house was publicized by radio broadcasting on CKDY on-air in Digby Nova Scotia. Kelly Cove Salmon purchased four 30-second advertising spots each day during the period of July 12-18, 2021. There were newsprint ads published in the Tri-County Vanguard on July 7 & 14 and The Chronicle Herald on July 10, 14, and 17. Posters were also posted throughout the neighbouring communities.
Where is the EIA located?	NA	The Nova Scotia does not require an EIA for this project. The complete application package is located on www.aquaculturegrowsns.ca.
Did you have a disease outbreak somewhere? What happened to the fish?	(c) & (g)	The company follows all procedures and regulations set in place by the chief veterinarian for PNS as per our Farm Management Plan. There have been no significant disease outbreaks at this farm. More than 10 years ago, we had fish at two farms test positive for ISAv. This wasn't a clinical outbreak.
Did you sell diseased fish?	NA	All fish marketed is approved for sale by CFIA.

Are smolts GMO (genetically modified organisms)?	(g)	No, the fish produced and grown by Cooke Aquaculture are not genetically modified in any way. We use the Saint John River strain for our brood stock.
How long have you been outside the lease?	(e)	KCS acquired the site in 2011, the site was outside the lease when acquired. KCS applied in 2016 to bring the site into compliance. The farm had been outside of its footprint since 1995.
What is the benefit to Victoria Beach?	(b)	KCS is always hiring in the Digby area. We contribute to the GDP of the province which in turn helps support critical infrastructure such as hospitals, schools, road, etc.
How many people are employed from Annapolis County?	(b)	Our shore base is in Digby due to the lack of wharves in the Annapolis section of the Basin. However, residents of Annapolis County could commute to Digby. Several Annapolis County residents have done this in the past.
How will public comments be documented?	NA	Public comments will be documented in a public-engagement report that will be submitted with the boundary amendment application to DFA.
How does the public get access to information on mortalities, antibiotic use, sea-lice treatments?	(c) & (g)	Some of that information is proprietary, any significant events will be posted on our website.
Does the company have a plan to further expand above this application?	(b)	Not in the Annapolis Basin.
What can be done about the birds and the noise?	(e)	We are constantly looking at better alternatives to minimize bird presence. We are trying new underwater feeders, wider bird netting and taller bird stands. We are looking at shore power to sites close to land to eliminate generator usage. As for regulatory guidelines we follow the Gov of Canada CCOHS (Canadian Center for Occupational Health & Safety). We also try to follow municipal guidelines, if they are available in the area we operate. We are a food-production business; there will be some level of noise associated with the production.

Why did the company not send notices to the property owners next to the farm?	NA	We advertised on the radio, in the local paper, Chronical herald, and posted a notice on the community board at the Grandville Hall located in the parking lot.
What is done to mitigate the risk for escaped fish?	(g)	The company has a Containment Management Plan which includes the components which have been engineered to withstand the conditions they are expected to withstand at this location. Additionally, we have incorporated new technologies in sapphire netting wherein stainless-steel wire is woven in to prevent predator attacks, We also add a second netting, called a predator net, during winter season to add a second layer of containment to the fish net.
Do you do genetic tracing?	(g)	Starting in 2023, all fish we put in the water will be able to be genetically traced back to Cooke Aquaculture in the unlikely event of an escape. This process is auditable by NSDFA
How are the grids engineered to withstand hurricanes?	(c) & (g)	Victoria Beach site was modeled using guidance from the following engineering standards: • NS 9415:2009 – "Marine fish farms: Requirements for site survey, risk analyses, design, dimensioning, production, installation and operation" • "Marine Scotland: A Technical Standard for Scottish Finfish Aquaculture" • ISO16488 – "International Standard: Marine fish farms – open net cage – design and operation" • API RP 2SK – "Design and Analysis of Stationkeeping Systems for Floating Structures" • DNV-OS-E301 – "Position Mooring" The analysis determined loading on mooring components (ropes, chains, anchors) in response to expected extreme 10-year and 50-year current, wind, and wave conditions. Materials were checked by comparing breaking strengths with expected loads for simulations.
Why has this process taken so long?	NA	Under the new regulatory framework, it has taken government

		some time to get to this point.
Who owned the salmon farm first?	NA	Casey Fisheries which was owned by Joe Casey.
What is the density of fish, does it increase disease when they are overcrowded?	(g)	The density allowed in each cage is managed through the Farm Management Plan. There is a critical limit and if that limited is reached the operator (Cooke) would have to mitigate (for example, harvest some fish or split the cage).

Comments	• Property owners' quality of life at the cottage is awful. There are ten thousand seagulls when the feed is going through the pipes, feed barge noise, constant noise. Thinking of selling the cottage. Seagulls pooping everywhere. Cottage was appraised at $120,000 but is now at $89,000; will not sell for less than $200,000. • The value of their home will be less if they try to sell. • Do not like the meeting format. • Engineered drawings do not line up with property owners. • Person who could not swim due to the farm's location. • Washington State disaster – what do you have to say about that? • River had large salmon runs and other species, but since Nova Scotia Power dam (hydro), the stocks are down. He felt this was not related to aquaculture. • I heard your farm is stinky. • Company's reputation and what have you done for Victoria Beach community? • Unemployed people in the area want to know how they go about applying. • Local fisherman fishes around the farm, has had a good catch for 20 years, would like a map of where moorings are located so he can fish around them.

3.0 Aquaculture Grows Nova Scotia

October 11, 2018, Cooke Aquaculture activated www.aquaculturegrowsns.ca as a means of making information about expansions, boundary amendments and upcoming open houses available to the public. The site includes background information on Cooke Aquaculture, maps of the proposed expansions, boundary amendments, and an FAQs section that addressed some of the questions posed to Cooke Aquaculture from the public, and a "contact us" form for the public to submit questions, comments, or concerns.

The URL to this site was included on the newspaper ad and promotional posters that were developed for the open house. Following the open house there has been no additional questions or comments reviewed on this link concerning the Victoria Beach boundary amendment.

Appendix A

Location	Public Notice
Lower Grandville Hall	 

APPENDIX B
Victoria Beach Baseline Assessment Report

Baseline Assessment Report

Site #1040
Victoria Beach

Annapolis Basin
Annapolis County
Nova Scotia

April 27, 2022

Prepared for:
Kelly Cove Salmon Ltd.
P.O. Box 33
Bridgewater, NS
B4V 2W6

Prepared by:
Sweeney International Marine Corp.
46 Milltown Blvd.
St. Stephen, NB
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SIMCorp File #SW2016-060

New Brunswick Newfoundland Nova Scotia

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www.simcorp.ca

April 27, 2022

SIMCorp File #SW2016-060

[redacted]
P.O. Box 33
Bridgewater, NS
B4V 2W6

Dear [redacted]

Reference: **Victoria Beach (#1040) Baseline Report**

Please find enclosed the above-noted report and attached video footage for the baseline assessment of site #1040 in Annapolis Basin, N.S. Video footage has been made available to the client through Citrix ShareFile and to the Nova Scotia Department of Fisheries and Aquaculture (NSDFA) through their online Secure File Transfer Service.

If you have any questions or comments on the above-noted report, please do not hesitate to contact me at [redacted]

[redacted]
Senior Marine Environmental Biologist
Atlantic Region
Sweeney International Marine Corp.
[redacted]

cc: [redacted] (SIMCorp)
Edward Parker (DFO)
Gretchen Wagner (NSDFA)
Robert Ceschiutti (NSDFA)
Jessica Feindel (NSDFA)
Jeff Nickerson (KCS)
[redacted] (KCS)

EP EMPLOYER
Eco Canada

The following outlines the regulatory requirements of baseline assessments for the province of Nova Scotia and lists where the associated information can be found within this report.

	Regulatory Requirement	Sections of Regulation	Baseline Report Section
Depositional modeling	Modeled predicted contours of 1, 5, and 10 g C m^{-2} d^{-1}	AAR Paragraph 8(1)(a)	6.3, Figure 15
	Use of an aquaculture waste depositional model	AAR Paragraph 8(1)(a)	6.1
	Model inputs of food and fecal waste as accepted interna ional standard values	AAR Paragraph 8(1)(a)	6.2, Appendix J
	Particle resuspension is not applicable	AAR Paragraph 8(1)(a)	6.1
Fish and Fish Habitat Survey	Survey of Fish and Fish Habitat within a grid that covers the lease, 1 g C m^{-2} d^{-1} depositional contour, and reference station	AAR Paragraph 8(1)(b)	7.2, Figure 17
	Species ≥ 1 cm in length are identified	AAR Paragraph 8(1)(b)	7.3
	All fish habitat and substrates types are identified	AAR Paragraph 8(1)(b)	7.3, Appendix K, Appendix L
	In lieu of a bathymetry survey, chart data with minimum resolution of 10 m contours were used to generate depth profiles within the 1 g C m^{-2} d^{-1} depositional contour, lease, and reference station	AAR Paragraph 8(1)(c)	4.0
Benthic Substrate Monitoring	Collected samples of the benthic substrate at each corner of the lease boundary, the site center, and a reference station	AAR Paragraph 8(1)(d); NSDFA SOP's Section 2 0	3.1
	Samples meet all quality criteria	AAR Paragraph 8(1)(d); NSDFA SOP's Section 5.0 & Section 2.0	3.2, Appendix A, Appendix C
	Information concerning seabed and sediment samples is recorded	AAR Paragraph 8(1)(d); NSDFA SOP's Section 2.0	3.2, Appendix A, Appendix D, Appendix E, Appendix F
	Concentration of free sulfide was determined within 36 hours	AAR Paragraph 8(1)(d)	3.3, Table 22
	Subsamples were kept cool until analyzed	AAR Paragraph 8(1)(d); NSDFA SOP's Section 2 0	3.2, Appendix B
	A designated meter and probe combination were selected for sulfide measurements	NSDFA SOP's Section 2.0	3.4, Appendix G
	Sulphide probe was calibrated using five serial dilutions of a standard sulfide solution beginning with the most dilute	AAR Paragraph 8(1)(d); NSDFA SOP's Section 2 0	3.4, Appendix G
	Grain size distribution measurements recorded according to the Wentworth grain size scale	AAR Paragraph 8(1)(d); NSDFA SOP's Section 2 0	3.2, Appendix F
	Redox measurements conducted as specified	AAR Paragraph 8(1)(d); NSDFA SOP's Section 2 0	3 3, Appendix D
Video Monitoring	Video monitoring procedures were conducted as specified	AAR Paragraph 11(2)(a), (b), and (c); NSDFA SOP's Section 2.0	3.5, 7.2
	Video monitoring was conducted at the same locations as benthic substrate samples	AAR Paragraph 11(2)(a), (b), and (c); NSDFA SOP's Section 2.0	3.5, Appendix A, Appendix H
	A baseline video transect required by NSDFA was omitted after communications wi h NSDFA deemed it unnecessary when a fish habitat survey is also conducted.	NSDFA SOP's Section 2.0	3.1
	Sampling coordinates are collected by GPS and recorded degrees minutes decimal minutes (3 digits following decimal point) using NAD83	AAR Paragraph 11(2)(a), (b), and (c); NSDFA SOP's Section 2.0	Table 3, 3.5, 7.2
	Timing of sampling occurred while the site was stocked (but before proposed stocking changes were implemented)	AAR Paragraph 8	1.0
ADCP Measurements	Tidal current measurements were collected for a minimum of 30 days as close to the lease center as possible due to the presence of gear and fish.	NSDFA SOP's Section 2.0	5.1, 5.3, Appendix I

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

1.0 INTRODUCTION

The following baseline report and attached video have been prepared by Sweeney International Marine Corp. (SIMCorp) for Kelly Cove Salmon Ltd. to summarize the findings of a formal baseline environmental survey of Victoria Beach (#1040). Marine aquaculture site #1040 is on the northern shore of Annapolis Basin, in Annapolis County (Fig. 1). This area is shown on CHS chart #4396. The current lease has dimensions of approximately 550 x 150 m with an area of approximately 8.25 ha (Table 1). At the time of sampling, Victoria Beach #1040 was stocked. The purpose of this baseline assessment is to support a boundary amendment application, which will increase the lease area to 31.4 ha and allow for an increase in production with the addition of four (4) cages. All above-water and below-water gear will be contained within the proposed lease boundaries.

Figure 1. Current Victoria Beach (#1040) location in Annapolis Basin

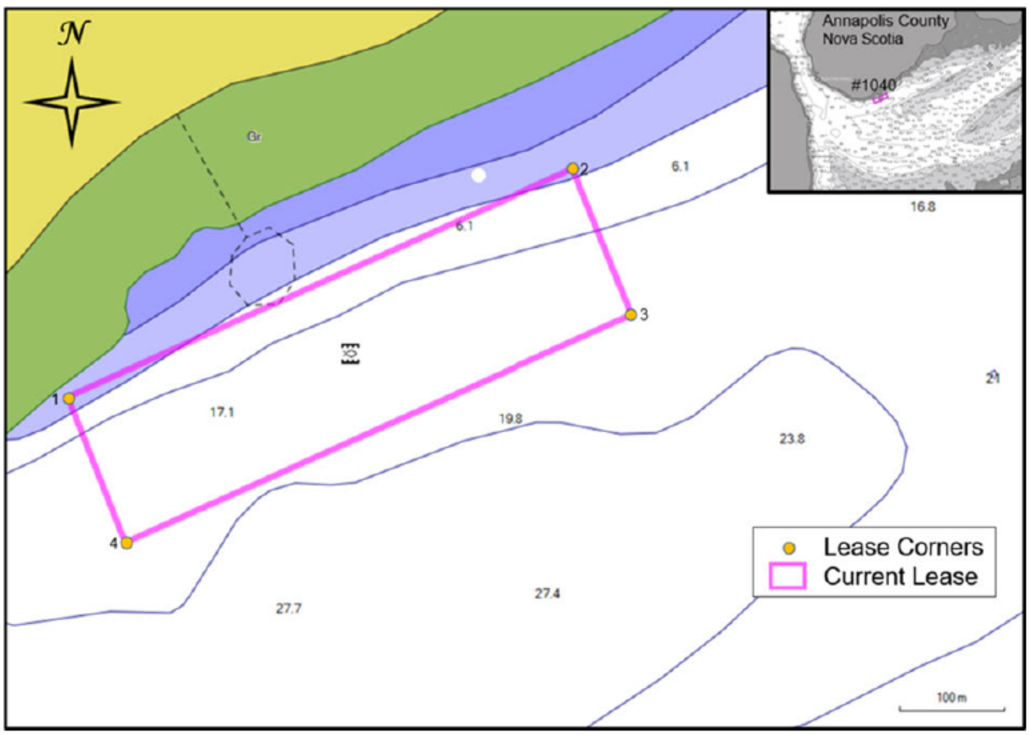


Table 1. Current boundary and center coordinates of Victoria Beach (#1040)

SITE COORDINATES (NAD 83)		
Corner	**Latitude**	**Longitude**
1	44° 40.096’	65° 43.492’
2	44° 40.213’	65° 43.110’
3	44° 40.139’	65° 43.065’
4	44° 40.022’	65° 43.448’
Site Center	44° 40.120’	65° 43.279’

The proposed boundary amendment extends the lease boundaries to add four (4) additional cages to the east of the current grid and to accommodate all below-surface gear. The dimensions of the proposed lease are approximately 188 x 500 x 247 x 290 x 910 x 290 m with an area of approximately 31.4 ha. (Fig. 2, Table 2).

Figure 2. Proposed boundary location for Victoria Beach (#1040)

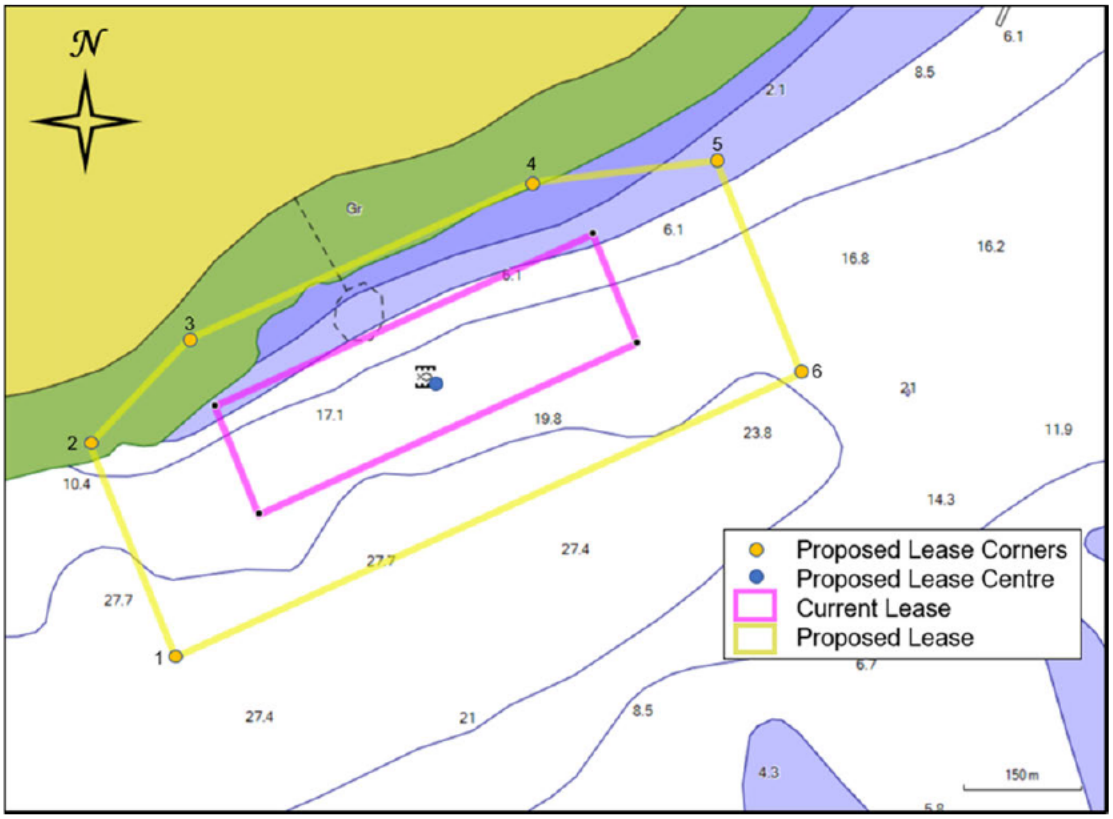


Table 2. Proposed boundary and center coordinates of Victoria Beach (#1040)

SITE COORDINATES (NAD 83)		
Corner	**Latitude**	**Longitude**
1	44° 39.926'	65° 43.532'
2	44° 40.070'	65° 43.619'
3	44° 40.142'	65° 43.519'
4	44° 40.248'	65° 43.171'
5	44° 40.263'	65° 42.986'
6	44° 40.119'	65° 42.899'
Site Center	44° 40.112'	65° 43.270'

2.0 CONTACT INFORMATION

Proponent:

Company Name: Kelly Cove Salmon Ltd.
Principal Contact: Mr. Jeff Nickerson
Mailing Address: P.O. Box 33
Bridgewater, Nova Scotia, B4V 2W6
E-mail: jnickerson@cookeaqua.com

Project Management:

Company Name: Sweeney International Marine Corp.
Principal Contact: [redacted]
Mailing Address: 46 Milltown Blvd.
St. Stephen, New Brunswick, E3L 1G3
Telephone: (506) 467-9014
Cellular: [redacted]
Facsimile: (506) 467-9503
E-mail: [redacted]

3.0 BENTHIC SUBSTRATE SAMPLING

3.1 Sampling Locations

The methods employed to conduct the seafloor sediment-condition analyses were adapted, in consultation with Nova Scotia's Department of Fisheries and Aquaculture (NSDFA) officials, Appendix B of the NSDFA *Standard Operating Procedures for the Environmental Monitoring of Marine Aquaculture in Nova Scotia* (NSDFA 2018a), as well as the *Aquaculture Activities Regulations* (AAR) Guidance Document (Department of Fisheries and Oceans Canada 2018a) and Monitoring Standard (Department of Fisheries and Oceans Canada 2018b). At the time of finalization and submission of this report, updated procedures from NSDFA were available. However, there were no significant changes to baseline requirements. Any further references in this report to sections of the SOPs refer to the 2021 version. Further details are available in the subsequent sections of this report.

To satisfy the NSDFA and AAR benthic substrate sampling criteria, a total of nine (9) stations were investigated for the purpose of this baseline survey (Fig. 3). The nine (9) stations represent six (6) stations at the corners of the proposed lease, one (1) at the site center, and two (2) reference stations. Two (2) attempts were made to locate a suitable reference station between 100 and 300 m away from the lease in the direction of the dominant current. However, acceptable sediment samples could not be collected at either reference station, thus a video transect was conducted via camera drops at 100, 150, 200, 250, and 300 m away from the lease. The baseline video transect was omitted after NSDFA deemed the fish and fish habitat survey (referenced in section 8.0) to be sufficient video monitoring. Due to coarser substrates at Victoria Beach, a full complement of sediment samples was unattainable from all the baseline survey stations. As such, video transects were conducted at the lease corners, site center, and a reference station. The sampling station coordinates are presented in Table 3. Seafloor characteristics for each station are presented in Tables 5 – 21.

Figure 3. Baseline sampling stations at Victoria Beach (#1040)

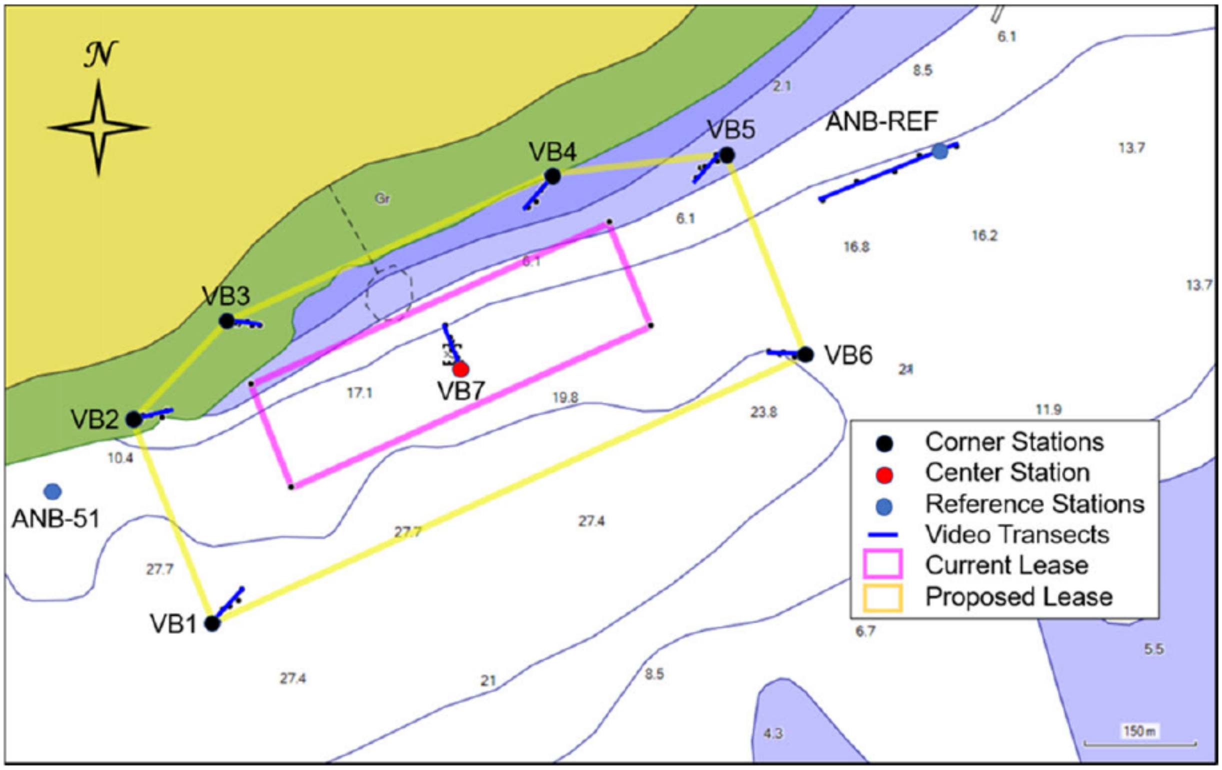


Table 3. Baseline Sampling Coordinates at Site #1040, Annapolis Basin

SITE COORDINATES (NAD 83)			
Station	**Location**	**Latitude**	**Longitude**
VB1	SW corner	44° 39.923’	65° 43.533’
VB2	NW corner	44° 40.072’	65° 43.618’
VB3	NNW corner	44° 40.142’	65° 43.515’
VB4	NNE corner	44° 40.247’	65° 43.177’
VB5	NE corner	44° 40.262’	65° 42.988’
VB6	SE corner	44° 40.117’	65° 42.902’
VB7	Site center	44° 40.112’	65° 43.267’
ANB-51	Reference Station	44° 40.020’	65° 43.705’
ANB-REF	Reference Station	44° 40.263’	65° 42.755’

3.2 Sediment Sample Collection

Benthic field data to satisfy the benthic substrate sampling component of the Victoria Beach (#1040) baseline assessment was carried out by SIMCorp Field Supervisor and Senior Marine Environmental Biologist [redacted], BSc, EP, Field Technician [redacted]

[redacted], and boat operator [redacted] on May 28, 2019. High tide was at 07:37 (7.0 m), and low tide was at 13:51 (2.0 m).

A 25-kg OSIL Van Veen grab was used to collect sediment samples from all the baseline stations. This grab type was selected due to its weight and size being sufficient to ensure vertical descent and meet the requirements outlined in section 4 (c) of the AAR monitoring standard. After deployment, the grab was pulled aboard and placed on the deck. When present, the overlying water in the grab was removed via siphon and a picture was taken of the contents (Appendix A). Notes were recorded on time, location, sediment type, colour, depth, odour, flora, and fauna, etc. Sediment subsamples were collected from the top 2 cm of the grab samples with 10-mL syringes that were sealed with Parafilm M® and capped to form an airtight seal until analyzed. The remaining top 2 cm of sediment was placed in 2-oz Whirl-Paks for use in grain-size analysis according to the Wentworth grain-size scale. Syringes and Whirl-Paks were labelled and placed in a plastic cooler with ice. Samples were kept cool until analyzed for redox, sulphide, porosity, percent organic matter, and grain size.

Sample temperatures during collection, transport, and analysis were recorded using HOBO ProV2 temperature loggers. Temperatures recorded from inside the sample cooler are presented graphically in Appendix B.

All reasonable efforts were made to conform to the provincial and federal regulatory requirements, maintain storage temperature of samples, to collect samples that were as undisturbed as possible (see Appendix C for details), and to preserve the integrity of the samples until analyzed.

3.3 Sediment Sample Analysis

All sediment samples were analyzed within 27 hours of collection for redox potential and sulphide ion concentration (Table 22, Fig. 4). Temperatures were taken for each sample and redox readings in mV were adjusted for temperature to produce mV readings relative to the normal hydrogen electrode (mV_{NHE}). Sulphide samples were brought to the same temperature at which the sulphide probe was calibrated before a reading was taken. Redox and sulphide measurements were made on the 0-to-2-cm-deep portion of the grab samples. These results can be related to the Environmental Quality Definitions for Nova Scotia Marine Aquaculture Monitoring (Table 4, NSDFA, 2021b). A copy of the laboratory data sheet for the redox and sulphide results is presented in Appendix D.

Sediment samples from each station were sent to the SIMCorp Environmental Sciences Lab (formerly SIMCorp Marine Benthic Sediments Laboratory) for analysis of porosity, total organic content, and grain size. The results of these analyses are presented in Table 23 and Appendices E and F.

Table 4. Environmental Quality Definitions for Nova Scotia Marine Aquaculture Monitoring

	Sediment Classification		
Measurement	**Oxic**	**Hypoxic**	**Anoxic**
Sediment colour	Tan to depth > 0.5 cm	Tan to < 0.5 cm with some black sediments at surface	Surface sediments black
Microbial presence	No *Beggiatoa*-like bacteria present	Patchy *Beggiatoa*-like bacteria	Widespread *Beggiatoa*-like bacterial mats
Macrofaunal Assemblage	Wide array of infauna and epifauna	Mixed group of mostly small infauna	Small infauna only
Sulfide, µM	**≤ 749 (A) 750 to 1499 (B)**	**1500 to 2999 (A) 3000 to 5999 (B)**	**≥ 6000**
Redox (Eh), mV_{NHE}	>100 (A) 100 to -50 (B)	-50 to -100 (A) -100 to -150 (B)	< -150
Organic matter, %	<= reference*	1.5 to 2X ref.	> 2X reference
Porosity, %	<= reference*	1 to 10X ref.	> 10X reference

3.4 Lab Equipment and Calibrations

Redox measurements were taken using a combination meter (Fisher Accumet AP125) and probe [Orion Epoxy Sure-Flow Combination Redox/ORP Electrode (Cat. No. 9678BNW)], which was checked for electrical function just prior to use [Orion ORP standard (Cat. No. 967901)] using a ORP standard solution to ensure the probe read 220 +/- 3.0 mV at 25°C. Readings were taken according to the NSDFA Standard Operating Procedures (SOP) protocols and immediately followed by sulphide measurements (NSDFA 2018a, 2021a).

Sulphide measurements were taken using a calibrated combination meter (Fisher Accumet AP125) and probe [Orion Sure-Flow Combination Silver/Sulphide Electrode (Cat No. 9616BNWP)]. Meter and sulphide probe calibrations took place in accordance with NSDFA SOP protocols at 10:51 on May 29, 2019. One probe was calibrated and used to analyze the samples. The results of the five-point calibration are in Appendix G. The calibration temperature was 22.3°C.

3.5 Video Surveillance Methods

Video footage was recorded using a J.W. Fishers Camera System, which was mounted perpendicular to the seafloor in an aluminum frame. The seafloor was illuminated with lighting built into the camera system. A 0.25-m^2 quadrat was visible in the field of view as a size reference. Appropriate weight was added to the camera frame to allow for stable movement through the water column. The video camera frame includes a scale bar demarcated with 5-cm segments, which aids in the identification of organisms greater than 1 cm. Live video footage from the underwater camera was recorded using a J.W.

Fishers digital video recorder (DVR) built into a VRM-2 video recorder and monitor system with a GPS interface, which allowed coordinate positions to be overlaid onto the video.

Video recording of each sampling station started at the surface with the viewing of a placard showing collection location information, followed by a 360° pan of the area at the sampling station, and then the underwater footage. The recording continued uninterrupted for the duration of the underwater surveillance and was concluded only after the camera was returned to the vessel at the surface. Footage coverage included the camera's descent, impact with the sediment surface, and minimum of 5 m^2 of seafloor over a minimum duration of two minutes. Screen shots of the seafloor for each sample location were taken and are presented in Appendix H. All on-site visual assessments have been recorded in the field notes and video assessments supplement the field data included in this report. Raw video files have been submitted to NSDFA and are also available upon request.

3.6 Results and Observations

Table 5. VB1 Benthic Log

Sampling Date:	May 28th, 2019
Water Body:	Annapolis Basin
Lease Name and Number:	Victoria Beach #1040
Water Temperature (°C)	8.6°C
Wind Direction and Speed:	Light Variable
Wave Action:	Calm
Current Direction & Speed:	Strong W<-->E
Tide Schedule:	High @ 7:37 (7.0 m); Low @ 13:51 (2.0 m); High @ 20:07 (7.1 m)
Vessel:	Carolina Skiff

Lease # or Reference Site:	#1040	**Station Comments:** No acceptable grab samples could be collected. A video transect was conducted.
Video Start Time:	8:02 AM	
Recorder Name(s):	[redacted]	**Video Notes:**
Sample Collector's Name(s)	**Sediment Sampler:** [redacted] **Syringe Sampler:** [redacted]	Hard packed brown mud, sand, gravel, cobble; *Flustra*; scallop shells; hermit crab; rock crab; barnacles; lobster; mixed Rhodophyta; oyster thief; *Fucus*; mussel shells (rare); shell debris (prevalent); detritus (some)
Sampling Station ID:	VB1	
Gear Present on Bottom	None	
Dist. and Dir. from Waypoint:	3 m @ 217°	
Sampling Coordinates:	N44.66540 W65.72555	**Benthic Descriptor Key:**
Station Depth (m):	36.3	[1] *e.g.* Gas bubbles, feed, faeces, sediment: colour, type, and consistency
Video (Y/N):	Y	[2] *e.g.* Strong, slight, none
Number of Collection Attempts:	5	[3] *e.g.* Eel grass, kelp, lobster, starfish, *Beggiatoa*, polycheates, etc.

Sample/Collection method	Ascension Speed (m/s)	Sample (Y/N)	Sample ID	Sediment Description[1]	Odour[2]	Sediment Sample Depth (cm)	Flora/Fauna[3]
Benthic Replicate 1 (10 mL) 12 L Van Veen Grab		N					
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab		N					
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab		N					

Table 6. VB2 Benthic Log

Lease # or Reference Site:	#1040	**Station Comments:** No acceptable grab samples could be collected. A video transect was conducted.
Video Start Time:	8:44 AM	
Recorder Name(s):	[redacted]	**Video Notes:**
Sample Collector's Name(s)	**Sediment Sampler:** [redacted] **Syringe Sampler:** [redacted]	Hard packed brown mud, sand, gravel, cobble, rubble; *Flustra*; hermit crab; green crab; barnacles; limpits; mixed Rhodophyta; sea colander; coralline algae; mussel shells (rare); shell debris (prevalent); detritus (rare)
Sampling Station ID:	VB2	
Gear Present on Bottom	None	
Dist. and Dir. from Waypoint:	4 m @ 10°	
Sampling Coordinates:	N44.66786 W65.72696	**Benthic Descriptor Key:**
Station Depth (m):	6.3	[1] *e.g.* Gas bubbles, feed, faeces, sediment: colour, type, and consistency
Video (Y/N):	Y	[2] *e.g.* Strong, slight, none
Number of Collection Attempts:	5	[3] *e.g.* Eel grass, kelp, lobster, starfish, *Beggiatoa* , polycheates, etc.

Sample/Collection method	Ascension Speed (m/s)	Sample (Y/N)	Sample ID	Sediment Description[1]	Odour[2]	Sediment Sample Depth (cm)	Flora/Fauna[3]
Benthic Replicate 1 (10 mL) 12 L Van Veen Grab		N					
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab		N					
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab		N					

Table 7. VB3 Benthic Log

Lease # or Reference Site:	#1040	**Station Comments:** No acceptable grab samples could be collected. A video transect was conducted.
Video Start Time:	9:03 AM	
Recorder Name(s):	[redacted]	**Video Notes:** Hard packed brown gravel, cobble, boulder; barnacles; snails; *Fucus*; shell debris (rare)
Sample Collector's Name(s)	**Sediment Sampler:** [redacted] **Syringe Sampler:** [redacted]	
Sampling Station ID:	VB3	
Gear Present on Bottom	None	
Dist. and Dir. from Waypoint:	6 m @ 84°	
Sampling Coordinates:	N44.66904 W65.72524	**Benthic Descriptor Key:**
Station Depth (m):	6.3	[1] *e.g.* Gas bubbles, feed, faeces, sediment: colour, type, and consistency
Video (Y/N):	Y	[2] *e.g.* Strong, slight, none
Number of Collection Attempts:	5	[3] *e.g.* Eel grass, kelp, lobster, starfish, *Beggiatoa*, polycheates, etc.

Sample/Collection method	Ascension Speed (m/s)	Sample (Y/N)	Sample ID	Sediment Description[1]	Odour[2]	Sediment Sample Depth (cm)	Flora/Fauna[3]
Benthic Replicate 1 (10 mL) 12 L Van Veen Grab		N					
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab		N					
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab		N					

Table 8. VB4 Benthic Log

Lease # or Reference Site:	#1040	**Station Comments:** Only one acceptable grab samples could be collected. A video transect was conducted.
Video Start Time:	9:21 AM	
Recorder Name(s):	[redacted]	**Video Notes:**
Sample Collector's Name(s)	**Sediment Sampler:** [redacted] **Syringe Sampler:** [redacted]	Hard packed brown mud, sand, gravel, cobble, boulder; hermit crab; barnacles; mixed Rhodophyta; *Fucus*; coralline algae; mussel shells (rare); shell debris (some); detritus (rare)
Sampling Station ID:	VB4	
Gear Present on Bottom	None	
Dist. and Dir. from Waypoint:	7 m @ 247°	
Sampling Coordinates:	N44.67079 W65.71962	**Benthic Descriptor Key:**
Station Depth (m):	5.9	[1] *e.g.* Gas bubbles, feed, faeces, sediment: colour, type, and consistency
Video (Y/N):	Y	[2] *e.g.* Strong, slight, none
Number of Collection Attempts:	5	[3] *e.g.* Eel grass, kelp, lobster, starfish, *Beggiatoa*, polycheates, etc.

Sample/Collection method	Ascension Speed (m/s)	Sample (Y/N)	Sample ID	Sediment Description[1]	Odour[2]	Sediment Sample Depth (cm)	Flora/Fauna[3]
Benthic Replicate 1 (10 mL) 12 L Van Veen Grab	0.37	Y	VB4 (1)	Brown mud, sand, shell debris	None	6.5	
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab		N					
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab		N					

Table 9. VB5 Benthic Log

Lease # or Reference Site:	#1040						**Station Comments:** No acceptable grab samples could be collected. A video transect was conducted.
Video Start Time:	9:45 AM						
Recorder Name(s):	[redacted]						**Video Notes:** Hard packed brown mud, sand, gravel, cobble; *Flustra*; hermit crab; tunicate; scallop shells; blood star; green sea urchin; rock crab; mixed Rhodophyta; oyster thief; coralline algae; kelp; shell debris (some); detritus (rare)
Sample Collector's Name(s)	**Sediment Sampler:** [redacted] **Syringe Sampler:** [redacted]						
Sampling Station ID:	VB5						
Gear Present on Bottom	None						
Dist. and Dir. from Waypoint:	4 m @ 243°						
Sampling Coordinates:	N44.67103 W65.71647						**Benthic Descriptor Key:** [1] *e.g.* Gas bubbles, feed, faeces, sediment: colour, type, and consistency [2] *e.g.* Strong, slight, none [3] *e.g.* Eel grass, kelp, lobster, starfish, *Beggiatoa*, polycheates, etc.
Station Depth (m):	9.4						
Video (Y/N):	Y						
Number of Collection Attempts:	5						
Sample/Collection method	**Ascension Speed (m/s)**	**Sample (Y/N)**	**Sample ID**	**Sediment Description[1]**	**Odour[2]**	**Sediment Sample Depth (cm)**	**Flora/Fauna[3]**
Benthic Replicate 1 (10 mL) 12 L Van Veen Grab		N					
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab		N					
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab		N					

Table 10. ANB-REF Benthic Log

Lease # or Reference Site:	Reference
Video Start Time:	10:07 AM
Recorder Name(s):	[redacted]
Sample Collector's Name(s)	**Sediment Sampler:** [redacted] **Syringe Sampler:** [redacted]
Sampling Station ID:	ANB-REF
Gear Present on Bottom	None
Dist. and Dir. from Waypoint:	3 m @ 42°
Sampling Coordinates:	N44.67106 W65.71258
Station Depth (m):	14
Video (Y/N):	Y
Number of Collection Attempts:	5

Station Comments: Only one acceptable grab samples could be collected. A video transect was conducted.
Video Notes: Hard packed brown sand, mud, gravel, cobble, rubble; *Flustra* (5%); encrusting sponge (<5%); scallop shells; detritus
Benthic Descriptor Key:
[1] *e.g.* Gas bubbles, feed, faeces, sediment: colour, type, and consistency
[2] *e.g.* Strong, slight, none
[3] *e.g.* Eel grass, kelp, lobster, starfish, *Beggiatoa*, polycheates, etc.

Sample/Collection method	Ascension Speed (m/s)	Sample (Y/N)	Sample ID	Sediment Description[1]	Odour[2]	Sediment Sample Depth (cm)	Flora/Fauna[3]
Benthic Replicate 1 (10 mL) 12 L Van Veen Grab	0.36	Y	ANB-REF (1)	Brown mud, gravel, shell debris	None	5	Shells, hermit crab
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab		N					
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab		N					

Table 11. VB6 Benthic Log

Lease # or Reference Site:	#1040						**Station Comments:** Only one acceptable grab samples could be collected. A video transect was conducted.
Video Start Time:	10:38 AM						
Recorder Name(s):	[redacted]						**Video Notes:** Hard packed brown mud, sand, gravel, cobble, rubble; hermit crab; *Flustra;* rock crab; lobster; mixed Rhodophyta; mussel shells (rare); shell debris (some); detritus (some)
Sample Collector's Name(s)	**Sediment Sampler:** [redacted]			**Syringe Sampler:** [redacted]			
Sampling Station ID:	VB6						
Gear Present on Bottom	None						
Dist. and Dir. from Waypoint:	3 m @ 224°						
Sampling Coordinates:	N44.66862 W65.71502						**Benthic Descriptor Key:**
Station Depth (m):	25						[1] *e.g.* Gas bubbles, feed, faeces, sediment: colour, type, and consistency
Video (Y/N):	Y						[2] *e.g.* Strong, slight, none
Number of Collection Attempts:	5						[3] *e.g.* Eel grass, kelp, lobster, starfish, *Beggiatoa* , polycheates, etc.
Sample/Collection method	**Ascension Speed (m/s)**	**Sample (Y/N)**	**Sample ID**	**Sediment Description[1]**	**Odour[2]**	**Sediment Sample Depth (cm)**	**Flora/Fauna[3]**
Benthic Replicate 1 (10 mL) 12 L Van Veen Grab	0.37	Y	VB6 (1)	Brown mud, sand, shell debris	None	6.5	Worm tubes, hermit crab
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab		N					
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab		N					

Table 12. ANB-51 Benthic Log

Lease # or Reference Site:	Reference	**Station Comments:** Only one acceptable grab samples could be collected. A video transect was conducted.
Video Start Time:	11:20 AM	
Recorder Name(s):	[redacted]	**Video Notes:**
Sample Collector's Name(s)	**Sediment Sampler:** [redacted] **Syringe Sampler:** [redacted]	Hard packed brown sand, mud, gravel, cobble, rubble; *Flustra;* mixed Rhodophyta (5%); *Fucus* (<5%); northern seastar; hermit crab; scallop shells; detritus
Sampling Station ID:	ANB-51	
Gear Present on Bottom	None	
Dist. and Dir. from Waypoint:	7 m @ 284°	
Sampling Coordinates:	N44.66699 W65.72843	**Benthic Descriptor Key:**
Station Depth (m):	18.7	[1] *e.g.* Gas bubbles, feed, faeces, sediment: colour, type, and consistency
Video (Y/N):	Y	[2] *e.g.* Strong, slight, none
Number of Collection Attempts:	5	[3] *e.g.* Eel grass, kelp, lobster, starfish, *Beggiatoa* , polycheates, etc.

Sample/Collection method	Ascension Speed (m/s)	Sample (Y/N)	Sample ID	Sediment Description[1]	Odour[2]	Sediment Sample Depth (cm)	Flora/Fauna[3]
Benthic Replicate 1 (10 mL) 12 L Van Veen Grab		N					
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab		N					
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab		N					

Table 13. VB7 Benthic Log

Lease # or Reference Site:	#1040	**Station Comments:** Only one acceptable grab samples could be collected. A video transect was conducted.
Video Start Time:	11:52 AM	
Recorder Name(s):	[redacted]	**Video Notes:** Hard packed brown sand, mud, gravel, cobble, boulder; *Flustra* (<5%); blood star; green crab; mussels; hermit crab; rock crab; scallop shells; mixed Rhodophyta (<5%); feed (prevalent); detritus (some); mussel shells (some); shell debris (some)
Sample Collector's Name(s)	**Sediment Sampler:** [redacted] **Syringe Sampler:** [redacted]	
Sampling Station ID:	VB7	
Gear Present on Bottom	None	
Dist. and Dir. from Waypoint:	4 m @ 84°	
Sampling Coordinates:	N44.66853 W65.72112	**Benthic Descriptor Key:**
Station Depth (m):	20	[1] *e.g.* Gas bubbles, feed, faeces, sediment: colour, type, and consistency
Video (Y/N):	Y	[2] *e.g.* Strong, slight, none
Number of Collection Attempts:	5	[3] *e.g.* Eel grass, kelp, lobster, starfish, *Beggiatoa* , polycheates, etc.

Sample/Collection method	Ascension Speed (m/s)	Sample (Y/N)	Sample ID	Sediment Description[1]	Odour[2]	Sediment Sample Depth (cm)	Flora/Fauna[3]
Benthic Replicate 1 (10 mL) 12 L Van Veen Grab		N					
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab		N					
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab		N					

Table 14. VB1 Transect Benthic Log

Station ID: VB1	0m	10m	20m	30m	40m	50m
Location (NAD 83)	N44 39.924 W65 43.533	N44 39.925 W65 43.526	N44 39.934 W65 43.522	N44 39.936 W65 43.514	N44 39.939 W65 43.505	N44 39.948 W65 43.501
Depth (m)	36.3/31.1	31.1	31	30.9	31.4	30.8
Time	8:05/13:20	13:26	13:33	13:39	13:45	13:51
Approximate Sediment Thickness (cm)	0	0	0	0	0	0
Sediment Colour	Brown	Brown	Brown	Brown	Brown	Brown
Sediment Consistency	Mud, sand, gravel, cobble	Mud, sand, gravel, cobble	Mud, sand, gravel, cobble	Mud, sand, gravel, cobble	Mud, sand, gravel, cobble, rubble	Mud, sand, gravel, cobble
Sediment Surface Consolidation	Hard packed	Hard packed	Hard packed	Hard packed	Hard packed	Hard packed
Gas Bubbles	None	None	None	None	None	None
Estimation of *Beggiatoa*-like Species	0%	0%	0%	0%	0%	0%
Estimation of OPC Coverage	0%	0%	0%	0%	0%	0%
Barrenness due to Aquaculture	None	None	None	None	None	None
Presence of Feed	None	None	None	None	None	None
Presence of Feces	None	None	None	None	None	None
Macrofauna	*Flustra,* scallop shell, hermit crab, rock crab, barnacles, lobster	*Flustra*	Hermit crab, scallop shell, *Flustra*	Flounder, hermit crab, whelk, *Flustra*, scallop shell, rock crab	*Flustra*, scallop shell, hermit crab, *Urticina* anemone	*Flustra,* rock crab, scallop shell, hermit crab
Macroflora % Coverage	Mixed Rhodophyta (<5%), Oyster Theif (<5%), *Fucus* (<5%)	Mixed Rhodophyta (<5%)	Mixed Rhodophyta (<5%)	Mixed Rhodophyta (<5%)	Mixed Rhodophyta (<5%), *Fucus* (<5%)	Mixed Rhodophyta (<5%), *Fucus* (<5%)
Presence of Gear on Bottom	None	None	None	None	None	None
Detritus & Fouling	Mussel shells (rare); detritus (some)	Mussel shells (rare); detritus (some)	Detritus (some)	Mussel shells (rare); detritus (rare)	Detritus (rare)	Detritus (rare)
Shell Debris	Prevalent	Prevalent	Some	Some	Some	Some
Notes						

Table 15. VB2 Transect Benthic Log

Station ID: VB2	0m	10m	20m	30m	40m	50m
Location (NAD 83)	N44 40.072 W65 43.618	N44 40.070 W65 43.610	N44 40.073 W65 43.607	N44 40.073 W65 43.599	N44 40.072 W65 43.587	N44 40.077 W65 43.582
Depth (m)	6.3/3.0	3.9	4.5	4.5	5.8	5
Time	8:46/16:24	16:27	16:30	16:33	16:36	16:40
Approximate Sediment Thickness (cm)	0.5	0	0	0	0	0
Sediment Colour	Brown	Brown	Brown	Brown	Brown	Brown
Sediment Consistency	Mud, sand, gravel, cobble	Mud, sand, gravel, cobble, boulder	Mud, sand, rubble, boulder	Mud, sand, gravel, cobble, rubble, boulder	Mud, sand, cobble	Mud, sand, gravel, cobble, rubble
Sediment Surface Consolidation	Hard packed	Hard packed	Hard packed	Hard packed	Hard packed	Hard packed
Gas Bubbles	None	None	None	None	None	None
Estimation of *Beggiatoa*-like Species	0%	0%	0%	0%	0%	0%
Estimation of OPC Coverage	0%	0%	0%	0%	0%	0%
Barrenness due to Aquaculture	None	None	None	None	None	None
Presence of Feed	None	None	None	None	None	None
Presence of Feces	None	None	None	None	None	None
Macrofauna	*Flustra*, hermit crab, green crab, barnacles	Barnacles, limpits, hermit crab	Scallop shells, lobster, unidentifiable crab	Blood star, rock crab	None	Rock crab, finger sponge, *Flustra*
Macroflora % Coverage	Carolline algae (5%), mixed Rhodophyta (5%), sea colander (<5%)	Coralline algae (5%), mixed Rhodophyta (5%)	Sea colander (35%), coralline algae (5%), mixed Rhodophyta (<5%), encrusting algae (10%)	Sea colander (15%), corallina algae (15%), mixed Rhodophyta (10%), kelp (<5%)	Mixed Rhodophyta (5%), coralline algae (10%), kelp (<5%), sea collander (10%)	Corallina algae (5%), mixed Rhodophyta (5%), Sea colander (<5%), kelp (<5%)
Presence of Gear on Bottom	None	None	None	None	None	None
Detritus & Fouling	Mussel shells (rare); detritus (rare)	Detritus (rare)	Mussel shells (rare); detritus (rare)	Detritus (rare)	Mussel shells (rare); detritus (rare)	Detritus (rare)
Shell Debris	Prevalent	Some	Some	Some	Some	Some
Notes						

Table 16. VB3 Transect Benthic Log

Station ID: VB3	0m	10m	20m	30m	40m	50m
Location (NAD 83)	N44 40.142 W65 43.514	N44 40.140 W65 43.509	N44 40.139 W65 43.506	N44 40.141 W65 43.496	N44 40.138 W65 43.491	N44 40.138 W65 43.483
Depth (m)	3	1	1.9	2.1	2.4	3.5
Time	9:04	16:04	16:07	16:10	16:13	16:16
Approximate Sediment Thickness (cm)	0	0	0	0	0	0.5
Sediment Colour	Brown	Brown	Brown	Brown	Brown	Brown
Sediment Consistency	Gravel, cobble, boulder	Gravel, cobble, rubble	Gravel, cobble, rubble, boulder	Gravel, cobble, rubble	Mud, sand, gravel, cobble, boulder	Mud, sand, rubble
Sediment Surface Consolidation	Hard packed	Hard packed	Hard packed	Hard packed	Hard packed	Hard packed
Gas Bubbles	None	Rare	None	None	None	None
Estimation of *Beggiatoa*-like Species	0%	0%	0%	0%	0%	0%
Estimation of OPC Coverage	0%	0%	0%	0%	0%	0%
Barrenness due to Aquaculture	None	None	None	None	None	None
Presence of Feed	None	None	None	None	None	None
Presence of Feces	None	None	None	None	None	None
Macrofauna	Barnacles, snails	Barnacles, snails	Barnacles, snails, limpits	Barnacles, limpits, hermit crab	Scallop shells, limpits, barnacles, hermit crab	Hermit crab
Macroflora % Coverage	*Fucus* (75%)	*Fucus* (15%)	*Fucus* (10%)	*Fucus* (30%), mixed Rhodophyta (<5%), coralline algae (<5%)	Mixed Rhodophyta (5%), *Fucus* (<5%), coralline algae (5%), sea colander (<5%)	Coralline algae (5%), mixed Rhodophyta (<5%), kelp (<5%), sea colander (<5%)
Presence of Gear on Bottom	None	None	None	None	None	None
Detritus & Fouling	None	Mussel shells (rare); detritus (rare)	Mussel shells (rare)	None	Detritus (rare)	Mussel shells (rare), detritus (rare)
Shell Debris	Rare	Prevalent	Prevalent	Prevalent	Some	Some
Notes	The 0 m station was not repeated when conducting the transect as the tide was low and it was not possible to manoeuver the vessel into place.					

Table 17. VB4 Transect Benthic Log

Station ID: VB4	0m	10m	20m	30m	40m	50m
Location (NAD 83)	N44 40.247 W65 43.177	N44 40.244 W65 43.174	N44 40.239 W65 43.179	N44 40.236 W65 43.183	N44 40.228 W65 43.188	N44 40.224 W65 43.196
Depth (m)	5.9/2.6	3.2	3.5	3.6	4.9	5
Time	9:22/15:34	15:38	15:42	15:45	15:49	15:53
Approximate Sediment Thickness (cm)	0.5	0.5	0.5	0.5	0.5	0
Sediment Colour	Brown	Brown	Brown	Brown	Brown	Brown
Sediment Consistency	Mud, sand, gravel, cobble, boulder	Mud, sand, rubble, boulder	Mud, sand	Mud, sand	Mud, sand	Mud, sand, cobble
Sediment Surface Consolidation	Hard packed	Hard packed	Hard packed	Hard packed	Hard packed	Hard packed
Gas Bubbles	None	None	None	None	None	None
Estimation of *Beggiatoa*-like Species	0%	0%	0%	0%	0%	0%
Estimation of OPC Coverage	0%	0%	0%	0%	0%	0%
Barrenness due to Aquaculture	None	None	None	None	None	None
Presence of Feed	None	None	None	None	None	None
Presence of Feces	None	None	None	None	None	None
Macrofauna	Barnacles, hermit crab	Barnacles	Hermit crab, macrofaunal burrows	Hermit crab	Scallop shell, rock crab, hermit crab, shrimp	Scallop shells, macrofaunal burrows
Macroflora % Coverage	Coralline algae (<5%), mixed Rhodophyta (<5%)	*Fucus* (<5%), mixed Rhodophyta (10%), coralline algae (5%)	Kelp (<5%)	Kelp (<5%)	Kelp (<5%), mixed Rhodophyta (<5%), sea lettuce (<5%)	Kelp (5%), mixed Rhodophyta (<5%), *Fucus* (<5%), sea colander (<5%), coralline algae (<5%)
Presence of Gear on Bottom	None	None	None	None	None	None
Detritus & Fouling	Mussel shells (rare); detritus (rare)	Mussel shells (rare); detritus (rare)	Mussel shells (rare); detritus (rare)	Detritus (rare)	Detritus (rare)	Mussel shells (rare), detritus (rare)
Shell Debris	Some	Rare	Rare	Rare	Rare	Some
Notes						

Table 18. VB5 Transect Benthic Log

Station ID: VB5	0m	10m	20m	30m	40m	50m
Location (NAD 83)	N44 40.262 W65 42.988	N44 40.262 W65 42.995	N44 40.257 W65 42.994	N44 40.252 W65 43.008	N44 40.252 W65 43.012	N44 40.245 W65 43.017
Depth (m)	9.4/6.0	6	6.8	6.8	6.7	7.2
Time	9:47/15:09	15:13	15:16	15:20	15:24	15:27
Approximate Sediment Thickness (cm)	0.5	0	0	0	0	0
Sediment Colour	Brown	Brown	Brown	Brown	Brown	Brown
Sediment Consistency	Mud, sand, gravel, cobble	Mud, sand, gravel, cobble, boulder	Mud, sand, gravel, cobble	Mud, sand, gravel, cobble	Mud, sand, gravel, cobble, rubble	Mud, sand, gravel, cobble
Sediment Surface Consolidation	Hard packed	Hard packed	Hard packed	Hard packed	Hard packed	Hard packed
Gas Bubbles	None	None	None	None	None	None
Estimation of *Beggiatoa*-like Species	<5%	0%	<5%	0%	<5%	0%
Estimation of OPC Coverage	0%	0%	0%	0%	0%	0%
Barrenness due to Aquaculture	None	None	None	None	None	None
Presence of Feed	None	None	None	None	None	None
Presence of Feces	None	None	None	None	None	None
Macrofauna	Hermit crab, *Flustra*, scallop shells, tunicate, blood star, sea urchin, rock crab	Hermit crab, *Flustra*, blood star, scallop shells	Rock crab, scallop shells	Hermit crab, *Flustra*, finger sponge	Hermit crab, blood star, scallop shells, *Flustra*, crab claw	Scallop shells, hermit crab, *Flustra*, rock crab
Macroflora % Coverage	Mixed Rhodophyta (5%), coralline algae (<5%), oyster theif (<5%), kelp (<5%)	Coralline algae (5%), mixed Rhodophyta (5%)	Mixed Rhodophyta (5%)	Coralline algae (5%), mixed Rhodophyta (15%)	Mixed Rhodophyta (5%), coralline algae (<5%)	Mixed Rhodophyta (<5%
Presence of Gear on Bottom	None	None	None	None	None	None
Detritus & Fouling	Mussel shells (rare); detritus (rare)	Mussel shells (rare); detritus (rare)	Detritus (rare)	Detritus (rare)	None	Detritus (rare)
Shell Debris	Some	Some	Some	Some	Some	Some
Notes						

Table 19. VB6 Transect Benthic Log

Station ID: VB6	0m	10m	20m	30m	40m	50m
Location (NAD 83)	N44 40.117 W65 42.901	N44 40.117 W65 42.906	N44 40.117 W65 42.911	N44 40.120 W65 42.923	N44 40.118 W65 42.926	N44 40.121 W65 42.939
Depth (m)	25.0/23.1	23.2	22.8	22.6	22.8	21.6
Time	10:40/14:05	14:10	14:16	14:21	14:28	14:33
Approximate Sediment Thickness (cm)	0.5	0.5	0.5	0.5	0.5	0.5
Sediment Colour	Brown	Brown	Brown	Brown	Brown	Brown
Sediment Consistency	Mud, sand, gravel, cobble, rubble	Mud, sand, gravel, cobble, rubble	Mud, sand, gravel, cobble	Mud, sand, gravel, cobble	Mud, sand, gravel, cobble	Mud, sand, gravel, cobble, rubble
Sediment Surface Consolidation	Hard packed	Hard packed	Hard packed	Hard packed	Hard packed	Hard packed
Gas Bubbles	None	None	None	None	None	None
Estimation of *Beggiatoa*-like Species	0%	<5%	0%	0%	<5%	0%
Estimation of OPC Coverage	0%	0%	0%	0%	0%	0%
Barrenness due to Aquaculture	None	None	None	None	None	None
Presence of Feed	None	None	None	None	None	None
Presence of Feces	None	None	None	None	None	None
Macrofauna	*Flustra*, hermit crab, rock crab, lobster	Hermit crab, *Flustra*, whelk, rock crab, scallop shells, finger sponge	Hermit crab, whelk, *Flustra*	*Flustra*, scallop shells, hermit crab	Scallop shells, *Flustra*, hermit crab	*Flustra*, hermit crab, whelk, scallop shells
Macroflora % Coverage	Mixed Rhodophyta (<5%)	*Fucus* (<5%)	*Fucus* (<5%), mixed Rhodophyta (<5%)	None	*Fucus* (<5%), mixed Rhodophyta (<5%)	Mixed Rhodophyta (<5%), *Fucus* (<5%)
Presence of Gear on Bottom	None	None	None	None	None	None
Detritus & Fouling	Mussel shells (rare); detritus (some)	Detritus (rare)	Mussel shells (rare); detritus (rare)	Detritus (rare)	Detritus (rare)	Mussel shells (rare), Detritus (rare)
Shell Debris	Some	Some	Some	Some	Some	Some
Notes						

Table 20. VB7 Transect Benthic Log

Station ID: VB7	0m	10m	20m	30m	40m	50m
Location (NAD 83)	N44 40.112 W65 43.267	N44 40.115 W65 43.271	N44 40.121 W65 43.277	N44 40.127 W65 43.277	N44 40.130 W65 43.280	N44 40.139 W65 43.284
Depth (m)	20	18	17.1	16	15.5	14.5
Time	11:54	12:45	12:54	12:58	13:02	13:07
Approximate Sediment Thickness (cm)	0.5	0.5	0.5	0.5	0.5	0.5
Sediment Colour	Brown	Brown	Brown	Brown	Brown	Brown
Sediment Consistency	Mud, sand, gravel, cobble, boulder	Mud, sand, gravel, cobble, rubble	Mud, gravel, cobble, boulder	Mud, gravel, cobble, boulder	Mud, gravel, cobble	Mud, gravel cobble
Sediment Surface Consolidation	Hard packed	Hard packed	Hard packed	Hard packed	Hard packed	Hard packed
Gas Bubbles	None	None	None	None	None	None
Estimation of *Beggiatoa*-like Species	0%	<5%	5%	0%	<5%	<5%
Estimation of OPC Coverage	0%	0%	0%	0%	0%	0%
Barrenness due to Aquaculture	None	None	None	None	None	None
Presence of Feed	Prevalent	Prevalent	None	None	None	None
Presence of Feces	None	None	None	None	None	None
Macrofauna	Blood star, green crab, *Flustra*, mussels, hermit crab, rock crab, scallop shells	*Flustra*, rock crab, scallop shells, mussels, hermit crab	*Flustra*, northern sea star, whelk, mussels, scallop shells, sea urchin, rock crab, hermit crab	*Flustra*, scallop shels, hermit crab	Hermit crab, *Flustra*, scallop shells, mussels	Hermit crab, *Flustra*, mussels, scallop shells, whelk
Macroflora % Coverage	Mixed Rhodophyta (<5%)	Mixed Rhodophyta (<5%), *Fucus* (<5%)	Mixed Rhodophyta (<5%), *Fucus* (<5%), kelp (<5%)	Mixed Rhodophyta (<5%)	Mixed Rhodophyta (<5%), sea lettuce (<5%)	Mixed Rhodophyta (<5%)
Presence of Gear on Bottom	None	None	None	None	None	None
Detritus & Fouling	Mussel shells (some); detritus (some)	Mussel shells (prevalent); detritus (rare)	Mussel shells (prevalent); detritus (rare)	Mussel shells (rare); detritus (rare)	Mussel shells (rare); detritus (rare)	Mussel shells (rare), detritus (rare
Shell Debris	Some	Some				
Notes						

Table 21. ANB Reference Transect Benthic Log

Station ID: ANB-REF Transect	100m	150m	200m	250m	300m
Location (NAD 83)	N44 40.229 W65 42.881	N44 40.243 W65 42.845	N44 40.250 W65 42.805	N44 40.262 W65 42.778	N44 40.268 W65 42.739
Depth (m)	15.7	15.6	13.7	11.6	11.4
Time	14:42	14:47	14:51	14:55	15:00
Approximate Sediment Thickness (cm)	0.5	0.5	0.5	0	0
Sediment Colour	Brown	Brown	Brown	Brown	Brown
Sediment Consistency	Mud, sand, gravel, cobble	Mud, sand, gravel, cobble	Mud, sand, gravel, cobble	Mud, gravel, cobble, rubble	Mud, gravel, cobble
Sediment Surface Consolidation	Hard packed	Hard packed	Hard packed	Hard packed	Hard packed
Gas Bubbles	None	None	None	None	None
Estimation of *Beggiatoa* -like Species	0%	0%	0%	0%	0%
Estimation of OPC Coverage	0%	0%	0%	0%	0%
Barrenness due to Aquaculture	None	None	None	None	None
Presence of Feed	None	None	None	None	None
Presence of Feces	None	None	None	None	None
Macrofauna	Hermit crab (3), scallop shells, *Flustra,* rock crab	Hermit crab, scallop shells, macrofaunal burrows	Unidentifiable fish, rock crab, *Flustra* , scallop shells, hermit crab	*Flustra* , scallop shells, *Urticina* anemone	*Flustra* , scallop shells, whelk, blood star, rock crab, hermit crab
Macroflora % Coverage	Mixed Rhodophyta (<5%)	Mixed Rhodophyta (<5%), kelp (<5%)	Mixed Rhodophyta (<5%)	Mixed Rhodophyta (<5%)	Mixed Rhodophyta (<5%)
Presence of Gear on Bottom	None	None	None	None	None
Detritus & Fouling	Detritus (some)	Detritus (some)	Detritus (rare)	Mussel shells (rare), detritus (rare)	Mussel shells (rare), detritus (rare)
Shell Debris	Some	Some	Some	Some	Prevalent
Notes					

Table 22. 2019 redox and sulphide results for baseline sampling from site #1040

Site #1040 – Victoria Beach

Sample Collection: May 28, 2019 8:02 – 16:43
Sample Analysis: Redox: May 29, 2019 11:02 - 11:13
Sulphides: May 29, 2019 11:06 - 11:15

Sample I.D.		Core Sample Temp	Redox	Redox	Sulphide	
Station	ID #	°C	mV	mVNHE	µM	mV
ANB-51	1	NS	NS	NS	NS	NS
	2	NS	NS	NS	NS	NS
	3	NS	NS	NS	NS	NS
Means		NS	NS	**NS**	**NS**	NS
ANB-REF	1	4.6	237.4	456.8	0	-531.0
	2	NS	NS	NS	NS	NS
	3	NS	NS	NS	NS	NS
Means		4.6	237.4	**456.8**	**0**	-531.0
VB1	1	NS	NS	NS	NS	NS
	2	NS	NS	NS	NS	NS
	3	NS	NS	NS	NS	NS
		NS	NS	**NS**	**NS**	NS
VB2	1	NS	NS	NS	NS	NS
	2	NS	NS	NS	NS	NS
	3	NS	NS	NS	NS	NS
Means		NS	NS	**NS**	**NS**	NS
VB3	1	NS	NS	NS	NS	NS
	2	NS	NS	NS	NS	NS
	3	NS	NS	NS	NS	NS
Means		NS	NS	**NS**	**NS**	NS
VB4	1	9.1	240.6	455.5	0	-664.5
	2	NS	NS	NS	NS	NS
	3	NS	NS	NS	NS	NS
Means		9.1	240.6	**455.5**	**0**	-664.5
VB5	1	NS	NS	NS	NS	NS
	2	NS	NS	NS	NS	NS
	3	NS	NS	NS	NS	NS
Means		NS	NS	**NS**	**NS**	NS
VB6	1	4.8	140.5	359.7	2	-802.0
	2	NS	NS	NS	NS	NS
	3	NS	NS	NS	NS	NS
Means		4.8	140.5	**359.7**	**2**	-802.0
VB7	1	NS	NS	NS	NS	NS
	2	NS	NS	NS	NS	NS
	3	NS	NS	NS	NS	NS
Means		NS	NS	**NS**	**NS**	NS

Redox Test Solution
Prior to analysis: 222.3 mV @ 25°C
Post analysis: 222.7 mV @ 25°C

Sulphide Probe Calibration:

Standard	mV
100	-856.8
500	-878.5
1000	-887.1
5000	-907.0
10000	-914.6

Sulphide Probe Calibration Temperature: 22.3°C

Sample met all grab quality criteria
Sample did not meet all quality criteria
Reference stations

Figure 4. Graph of mean redox and sulphide values for baseline sampling at site #1040

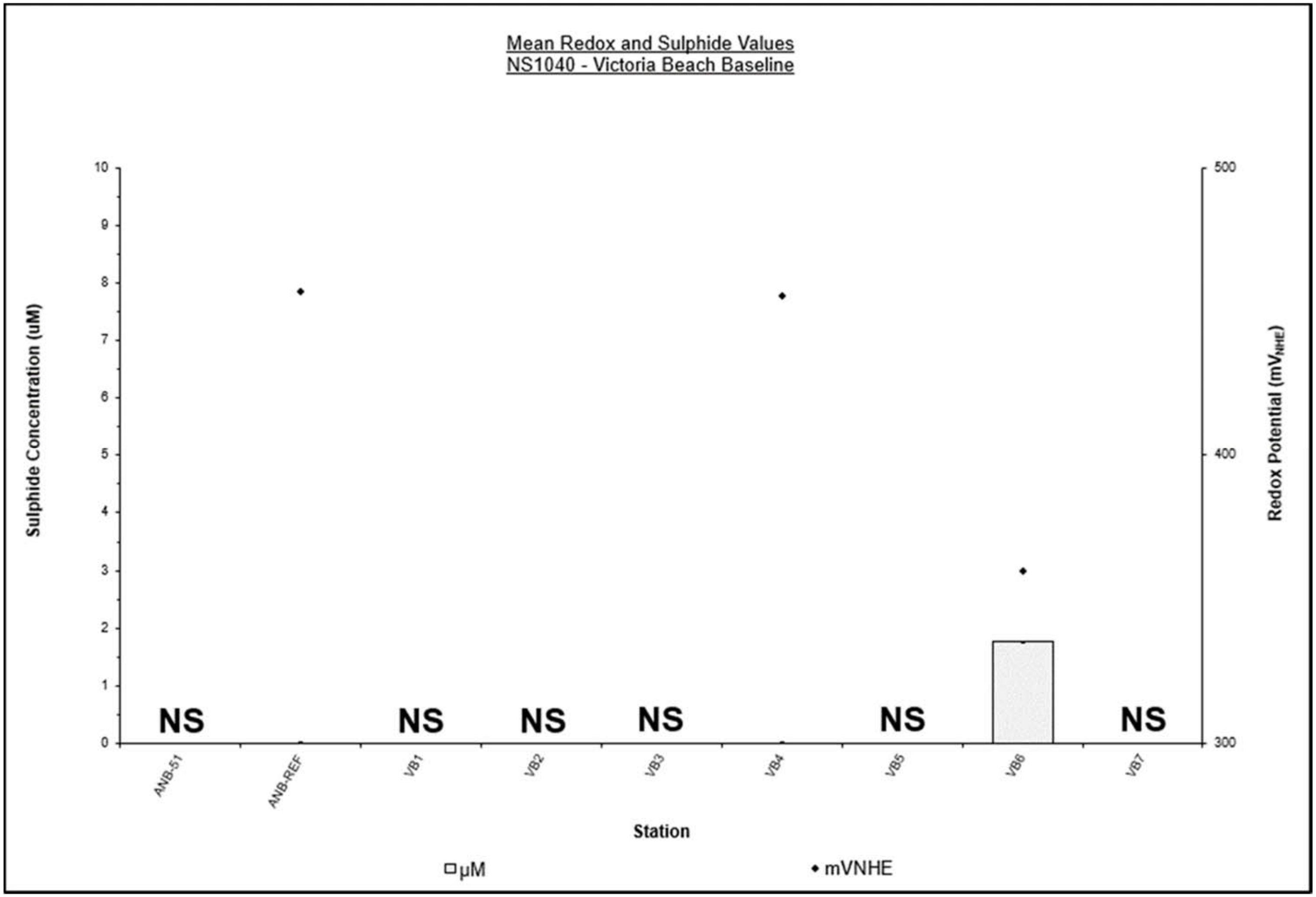


Table 23. 2019 porosity and percent organic matter results for baseline sampling from site #1040

Station	Sample #	Porosity Value (%)	% Organic Matter
ANB-51	1	NS	NS
ANB-51	2	NS	NS
ANB-51	3	NS	NS
ANB-REF	1	22.36	1.56
ANB-REF	2	NS	NS
ANB-REF	3	NS	NS
VB1	1	NS	NS
VB1	2	NS	NS
VB1	3	NS	NS
VB2	1	NS	NS
VB2	2	NS	NS
VB2	3	NS	NS
VB3	1	NS	NS
VB3	2	NS	NS
VB3	3	NS	NS
VB4	1	22.14	1.55
VB4	2	NS	NS
VB4	3	NS	NS
VB5	1	NS	NS
VB5	2	NS	NS
VB5	3	NS	NS
VB6	1	21.86	1.42
VB6	2	NS	NS
VB6	3	NS	NS
VB7	1	NS	NS
VB7	2	NS	NS
VB7	3	NS	NS

Notes: samples in turquoise are from reference stations

3.7 Benthic Observations and Analysis

Review of the video footage and grab observations collected from the proposed Victoria Beach #1040 lease area in Annapolis Basin revealed prevalent waste feed at the site center (VB7). The substrate beneath site #1040 consisted mainly of hard-packed mud, sand, gravel, and cobble with some boulders. Shell debris was common. Grain-size analysis results are presented in Appendix E and further support these observations.

Flora and fauna observed in the video footage and in grab samples included *Flustra*, hermit crabs, rock crabs, whelks, anemones, barnacles, limpets, blood stars, a green crab, snails, lobster, finger sponge, *Fucus,* oyster thief, sea colander, kelp, and mixed Rhodophyta. Significant quantities of *Beggiatoa*-like bacteria were observed at one video station (VB7-20m). Shell debris including mussel and scallop shells were common.

Since site #1040 is characterized by predominantly coarser sediment types. None of the stations sampled allowed for a full complement of sediment samples to be collected. Video transects were conducted at all stations. Only 3 individual sampling attempts resulted in an acceptable sample for analysis. Analysis of the sulphide concentration and redox potential of the sediments from these grabs revealed oxic conditions for each sample. The highest sulphide concentration obtained during this baseline assessment was 2 µM at the station located at southeast corner (VB6) of the lease.

4.0 BATHYMETRIC PROFILING

Bathymetric profiling of the proposed lease area was not performed by SIMCorp during the baseline assessment. Depth profiles provided were created using Mapsource software and hydrographic charts from BlueChart Americas v9.5. The data gathered from charts was compiled and a three-dimensional surface map (Fig. 6) and a two-dimensional contour diagram (Fig. 5) were produced by interpolation. The maps illustrate the basic bathymetry of the scanned area and can serve to aid in the planning and placement of marine farm infrastructure such as grid anchors and other moorings.

Under the *Standards for Hydrographic Surveys* (CHS, 2013), accuracy requirements vary by survey works and area and are categorized into Orders. Order 1b is described as "*Areas shallower than 100 metres where under-keel clearance is not considered to be an issue for the type of surface shipping expected to transit the area.*" and further defined as a survey which only requires a general description of the seafloor which "*… is sufficient to ensure there are no obstructions on the seafloor that will endanger the type of vessel expected to transit or work the area.*"

Figure 5. Interpolated 2-D bathymetric profile of site #1040 at Victoria Beach

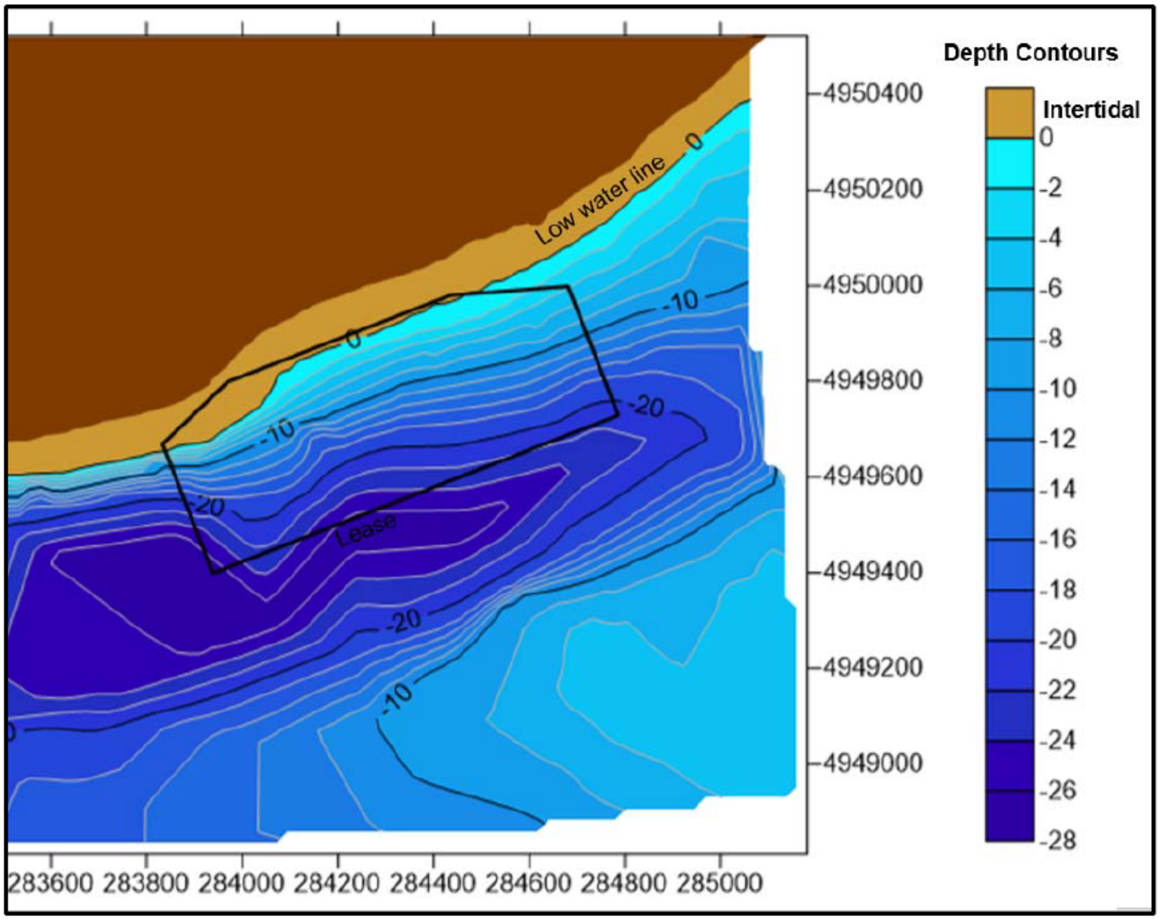
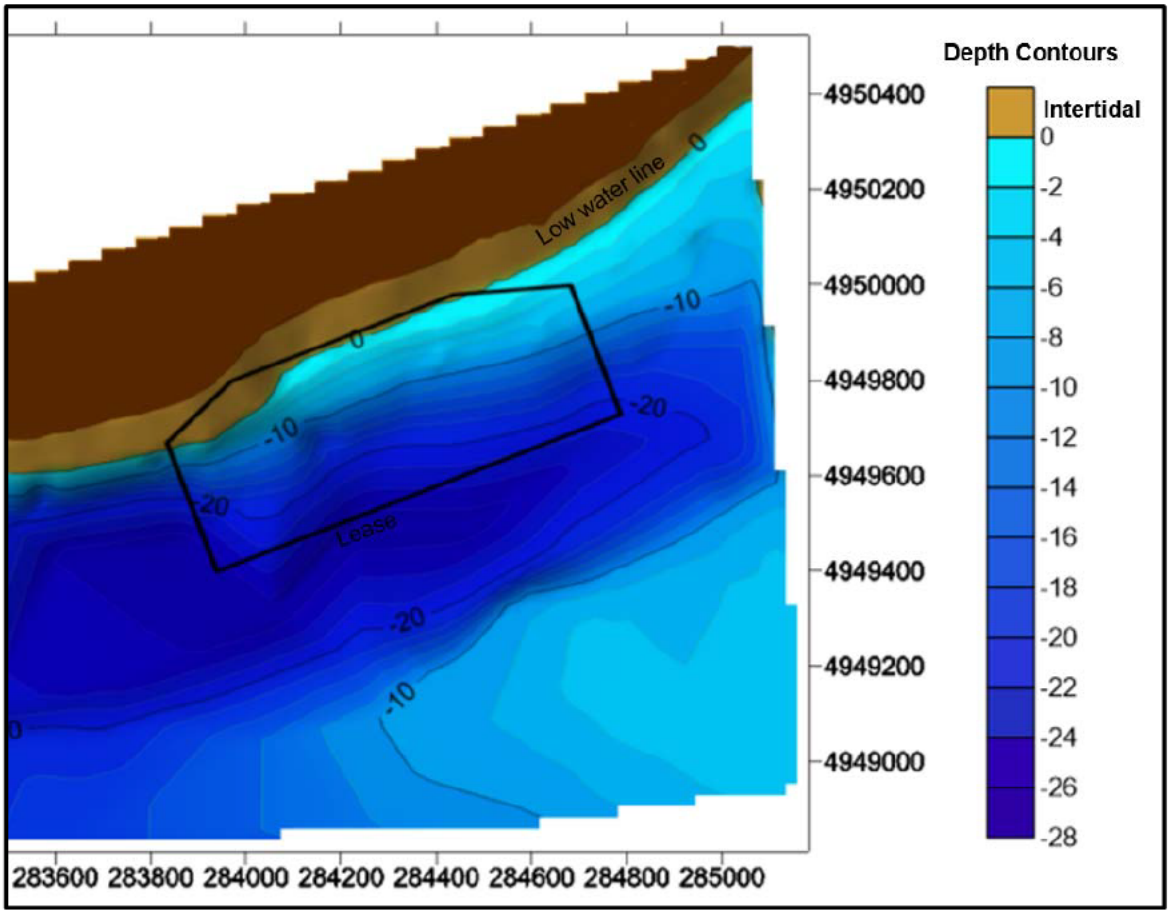


Figure 6. Interpolated 3-D bathymetric profile of site #1040 at Victoria Beach

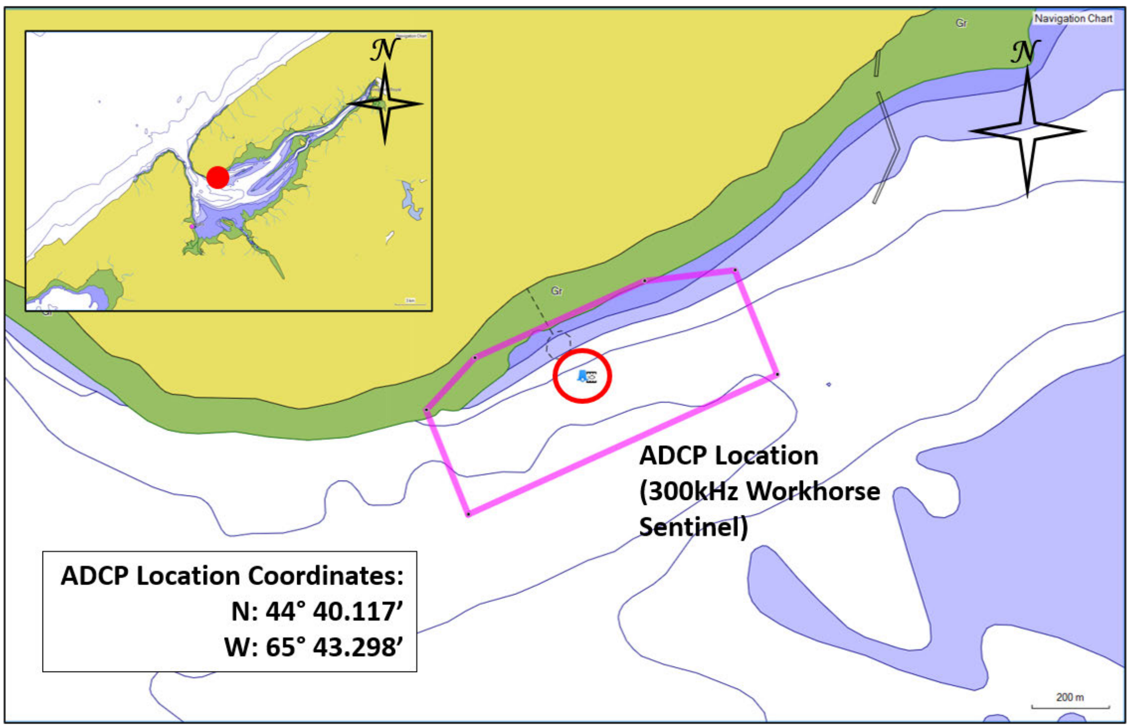


5.0 ACOUSTIC DOPPLER CURRENT PROFILER

5.1 Deployment Location

Measurements of the current speed and direction were collected at Victoria Beach (#1040) using a 300-kHz Teledyne RDI Workhorse Sentinel Acoustic Doppler Current Profiler (ADCP) unit deployed by SIMCorp (Fig. 7). The meter was deployed in approximately 24 m of water at coordinates N44° 40' 07.0" W65° 43' 17.9", which is approximately 40 m away from the site center.

Figure 7. Location of ADCP Deployment at Victoria Beach #1040, Annapolis Basin, NS



5.2 Data Collection

Current meter data is included to satisfy, in part, baseline survey requirements as per Section 8(1)(a) of the federal Department of Fisheries and Oceans Canada (DFO) *Aquaculture Activities Regulations* (DFO Canada, 2018a) by following *I. Survey for Baseline Information for New Sites and Expansion of Existing Sites* to satisfy conditions under "Predicted Contours" in the AAR Monitoring Standard (DFO Canada, 2018b).

The ADCP was deployed for a period of 39 days between September 8, 2011 and October 17, 2011.

5.3 Deployment Setup and Procedures

Calibration was conducted away from any ferro-magnetic materials or structures and immediately prior to the deployment, as per the manufacturer's instructions (Teledyne RD Instruments, 2007). Following the calibration, the ADCP unit was configured to record the current speed and direction of the water column in 1-m bins throughout the water column, averaging its recordings every fifteen (15) minutes (i.e., 200 pings each 1.5 seconds over 5 minutes and averaged every 15 minutes).

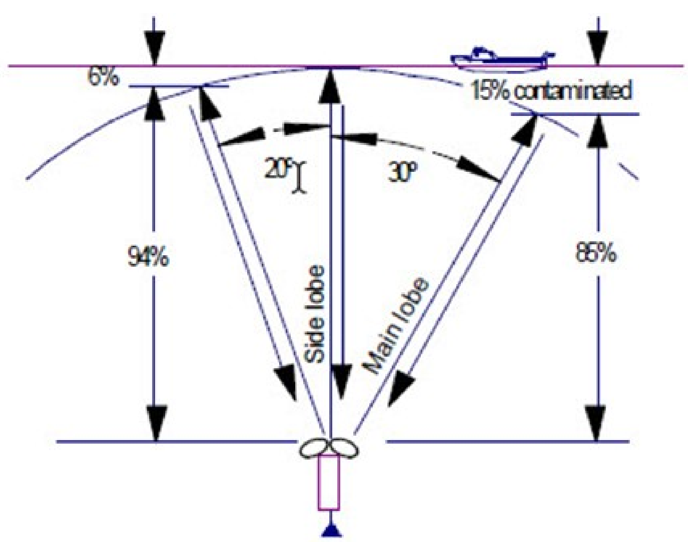
Once the unit was recovered, the data was downloaded, analyzed, and processed by SIMCorp Marine Environmental Biologist [redacted]. Graphs and figures illustrating the frequency distribution of both current speed and direction are presented in Appendix I and raw current speed and direction data is included in the supplementary material submitted with this report (*Raw Victoria Beach.xlsx*).

5.4 Data Verification & Analyses

5.5.1 Side-lobe Contamination

According to the ADCP Principles of Operation: A Practical Primer (Teledyne RD Instruments, 2011), the depth bins near the surface can be subject to side-lobe contamination (Fig. 8), and thus current speed and direction data recorded near the surface may not be reliable. The echo from the water's surface is much stronger than regular echoes in the water column and can contaminate the data collected. Typically, for a 20° beam angle, the data from the last 6% of the depth bins (closest to the surface) are discarded based on the Rmax equation. As a result, the data were trimmed accordingly.

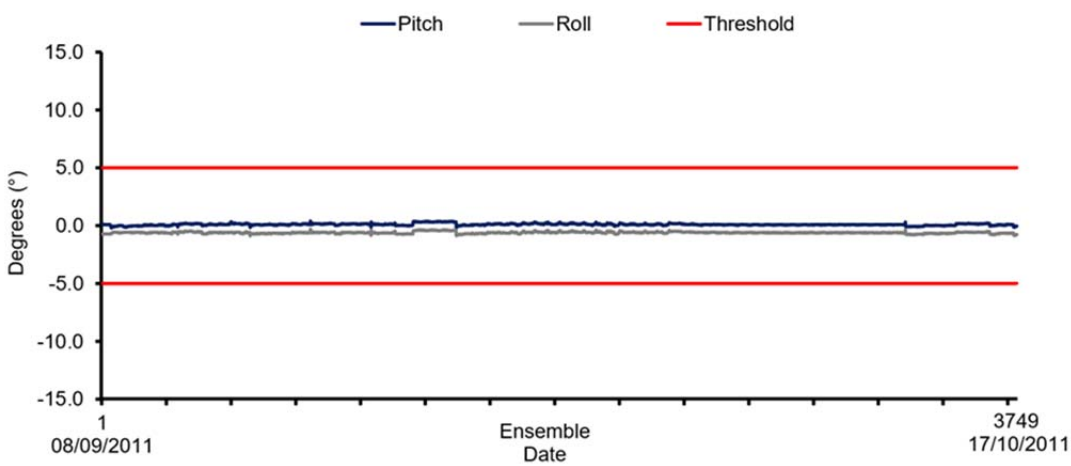
Figure 8. Side-lobe contamination of the Teledyne RDI Workhorse Sentinel ADCP



5.5.2 Pitch and Roll QA/QC

Although the positions of the ADCP beams are specifically configured (i.e., Janus configuration) to limit errors associated with the natural tilting of the unit during data collection (Symonds, 2006), part of the verification process for quality assurance and quality control purposes (QA/QC) is to ensure the instrument was not tipped at excessive angles for long periods of time. Therefore, pitch and roll measured by the ADCP were plotted for the entire deployment period (Fig. 9) to assess the relative positioning of the beams in comparison to the surface. Pitch and roll of 0 ± 5 degrees are generally considered optimal (pers. comm. with Teledyne personnel). Any exceedances are noted and further examined.

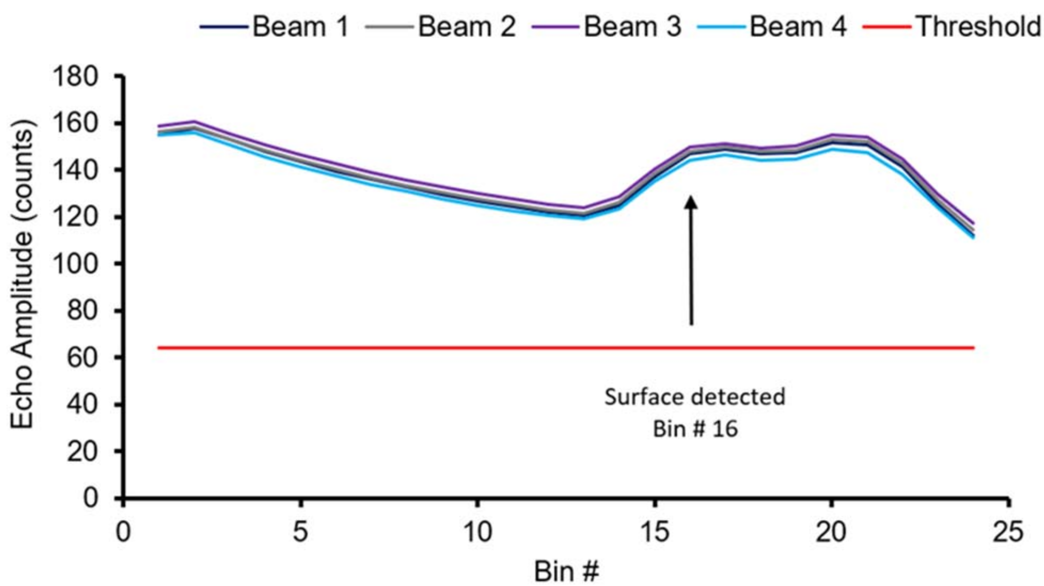
Figure 9. Pitch and roll (degrees) of the Teledyne RDI Workhorse Sentinel ADCP at Victoria Beach #1040, Annapolis Basin, NS



5.5.3 Echo Intensity QA/QC

Raw data were also verified with a beam check by plotting the average echo intensity for each depth bin for the four beams (Fig. 10). This QA/QC method of trimming data evaluates the entire profile and identifies the range of valid data. The presence of a large peak generally indicates interference in the beams' echo intensity, such as a response to the surface, and likely represents the side-lobe contamination zone. Data near and past the peak should be discarded. The previously trimmed data from the Rmax equation were compared to the beams' echo intensity to ensure the area discarded corresponded with the bins where the peak was observed. This ensures that data deemed unreliable due to side-lobe contamination or interference from obstructions are omitted from further analyses.

Figure 10. Beam check of the Teledyne RDI Workhorse Sentinel ADCP at Victoria Beach #1040, Annapolis Basin, NS



5.5.4 Error Velocity and Correlation Magnitude QA/QC

The following error-velocity and correlation-magnitude QA/QC processes evaluate the data based on individual readings. Symonds (2006) developed a QA/QC model which identifies parameter thresholds based on the configuration setup of the ADCP. According to Symonds (2006), the error-velocity evaluation "*… will ensure that the flow being measured is homogeneous and that all 4 beams are measuring a consistent water flow.*" while the correlation magnitude "*… will ensure that the highest quality of velocity data is being used.*"

Once the parameter thresholds for the error velocity and correlation magnitude were quantified by the QA/QC model, the data previously trimmed from the Rmax equation were then trimmed with the error velocity threshold followed by the correlation magnitude threshold. This ensures that extreme outliers are omitted from further analyses.

5.5.5 Trimmed Speed and Direction Data

Once the data were trimmed based on the previously described QA/QC processes, the data were compiled into frequency distributions as current roses and histograms for current direction and speed, respectively, for every recorded depth (each 0.5-m depth bin) containing reliable data (Appendix I). The depth-averaged frequency distribution of current direction and speed is also presented in Figure 11, and a summary of the data is also presented in Figure 12 and Table 24. Both trimmed and raw data are presented in the supplementary material included with this report (Trimmed Victoria Beach.xlsx and Raw Victoria Beach.xlsx, respectively).

5.6 Current Speed and Direction Results

The petals on the current rose diagrams indicate the direction in which the current was flowing (i.e., if the broad ends of the petals point north, then the current was flowing to the north). Throughout the water column, the most common flow was in a westward direction, with categorical modes of 265 to 275 degrees (Table 24). A weaker, less-frequent reciprocal current flowed toward the east.

The overall, average, current speed throughout the entire water column was 31.2 cm/s (Fig. 11). Mean current speeds were 23.7 cm/s near bottom and 41.0 cm/s at the surface. The most frequently observed speed class, throughout the water column, was 24.0 - 32.0 cm/s. Current velocities below 7.0 cm/s were observed 6.8% of the time and velocities above 56.0 cm/s were observed 8.8% of the time, with the highest maximum recorded current speeds of 109.3 cm/s at 2 m below the surface (Appendix I, Table 24). Average and maximum current velocities recorded in each depth cell are illustrated in Figure 12. Figure 13 gives a view of the overall current regime of the deployment location.

Water currents are one of many essential factors to consider during the site-selection process as it directly and indirectly relates to the carrying and assimilative capacities of the aquaculture facility and the surrounding environment (Benetti et al., 2010). Beveridge (1987) reported that current speeds between 10 cm/s and 60 cm/s are best for marine fish farming, as indicated in Table 25; and Pennell (1992) reported that near surface currents of less than 2 cm/s would be considered poor. As such, the average current dynamics at Victoria Beach class the site as an ideal energy system, with few measurements at the low or high ranges (Table 25).

Figure 11. Depth-averaged frequency distribution of current speed and direction at Victoria Beach #1040, Annapolis Basin, NS

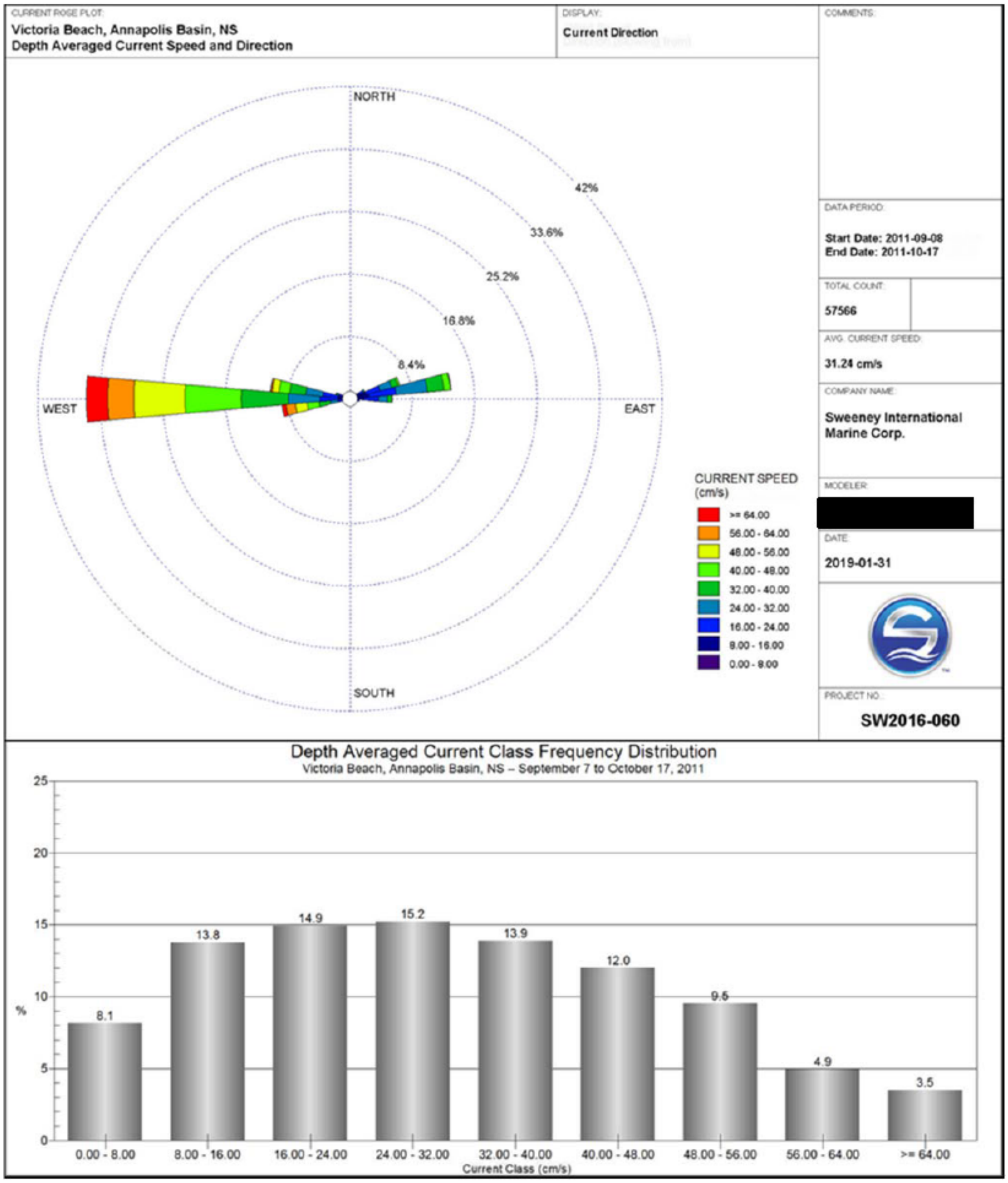


Table 24. Summary of current velocities and directions recorded in each depth cell throughout the water column at Victoria Beach #1040, Annapolis Basin, NS

Distance from Bottom (m)	Distance from Surface (m)	Speed Most Frequent (cm/s)	Minimum (cm/s)	Average (cm/s)	Maximum (cm/s)	< 7.0 cm/s (%)	< 35.0 cm/s (%)	> 56.0 cm/s (%)	Direction Highest Frequency (°)
4	**17**	16.0 - 24.0	0.1	23.7	74.2	8.7	80.9	1.6	265-275
5	**16**	24.0 - 32.0	0.2	25.3	80.6	6.2	75.9	2.4	265-275
6	**15**	24.0 - 32.0	0.5	26.6	85.2	8.6	71.7	3.0	265-275
7	**14**	24.0 - 32.0	0.5	27.7	87.6	7.7	68.5	3.9	265-275
8	**13**	24.0 - 32.0	0.6	28.7	88.2	7.1	65.8	4.6	265-275
9	**12**	24.0 - 32.0	0.0	29.6	89.0	6.4	63.9	5.3	265-275
10	**11**	24.0 - 32.0	0.4	30.3	93.5	6.6	61.9	6.0	265-275
11	**10**	24.0 - 32.0	0.4	31.0	94.0	6.2	59.5	6.8	265-275
12	**9**	32.0 - 40.0	0.5	31.7	96.0	6.2	58.0	7.7	265-275
13	**8**	32.0 - 40.0	0.5	32.3	99.4	6.7	56.3	8.6	265-275
14	**7**	32.0 - 40.0	0.1	33.0	100.3	6.5	54.6	9.9	265-275
15	**6**	40.0 - 48.0	0.4	33.9	103.4	6.4	53.0	11.8	265-275
16	**5**	48.0 - 56.0	0.4	34.8	103.7	6.2	50.9	13.7	265-275
17	**4**	48.0 - 56.0	0.3	36.4	105.0	6.0	47.8	16.8	265-275
18	**3**	48.0 - 56.0	0.1	39.4	105.7	2.2	41.4	22.0	265-275
19	**2**	48.0 - 56.0	0.4	41.0	109.3	5.2	38.9	26.8	265-275
Depth Averaged		**24.0 - 32.0**	**0.0**	**31.2**	**109.3**	**6.8**	**60.1**	**8.8**	**265-275**

Figure 12. Average and maximum current velocities recorded in each depth cell throughout the water column at Victoria Beach #1040, Annapolis Basin, NS

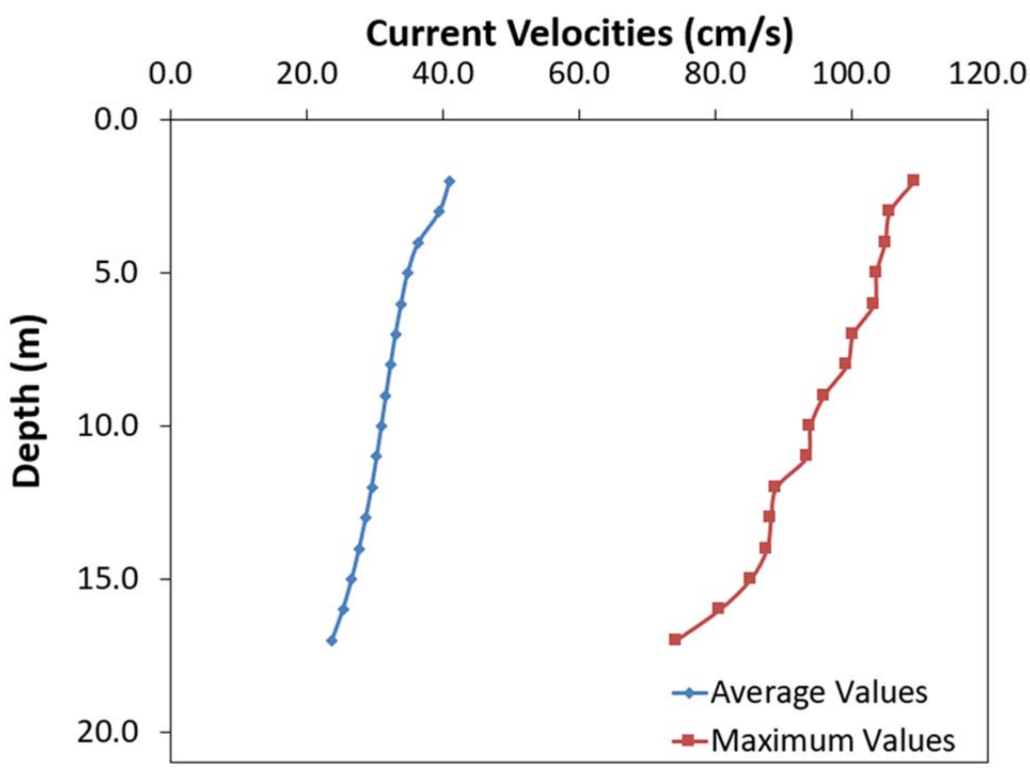


Figure 13. Summary of depth-averaged current speeds and directions at Victoria Beach #1040, Annapolis Basin, NS

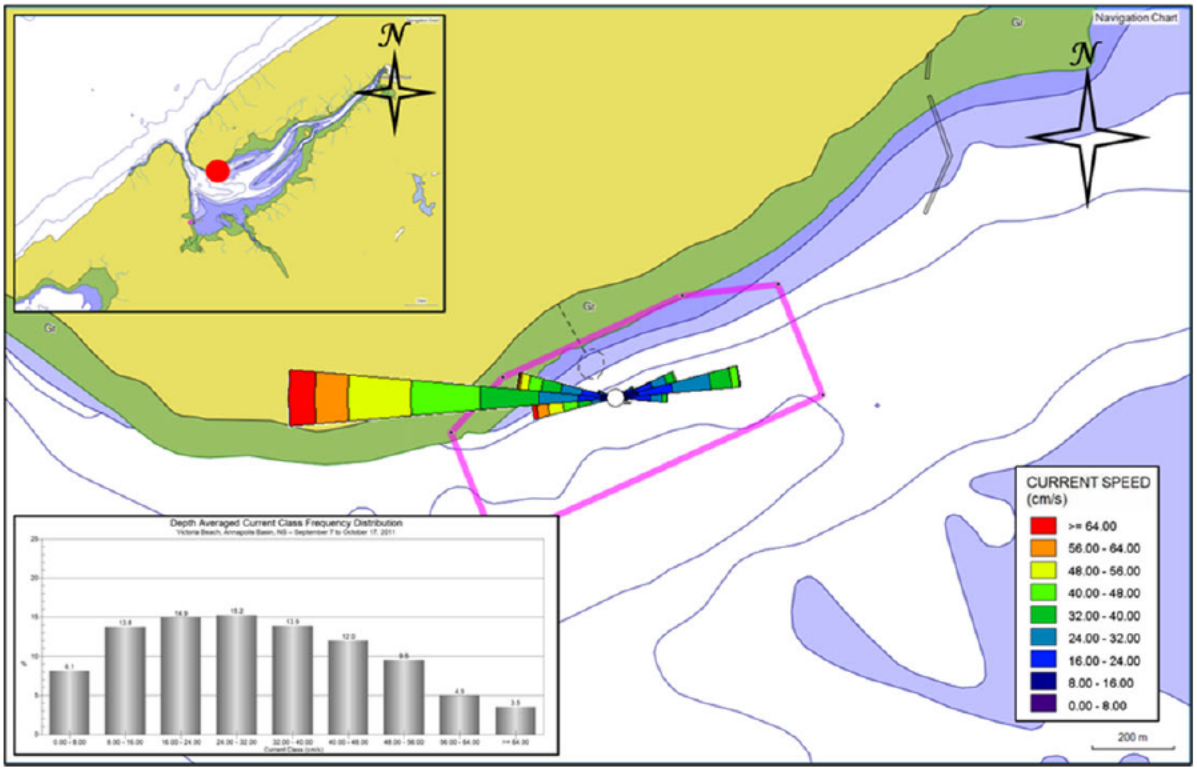


Table 25. Current speed ranges and designations for salmon farming

Rating	Current Speed (cm/s)
Minimum	5.0
Low	< 10.0
Ideal Range	10.0 – 35.0
Acceptable Range	10.0 – 60.0
High	> 60.0

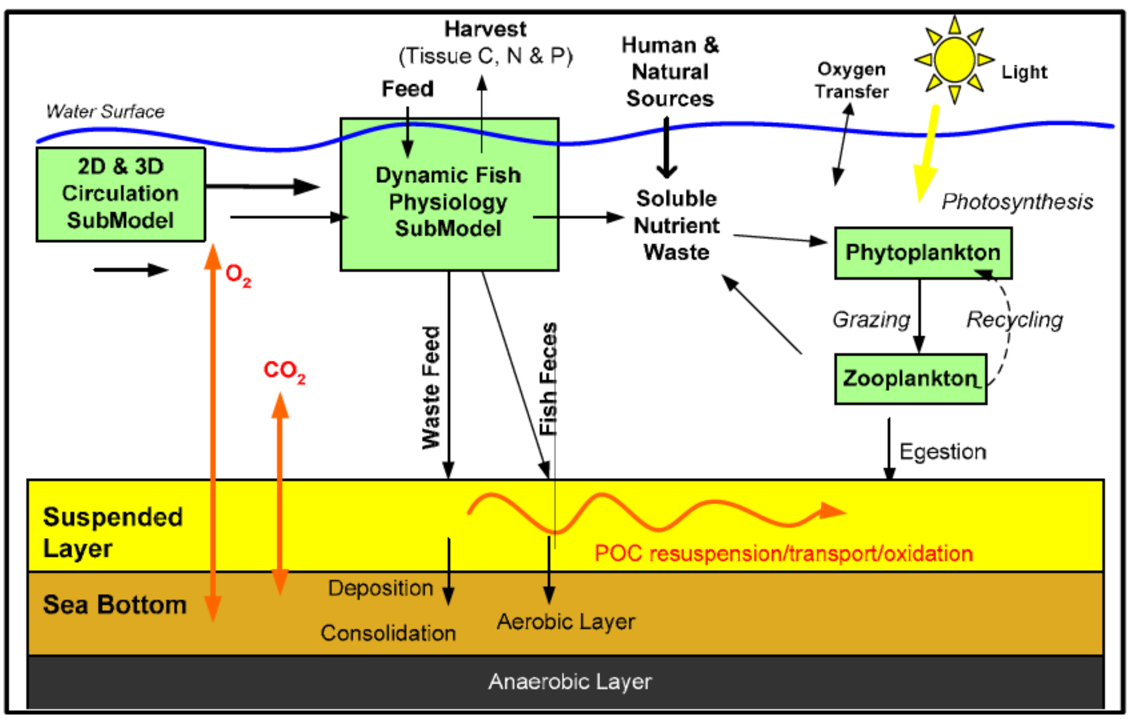
6.0 DEPOSITIONAL MODELING

6.1 Introduction

AquaModel is a computational tool for planning and evaluating proposed aquaculture sites, acquiring permits, and assessing investment risks and opportunities. It runs on a standard PC and provides a simple interface to enter environmental and operational information. Graphical outputs map the distribution over time of key parameters including water temperature, oxygen, particulate-organic and dissolved-nutrient wastes, algal and plankton effects, and dozens of other environmental and fish cultural/management parameters. AquaModel is also a full-fledged geographic information system (GIS), fully compatible with leading, stand-alone GIS systems.

AquaModel is a true dynamic model, not a look-up spreadsheet-based model but one where the fish eat, grow, swim, and excrete at rates based on the well-established science for Atlantic Salmon (and 11 other species of fish) as shown in the figure below. The developers of AquaModel include scientists with decades of fish-farm experience involving sediment-effects monitoring and research as well as fish physiology and nutrient effects on algae and microalgae.

Figure 14. Schematic of the dynamic processes in AquaModel



AquaModel has been used numerous times in Atlantic Canada by SIMCorp and the developers of the model, and so it has a custom, Atlantic-salmon submodel designed and validated for both accurate growth and food conversion ratio results in Atlantic Canada.

Resuspension in AquaModel does not affect the modeling of the rate of deposition of total organic carbon (TOC). Resuspension occurs after deposition and is used in the calculation of the estimated TOC that accumulates in the sediment, a parameter not required under the AARs, and is thus not applicable to this report.

Further information on AquaModel can be found at http://www.aquamodel.net/. For information on model validation, see http://www.aquamodel.net/Validation.html.

6.2 Model Inputs and Assumptions

6.2.1 Species

The 2-D mode was selected for analyzing the depositional rate at the Victoria Beach #1040 aquaculture site. The 2-D mode is used for analysis at an individual farm level whereas the 3-D mode is used for bay-wide scales and can include multiple farm inputs. The Atlantic-salmon submodel "AtlanticSalmonNS", designed and validated for both accurate growth and food conversion ratio results in Atlantic Canada, was selected.

6.2.2 Bathymetry

Bathymetry was entered as a simple text file with longitude, latitude, and depth arranged in x, y, z format (i.e., three columns of data). Detailed bathymetry is available in section 4 of this report. The shoreline was based on user-collected data using Google Earth.

6.2.3 Currents

Current meter data was input with a simple Excel file. ADCP data were collected from September 8, 2011 to October 17, 2011 in the Annapolis Basin in approximately 24 m of water (Fig. 7).

6.2.4 Events Files

For operational effects, an events Excel file (VictoriaEventsV1.xlsx) was compiled for inputs of estimated mortality and harvesting. Mortalities were based on a 10% loss throughout the production cycle. Beginning in late October of the second year of production, harvests were simulated. Approximately 10,000 fish were removed per harvest with 60 harvests events between October 31 and January 14.

Temperature and dissolved oxygen data from the Victoria Beach #1040 lease during operations were used to simulate a full year of environmental data for the model. The one year of data was extended to cover the entire simulated production period, which was from May 1, 2022 to January 31, 2024.

6.2.5 Pen Parameters

The cage centers were entered through the menu, and other simple factors such as fish size at introduction (i.e., 150 g) and stocking density (i.e., 0.6911 kg m^{-3}) were specified. Circular cages with a length and width (i.e., the square root of the cage area) of 28.21 m were entered. This is equivalent to a cage with a circumference of 100 m. Net depth was set to 9 m. The introductory fish weights and the initial densities were set based on estimates of proposed production.

6.2.6 Feed Parameters

Under the Operations tab, the optimal feed rate option was selected, and a waste feed rate (3%) was entered. The carbon fraction of the feed as a dry weight was set at 51.5% and the water fraction of the bulk feed was set at 5.5%. The fecal settling rate was set at 3 cm/s and the feed settling rate was set at 9 cm/s, based on best available literature.

6.2.7 Other Inputs

Under the Benthic menu tab of the model, the initial value of the TOC fraction of the seafloor was set to 0.0002 (fraction dry weight = 0.02%), which assumes a seafloor composition of patches of sand with rock. The particle deposition threshold was set to 6 cm/s (fecal) and 8 cm/s (pellet). The particle erosion threshold was set to 8 cm/s (fecal) and 12 cm/s (pellet) and the erosion factor to 1.0 g C m^{-2} d^{-1} (both fecal and pellet). Ambient TOC deposition was assumed to be 0.02 g C m^{-2} d^{-1}. The TOC deposition moving average was set to 1 day and the seston TOC oxidation rate/day at 0.02. All these factors were set based on prior experience with Atlantic Canada and other-location salmon farms including use of sensitivity analyses.

Under the Array menu tab, the plankton model was turned off, but the physiology and benthic models were enabled with the organic matter type set to TOC.

Under Drifter Processing Type, the no drifters option was selected.

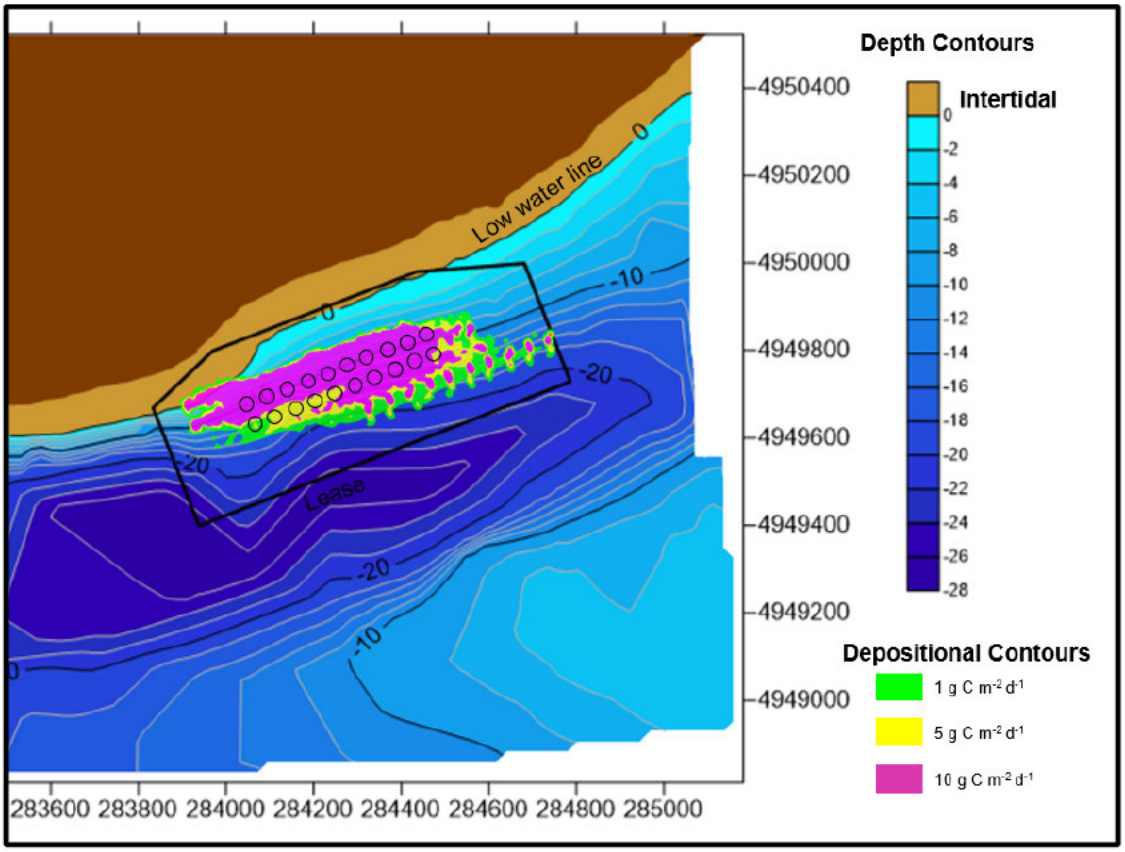
Under the Conditions menu tab, the ambient value of dissolved oxygen was set to 8.0 mg L^{-1} and the surface (mixed) layer depth was set to 40 m for both winter and summer. This depth is greater than the actual water depth, so assumes no stratification of the water column.

6.3 Model Output

For the purposes of the AAR, only contours generated to represent TOC deposition at the time of peak feeding are required.

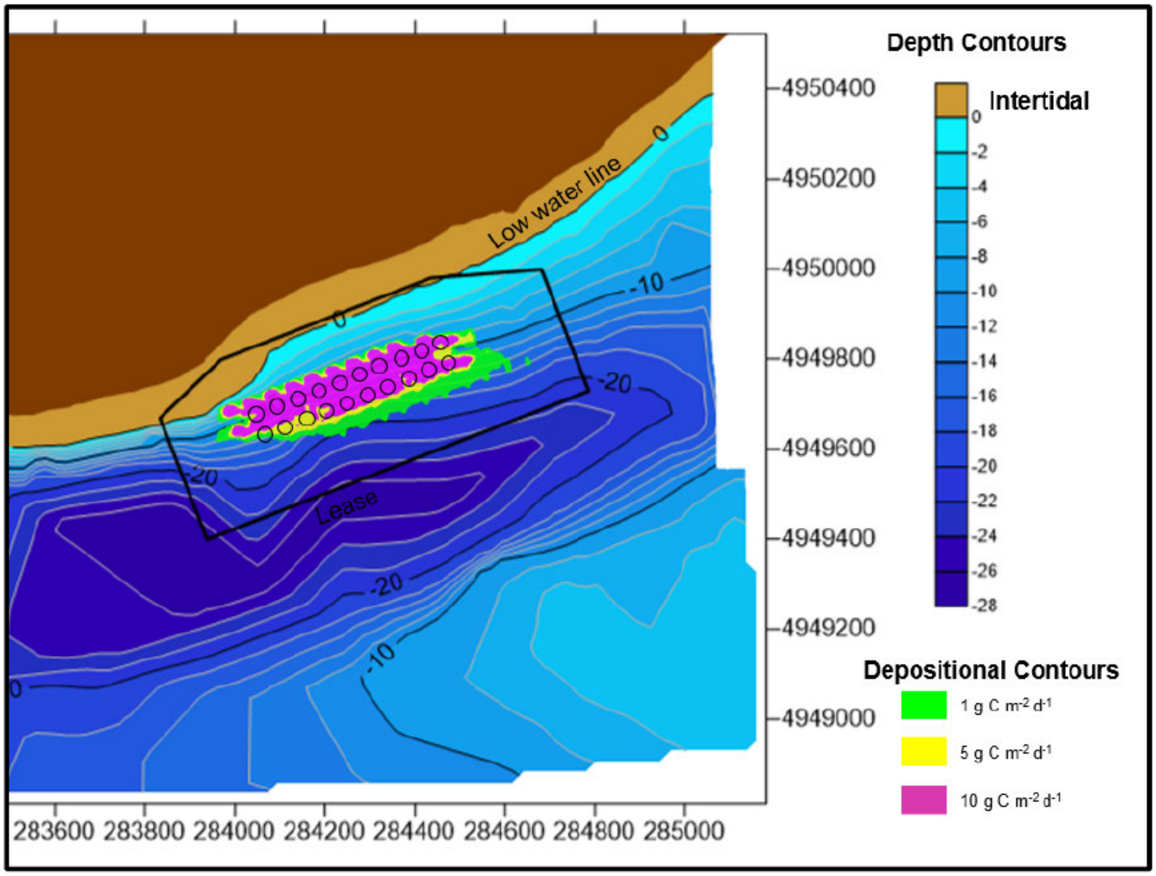
The model was run with a start date of May 1, 2022 and the first harvest occurring in October 2023. The date of highest feed use was calculated to occur in October of the second year of production (i.e., 2023). The map of the contours showing the predicted sediment TOC rate of deposition (1, 5, and 10 g C m^{-2} d^{-1}) was captured for this timestep and is included in Figure 15 below. The 1 g C m^{-2} d^{-1} contour falls directly under the cage array and extends towards the western and eastern boundaries of the lease in the direction of the dominant current. The model shows the contours to extend very slightly further east and beyond the lease boundary. Cage positions are represented by black circles.

Figure 15. Predicted TOC rate of deposition for October 16, 2023 (peak feeding)



September 23, 2022 was selected to represent the TOC deposition rate during a period of mean feed usage. A map of the depositional contours for this timestep is shown in Figure 16. The 1 g C m^{-2} d^{-1} contour falls directly under the cage array and extends slightly to the east and west in the direction of the dominant current. None of the depositional contours modeled extend outside of the lease boundary.

Figure 16. Predicted TOC rate of deposition for September 23, 2022 (time of mean feed usage)



6.4 AquaModel Settings

The screen shots shown in Appendix J illustrate the inputs and settings used to run the model for Nova Scotia aquaculture site #1040. The current meter, bathymetry, temperature / oxygen, and mortality / harvest data files are included as supplementary material to this report.

7.0 FISH AND FISH HABITAT SURVEY

7.1 Summary

A benthic, visual survey was undertaken to collect qualitative data of the physical and biological characteristics of fish and fish habitat within the Victoria Beach (#1040) lease. Following the AAR requirements, the presence and relative abundance of dominant substrate type and flora and fauna were documented within the vicinity of the lease to provide a qualitative evaluation of the physical and biological characteristics of fish and fish habitat.

Benthic field data to satisfy the fish and fish habitat component of the baseline assessment was carried out by SIMCorp Field Supervisor and Senior Marine Environmental Biologist [redacted], BSc, EP, Field Technician [redacted], and boat operator [redacted] on May 29, 2019. High tide was at 8:32 (7.0 m), and low tide was at 14:44 (1.9 m).

The fish and fish habitat survey carried out at the proposed Victoria Beach #1040 site revealed:

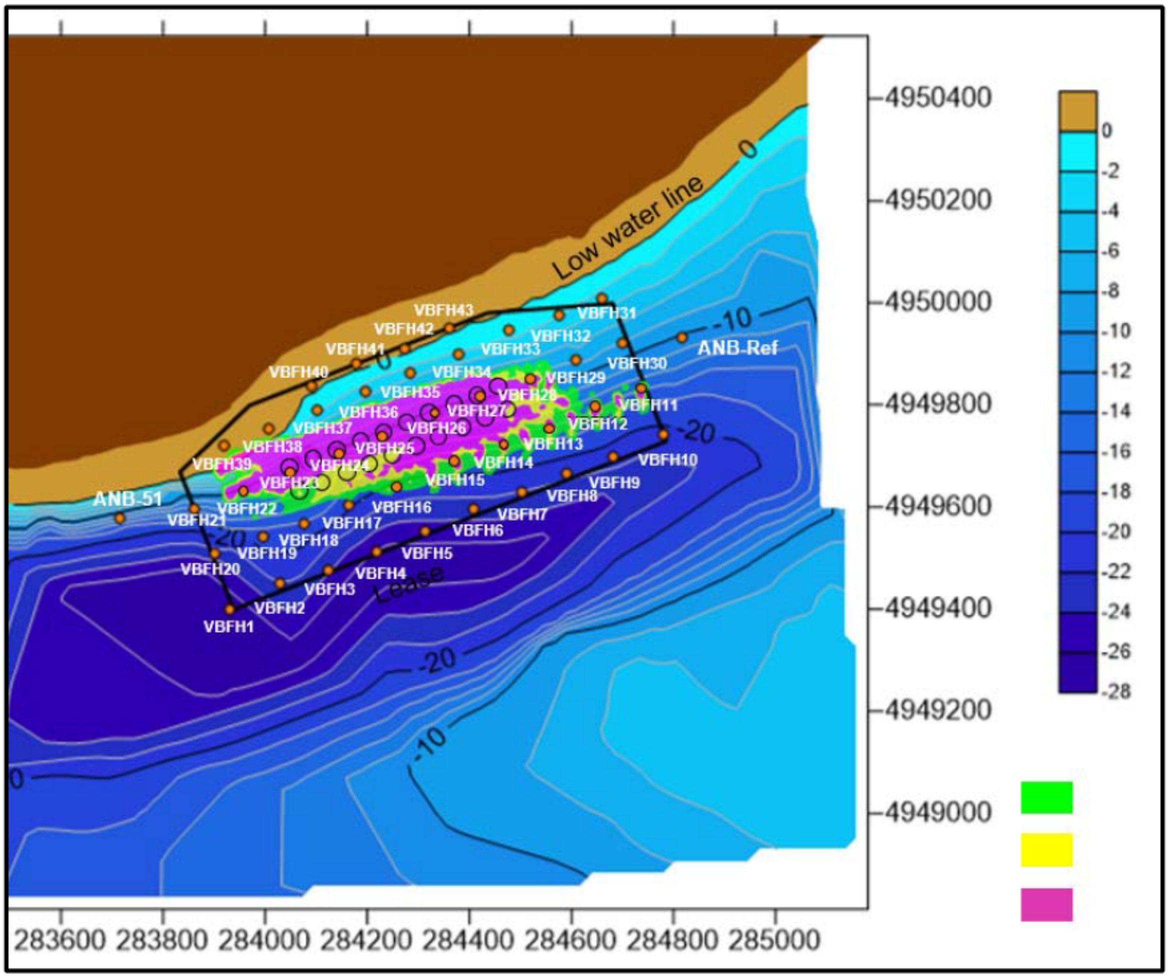
- Scallop shells and other shell debris were common
- *Flustra*
- Crustaceans
- No sensitive species were observed
- No species at risk were observed

7.2 Video Surveillance Methods

The fish and fish habitat survey was carried out by SIMCorp to collect underwater video footage at stations within the lease using a combination of a video camera and a VRM-2 video recorder by J.W. Fishers, with a GPS interface, which allowed coordinate positions to be overlaid onto the video. Benthic video sampling of the reference station occurred during the benthic substrate sampling on May 28, 2019

A total of forty-five (45) video stations, arranged in a grid pattern, were investigated for the purpose of the fish and fish habitat survey (Fig. 17). All stations, except reference stations, were spaced approximately 100 m apart across the entire proposed Victoria Beach (#1040) lease area and the 1 g C m^{-2} d^{-1} depositional contour. Stations were videoed for at least 2 minutes of bottom time. The video footage was reviewed and analyzed by SIMCorp, noting observations of substrate type, fauna, and flora at each station. Seafloor observations from the video stations were used to conduct the fish and fish habitat survey. Abundance estimates were recorded as number of individuals, percent coverage, or relative estimates, depending on the organism being assessed. Observations were compiled in pictorial form to produce a habitat map of the seafloor characteristics as required in the AAR for baseline surveys. Please refer to the habitat map located in Appendix K.

Figure 17. Victoria Beach video station locations surveyed on May 28, and May 29, 2019



7.3 Results

The seafloor of the proposed Victoria Beach lease area consisted mostly of mixed substrate types. Most of the area surveyed was characterized primarily by sand, mud, gravel, and cobble. A few stations also had boulders. Scallop shells and other shell debris were prevalent.

No distinguishable macroalgae beds were present other than one small, mixed Rhodophyta bed located between the northwest corners of the lease (VBFH39). Faunal species observed included sea stars, *Flustra*, hermit crabs, rock crabs, whelks, finger sponges, green sea urchins, and a lobster. *Beggiatoa*-like bacteria were observed in significant quantities at three (3) of the forty-five (45) stations surveyed. All stations were near the current cage grid.

Screen shots of the seafloor for observations at each station during the habitat survey of the Victoria Beach #1040 site are available in Appendix L. Table 26 provides a list of flora and fauna species (or higher taxonomic level) observed during the benthic survey. A more detailed and comprehensive species list over the entire survey area is available in Appendix M. Tables 27 and 28 include the substrate and benthic indicator observations from the baseline sampling stations as required in the AAR. Raw video footage has been provided to NSDFA with this report and is also available upon request.

Table 26. List of species (or higher taxonomic level) observed during the benthic survey of Victoria Beach

List of Species Observed		
Algae (Coralline)	Flounder	Sculpin
Algae (Encrusting)	*Flustra*	Sea Star (*Henricia*)
Algae (*Fucus*)	Green Crab	Sea Star (Northern)
Algae (Kelp)	Green Sea Urchin	Sponge (Encrusting)
Algae (Mixed Rhodophyta)	Hermit Crab	Sponge (Finger)
Algae (Oyster Thief)	Lobster	Sponge (Unidentifiable)
Algae (Sea Colander)	Mussel	Unidentifiable Juvenile Fish
Anemone (*Urticina*)	Quahog	Whelk
Eel Pout	Rock Crab	

Table 27. Baseline video observations of substrate type from the Victoria Beach survey, May 28 and May 29, 2019

Station (m)	Latitude (dd mm.mmm)	Longitude (dd mm.mmm)	Depth (m)	Time	Video Quality	Figure #	Substrate: Primary [1] > 50% (hard/soft)	Descriptors: Rockwall	Bedrock	Boulders	Rubble	Cobble	Gravel	Sand	Silt/Mud	Organic	Floc	Comments and Observations
VBFH1	44 39.925	65 43.538	36.1	9:05	4	J-1	Soft					25%	10%	65%				Prevalent Shell Debris
VBFH2	44 39.955	65 43.465	36.0	9:13	4	J-1	Soft					30%	10%	60%				Prevalent Shell Debris
VBFH3	44 39.972	65 43.395	35.8	9:21	4	J-1	Soft					25%	20%	55%				Prevalent Shell Debris
VBFH4	44 39.992	65 43.322	35.3	9:30	4	J-1	Hard					30%	20%	50%				Prevalent Shell Debris
VBFH5	44 40.015	65 43.254	35.3	9:38	4	J-1	Soft					10%	20%	70%				Prevalent Shell Debris
VBFH6	44 40.041	65 43.182	33.7	9:45	4	J-1	Soft					5%	15%	80%				Prevalent Shell Debris
VBFH7	44 40.060	65 43.112	30.1	9:53	4	J-1	Soft						5%	95%				Prevalent Shell Debris
VBFH8	44 40.082	65 43.046	27.6	10:01	4	J-1	Soft			10%	5%	10%	5%	70%				Prevalent Shell Debris
VBFH9	44 40.101	65 42.978	27.6	10:08	4	J-2	Soft			Trace		5%	25%	70%				Prevalent Shell Debris
VBFH10	44 40.126	65 42.905	26.5	10:16	4	J-2	Soft				Trace	5%	10%	85%				Prevalent Shell Debris
VBFH11	44 40.174	65 42.941	23.0	10:28	4	J-2	Hard			Trace		45%	20%	35%				Prevalent Shell Debris
VBFH12	44 40.153	65 43.006	21.1	10:34	4	J-2	Hard			20%	5%	20%	25%	30%				Prevalent Shell Debris
VBFH13	44 40.130	65 43.076	22.8	10:40	4	J-2	Soft						40%	60%				Prevalent Shell Debris
VBFH14	44 40.108	65 43.141	25.6	10:47	4	J-2	Soft			10%		5%	20%	65%				Prevalent Shell Debris
VBFH15	44 40.091	65 43.212	26.4	10:54	4	J-2	Soft							100%				Prevalent Shell Debris
VBFH16	44 40.064	65 43.299	25.8	11:02	4	J-2	Soft					5%	15%	80%				Prevalent Shell Debris
VBFH17	44 40.040	65 43.367	24.1	11:12	4	J-3	Hard				5%	5%	65%	25%				Prevalent Shell Debris
VBFH18	44 40.019	65 43.432	26.2	11:20	4	J-3	Soft			5%	5%	5%	10%	75%				Prevalent Shell Debris
VBFH19	44 40.004	65 43.492	30.0	11:28	4	J-3	Hard			10%		50%	30%	10%				Prevalent Shell Debris
VBFH20	44 39.985	65 43.563	31.8	11:36	4	J-3	Hard					10%	75%	15%				Prevalent Shell Debris
VBFH21	44 40.030	65 43.595	19.3	11:44	4	J-3	Hard				25%	20%	50%	5%				Prevalent Shell Debris
VBFH22	44 40.052	65 43.523	17.5	11:50	4	J-3	Hard			20%	5%	40%	35%					Prevalent Shell Debris
VBFH23	44 40.072	65 43.458	18.9	11:56	4	J-3	Hard				5%	40%	45%	10%				Prevalent Shell Debris

1: It is important to clarify that hard bottom is indicative of bedrock, boulder, rubble, cobble, gravel or hard packed finer substrate consisting of mud, sand or silt. Soft bottom is indicative of a softer, more loosely packed mud, sand or silt. Substrate Descriptions are visual estimations of surface coverage.

Table 27. Baseline video observations of substrate type from the Victoria Beach survey, May 28 and May 29, 2019 (continued)

Station (m)	Latitude (dd mm.mmm)	Longitude (dd mm.mmm)	Depth (m)	Time	Video Quality	Figure #	Substrate											Comments and Observations
							Primary [1.]	Descriptors										
							> 50% (hard/soft)	Rockwall	Bedrock	Boulders	Rubble	Cobble	Gravel	Sand	Silt/Mud	Organic	Floc	
VBFH24	44 40.096	65 43.383	19.8	12:01	4	J-3	Hard				15	20	15	50				Prevalent Shell Debris
VBFH25	44 40.115	65 43.321	20.2	12:12	4	J-4	Soft					10%	20%	70%				Prevalent Shell Debris
VBFH26	44 40.139	65 43.242	17.4	12:18	4	J-4	Soft					10%	15%	75%				Prevalent Shell Debris
VBFH27	44 40.159	65 43.177	15.6	12:23	4	J-4	Soft					10%	30%	60%				Prevalent Shell Debris
VBFH28	44 40.180	65 43.105	13.2	12:29	4	J-4	Hard				5%	15%	50%	30%				Prevalent Shell Debris
VBFH29	44 40.201	65 43.038	9.8	12:34	4	J-4	Hard				10%	35%	50%	5%				Prevalent Shell Debris
VBFH30	44 40.221	65 42.971	10.2	12:40	4	J-4	Hard					70%	25%	5%				Prevalent Shell Debris
VBFH31	44 40.268	65 43.003	5.8	12:45	4	J-4	Hard			5%	10%	40%	25%	20%				Prevalent Shell Debris
VBFH32	44 40.248	65 43.066	5.0	12:50	4	J-4	Hard			15%	15%	30%	30%	10%				Prevalent Shell Debris
VBFH33	44 40.230	65 43.139	5.4	12:54	4	J-5	Soft					5%		95%				
VBFH34	44 40.204	65 43.213	6.0	12:59	4	J-5	Soft					Trace			100%			
VBFH35	44 40.183	65 43.282	7.8	13:05	4	J-5	Soft								100%			
VBFH36	44 40.162	65 43.349	7.8	13:10	4	J-5	Soft					Trace			100%			
VBFH37	44 40.139	65 43.418	7.3	13:15	4	J-5	Soft				5%	10%	5%	80%				Prevalent Shell Debris
VBFH38	44 40.118	65 43.491	5.1	13:20	4	J-5	Hard					15%	35%	50%				Prevalent Shell Debris
VBFH39	44 40.098	65 43.554	1.7	13:26	4	J-5	Hard			40%	25%	5%	15%	15%				Prevalent Shell Debris
VBFH40	44 40.166	65 43.429	2.1	13:31	4	J-5	Hard				50%	20%	10%	20%				Prevalent Shell Debris
VBFH41	44 40.190	65 43.362	2..6	13:36	4	J-6	Soft					15%	5%	80%				Prevalent Shell Debris
VBFH42	44 40.208	65 43.292	2.6	13:41	4	J-6	Soft								100%			Prevalent Shell Debris
VBFH43	44 40.231	65 43.226	2.0	13:47	4	J-6	Soft			10%	10%	5%	10%		65%			Prevalent Shell Debris
ANB-REF	44 40.263	65 42.755	14.0	10:07	4	J-6	Soft				5%	5%	20%	70%				Prevalent Shell Debris
ANB-51	44 40.019	65 43.706	18.7	11:20	4	J-6	Hard				15%	45%	30%	10%				Prevalent Shell Debris

1: It is important to clarify that hard bottom is indicative of bedrock, boulder, rubble, cobble, gravel or hard packed finer substrate consisting of mud, sand or silt. Soft bottom is indicative of a softer, more loosely packed mud, sand or silt. Substrate Descriptions are visual estimations of surface coverage.

Table 28. Baseline video observations of benthic indicators from the Victoria Beach survey, May 28 and May 29, 2019

Station (m)	Latitude (dd mm.mmm)	Longitude (dd mm.mmm)	Depth (m)	Time	Video Quality	Figure #	Benthic Indicators: Bacteria P/A	Bacteria %	OPC P/A	OPC %	Barren (P/A)	Other Benthic Descriptors or Observations: Off Gas	Feed	Shell Debri	Mussel Shells	Sed. Color	Flora (%)	Fauna (Abundance)	Comments and Observations
VBFH1	44 39.925	65 43.538	36.1	9:05	4	J-1	A		A		A	A	A	P	A	Brown	<5%	*Flustra* (5%); Hermit Crab (2)	Rhodophyta (<5%); Detritus; Scallop Shells
VBFH2	44 39.955	65 43.465	36.0	9:13	4	J-1	A		A		A	A	A	P	A	Brown	<5%	*Flustra* (5%); Hermit Crab (2); Sponge (<5%)	Rhodophyta (<5%); Detritus; Scallop Shells
VBFH3	44 39.972	65 43.395	35.8	9:21	4	J-1	A		A		A	A	A	P	A	Brown	<5%	*Flustra* (<5%); Hermit Crab (1)	Rhodophyta (<5%); Detritus; Scallop Shells
VBFH4	44 39.992	65 43.322	35.3	9:30	4	J-1	A		A		A	A	A	P	A	Brown	5%	*Flustra* (5%); *Henricia* Sea Star (2)	Rhodophyta (<5%); Oyster Thief (<5%); *Fucus* (<5%); Detritus; Scallop Shells
VBFH5	44 40.015	65 43.254	35.3	9:38	4	J-1	A		A		A	A	A	P	A	Brown	<5%	*Flustra* (<5%); Hermit Crab (5)	Rhodophyta (<5%); Detritus; Scallop Shells
VBFH6	44 40.041	65 43.182	33.7	9:45	4	J-1	A		A		A	A	A	P	A	Brown	<5%	*Flustra* (<5%); Hermit Crab (2)	*Fucus* (<5%); Oyster Thief (<5%); Detritus; Scallop Shells
VBFH7	44 40.060	65 43.112	30.1	9:53	4	J-1	A		A		A	A	A	P	P	Brown	0%	*Flustra* (<5%); Hermit Crab (3); Whelk (1)	Detritus
VBFH8	44 40.082	65 43.046	27.6	10:01	4	J-1	A		A		A	A	A	P	P	Brown	0%	*Flustra* (10%); Rock Crab (1); Whelk (1); Hermit Crab (1)	Detritus
VBFH9	44 40.101	65 42.978	27.6	10:08	4	J-2	A		A		A	A	A	P	A	Brown	<5%	*Flustra* (5%); Rock Crab (1); Hermit Crab (1); Quahog (1)	*Fucus* (<5%); Detritus
VBFH10	44 40.126	65 42.905	26.5	10:16	4	J-2	A		A		A	A	A	P	P	Brown	<5%	*Flustra* (5%); Hermit Crab (1); Whelk (1)	*Fucus* (<5%); Detritus; Scallop Shells
VBFH11	44 40.174	65 42.941	23.0	10:28	4	J-2	A	<5	A		A	A	A	P	A	Brown	<5%	*Flustra* (10%); Hermit Crab (7); *Henricia* Sea Star (1)	Rhodophyta (<5%); Detritus; Scallop Shells
VBFH12	44 40.153	65 43.006	21.1	10:34	4	J-2	A		A		A	A	A	P	A	Brown	5%	*Flustra* (15%); Finger Sponge (2); Rock Crab (1); Hermit Crab (2)	Rhodophyta (<5%); *Fucus* (<5%); Detritus; Scallop Shells
VBFH13	44 40.130	65 43.076	22.8	10:40	4	J-2	A		A		A	A	A	P	A	Brown	5%	*Urticina* Anemone (1); *Flustra* (<5%); Rock Crab (1); Hermit Crab (1)	Rhodophyta (5%); *Fucus* (<5%); Detritus; Scallop Shells
VBFH14	44 40.108	65 43.141	25.6	10:47	4	J-2	A		A		A	A	A	P	A	Brown	5%	*Flustra* (10%); Quahog (1); *Henricia* Sea Star (1); Finger Sponge (1); Rock Crab (1); Whelk (2)	Rhodophyta (5%); Detritus; Scallop Shells
VBFH15	44 40.091	65 43.212	26.4	10:54	4	J-2	A		A		A	A	A	P	P	Brown	<5%	*Flustra* (<5%); Hermit Crab (1); Whelk (1)	Rhodophyta (<5%); Detritus
VBFH16	44 40.064	65 43.299	25.8	11:02	4	J-2	A		A		A	A	A	P	P	Brown	<5%	*Flustra* (5%); Flounder (1); Sculpin (1); Hermit Crab (3); Rock Crab (3); Whelk (1)	*Fucus* (<5%); Detritus; Scallop Shells
VBFH17	44 40.040	65 43.367	24.1	11:12	4	J-3	A		A		A	A	A	P	P	Brown	<5%	*Flustra* (<5%); Whelk (1); Hermit Crab (1); Mussel (1)	Rhodophyta (<5%); Detritus
VBFH18	44 40.019	65 43.432	26.2	11:20	4	J-3	A	<5	A		A	A	P	P	P	Brown	<5%	*Flustra* (<5%); Hermit Crab (1)	Rhodophyta (<5%); Detritus; Scallop Shells; Piece of Metal; Piece of Net
VBFH19	44 40.004	65 43.492	30.0	11:28	4	J-3	A	<5	A		A	A	A	P	P	Brown	0%	*Flustra* (10%); Flounder (1); Rock Crab (4); Dead Rock Crab (2); Hermit Crab (2)	Detritus; Scallop Shells
VBFH20	44 39.985	65 43.563	31.8	11:36	4	J-3	A	<5	A		A	A	A	P	A	Brown	<5%	*Flustra* (5%); Rock Crab (2); Hermit Crab (2)	Rhodophyta (<5%); *Fucus* (<5%); Detritus; Scallop Shells
VBFH21	44 40.030	65 43.595	19.3	11:44	4	J-3	A	<5	A		A	A	A	P	A	Brown	5%	*Flustra* (10%); Finger Sponge (6)	Encrusting Algae (5%); *Fucus* (<5%); Rhodophyta (<5%); Detritus; Scallop Shells
VBFH22	44 40.052	65 43.523	17.5	11:50	4	J-3	P	5	A		A	A	A	P	A	Brown	5%	*Flustra* (10%); Finger Sponge (5); Rock Crab (1); Encrusting Sponge (<5%); *Henricia* Sea Star (1)	Rhodophyta (5%); Encrusting Algae (<5%); Detritus
VBFH23	44 40.072	65 43.458	18.9	11:56	4	J-3	P	5	A		A	A	A	P	P	Brown	<5%	*Flustra* (5%); Rock Crab (1); Hermit Crab (2); Whelk (1); Encrusting Sponge (<5%)	*Fucus* (<5%); Rhodophyta (<5%); Anchor and Chain; Detritus; Scallop Shells

Note: It is important to clarify that percent coverage of Bacteria, OPC and Other Benthic Observations of Flora are visual estimations of surface coverage.

Benthic Indicators: A or "Absence" represents < 5 % coverage of OPC and / or bacteria and / or where barrenness due to aquaculture is not observed. P or "Presence" represents ≥ 5 % coverage of OPC and / or bacteria and / or where barrenness due to aquaculture is observed.

Table 28. Baseline video observations of benthic indicators from the Victoria Beach survey, May 28 and May 29, 2019 (continued)

Station (m)	Latitude (dd mm.mmm)	Longitude (dd mm.mmm)	Depth (m)	Time	Video Quality	Figure #	Benthic Indicators: Bacteria P/A	Bacteria %	OPC P/A	OPC %	Barren (P/A)	Other Benthic Descriptors or Observations: Off Gas	Feed	Shell Debri	Mussel Shells	Sed. Color	Flora (%)	Fauna (Abundance)	Comments and Observations
VBFH24	44 40.096	65 43.383	19.8	12:01	4	J-3	A		A		A	A	A	P	P	Brown	<5%	*Flustra* (<5%); Green Crab (1); Rock Crab (3); Hermit Crab (4)	Rhodophyta (<5%); Detritus; Scallop Shells
VBFH25	44 40.115	65 43.321	20.2	12:12	4	J-4	A		A		A	A	A	P	P	Brown	<5%	*Flustra* (<5%); Rock Crab (1)	Rhodophyta (<5%); Detritus; Scallop Shells
VBFH26	44 40.139	65 43.242	17.4	12:18	4	J-4	A		A		A	A	A	P	P	Brown	5%	*Flustra* (<5%); Hermit Crab (1); Rock Crab (1); Eel Pout (1)	Rhodophyta (5%); Detritus; Scallop Shells
VBFH27	44 40.159	65 43.177	15.6	12:23	4	J-4	A		A		A	A	A	P	P	Brown	<5%	*Flustra* (<5%); Rock Crab (1)	Rhodophyta (<5%); Detritus; Scallop Shells
VBFH28	44 40.180	65 43.105	13.2	12:29	4	J-4	A	<5	A		A	A	A	P	A	Brown	<5%	*Flustra* (<5%); Hermit Crab (6); Whelk (1)	*Fucus* (<5%); Rhodophyta (<5%); Detritus; Scallop Shells
VBFH29	44 40.201	65 43.038	9.8	12:34	4	J-4	P	5	A		A	A	A	P	A	Brown	<5%	*Flustra* (5%); Finger Sponge (3); *Henricia* Sea Star (1)	Rhodophyta (<5%); Detritus; Scallop Shells
VBFH30	44 40.221	65 42.971	10.2	12:40	4	J-4	A	<5	A		A	A	A	P	A	Brown	<5%	*Flustra* (<5%)	Rhodophyta (<5%); Scallop Shells
VBFH31	44 40.268	65 43.003	5.8	12:45	4	J-4	A		A		A	A	A	P	A	Brown	35%	*Flustra* (<5%); *Henricia* Sea Star (3); Finger Sponge (1); Northern Sea Star (1)	Coralline Algae (20%); Encrusting Algae (5%); Sea Colander (5%); Rhodophyta (5%)
VBFH32	44 40.248	65 43.066	5.0	12:50	4	J-4	A		A		A	A	A	P	P	Brown	40%	Finger Sponge (1)	Coralline Algae (15%); Sea Colander (15%); Rhodophyta (10%); Scallop Shells; Detritus
VBFH33	44 40.230	65 43.139	5.4	12:54	4	J-5	A		A		A	A	A	P	A	Brown	<5%	Green Crab (1)	Rhodophyta (<5%); Detritus
VBFH34	44 40.204	65 43.213	6.0	12:59	4	J-5	A		A		A	A	A	P	A	Brown	<5%	Rock Crab (1); Hermit Crab (3)	Rhodophyta (<5%); Detritus; Scallop Shells
VBFH35	44 40.183	65 43.282	7.8	13:05	4	J-5	A		A		A	A	A	P	A	Brown	<5%	Unidentifiable Juvenile Fish (1)	Oyster Thief (<5%); Rhodophyta (<5%); Detritus
VBFH36	44 40.162	65 43.349	7.8	13:10	4	J-5	A		A		A	A	A	P	A	Brown	<5%	Whelk (2)	Rhodophyta (<5%); *Fucus* (<5%); Kelp (<5%); Macrofaunal Burrows; Detritus
VBFH37	44 40.139	65 43.418	7.3	13:15	4	J-5	A		A		A	A	A	P	A	Brown	<5%	Hermit Crab (1); *Flustra* (<5%); Rock Crab (1)	Rhodophyta (<5%); Detritus; Scallop Shells
VBFH38	44 40.118	65 43.491	5.1	13:20	4	J-5	A		A		A	A	A	P	P	Brown	5%	Green Sea Urchin (2); Hermit Crab (3)	Coralline Algae (<5%); Kelp (<5%); Detritus
VBFH39	44 40.098	65 43.554	1.7	13:26	4	J-5	A		A		A	A	A	P	A	Brown	35%	Hermit Crab (1); Green Sea Urchin (1); Lobster (1); Rock Crab (1)	Coralline Algae (15%); Rhodophyta (20%); Encrusting Algae (<5%); Kelp (<5%); Detritus
VBFH40	44 40.166	65 43.429	2.1	13:31	4	J-5	A		A		A	A	A	P	A	Brown	35%	Rock Crab (1)	Coralline Algae (20%); Rhodophyta (15%); *Fucus* (<5%); Detritus
VBFH41	44 40.190	65 43.362	2..6	13:36	4	J-6	A		A		A	A	A	P	A	Brown	10%	Sculpin (1)	Rhodophyta (5%); Kelp (5%); Detritus
VBFH42	44 40.208	65 43.292	2.6	13:41	4	J-6	A		A		A	A	A	P	A	Brown	0%		Detritus
VBFH43	44 40.231	65 43.226	2.0	13:47	4	J-6	A		A		A	A	A	P	A	Brown	10%		Coralline Algae (5%); Rhodophyta (5%); Detritus
ANB-REF	44 40.263	65 42.755	14.0	10:07	4	J-6	A		A		A	A	A	P	A	Brown	0%	*Flustra* (5%); Encrusting Sponge (<5%)	Detritus; Scallop Shells
ANB-51	44 40.019	65 43.706	18.7	11:20	4	J-6	A	<5	A		A	A	A	P	A	Brown	5%	*Flustra* (<5%); Northern Sea Star (2); Hermit Crab (2)	Rhodophyta (5%); *Fucus* (<5%); Detritus; Scallop Shells

Note: It is important to clarify that percent coverage of Bacteria, OPC and Other Benthic Observations of Flora are visual estimations of surface coverage.

Benthic Indicators: A or "Absence" represents < 5 % coverage of OPC and / or bacteria and / or where barrenness due to aquaculture is not observed. P or "Presence" represents ≥ 5 % coverage of OPC and / or bacteria and / or where barrenness due to aquaculture is observed.

8.0 REFERENCES

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Symonds, D. 2006. QA/QC Parameters for Acoustic Doppler Current Profilers. TRDI Application Note. 17 p.

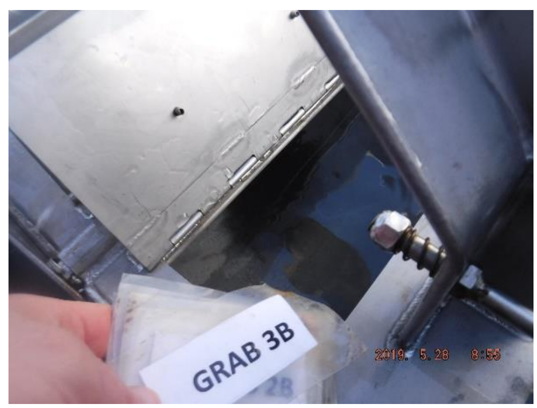
APPENDIX A
Grab Photos

VB1
Grabs that were not sampled

VB1 (Continued)
Grabs that were not sampled

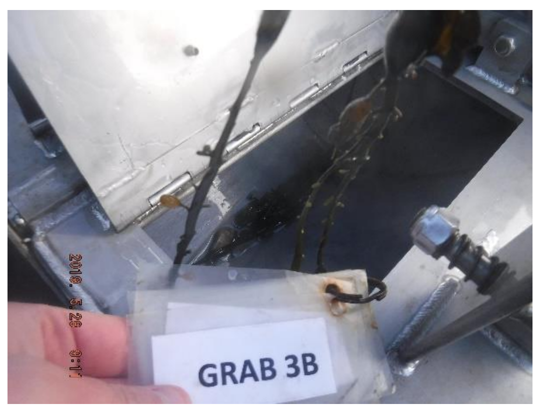
VB2

Grabs that were not sampled



VB2 (Continued)
Grabs that were not sampled

VB3
Grabs that were not sampled

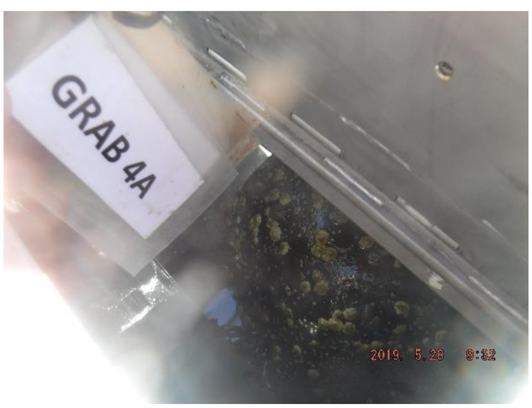


VB3 (Continued)
Grabs that were not sampled

VB4

Pre-siphon **Post-siphon**

VB4 (Continued)
Grabs that were not sampled



VB5

Grabs that were not sampled

VB5 (Continued)
Grabs that were not sampled

ANB-REF

Pre-siphon **Post-siphon**

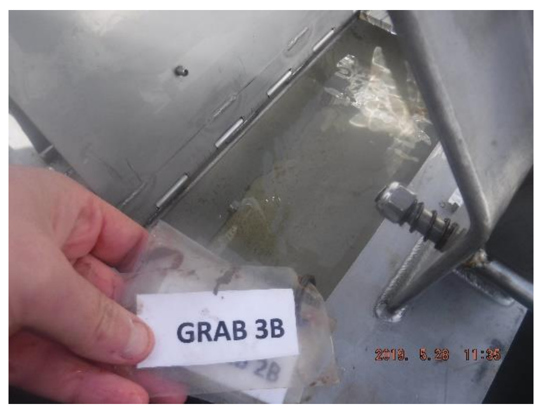
ANB-REF (Continued)
Grabs that were not sampled

Pre-siphon

Post-siphon

VB6 (Continued)
Grabs that were not sampled

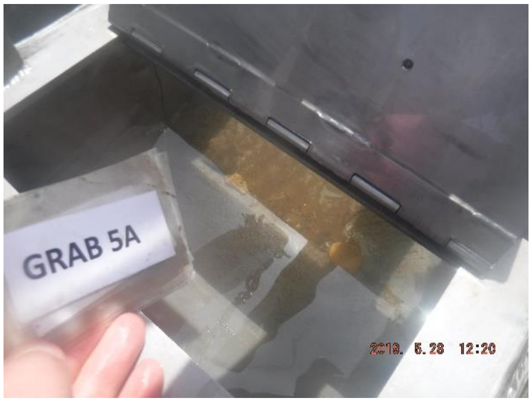
ANB-51
Grabs that were not sampled

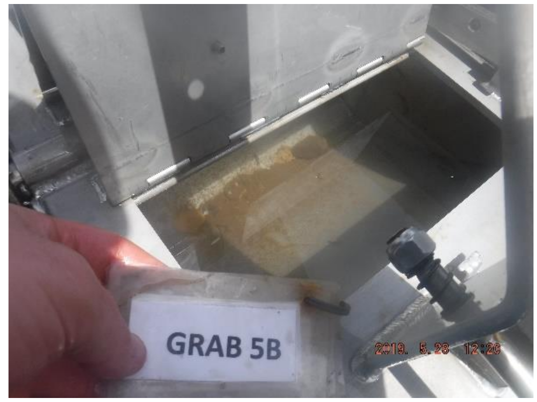


ANB-51 (Continued)
Grabs that were not sampled

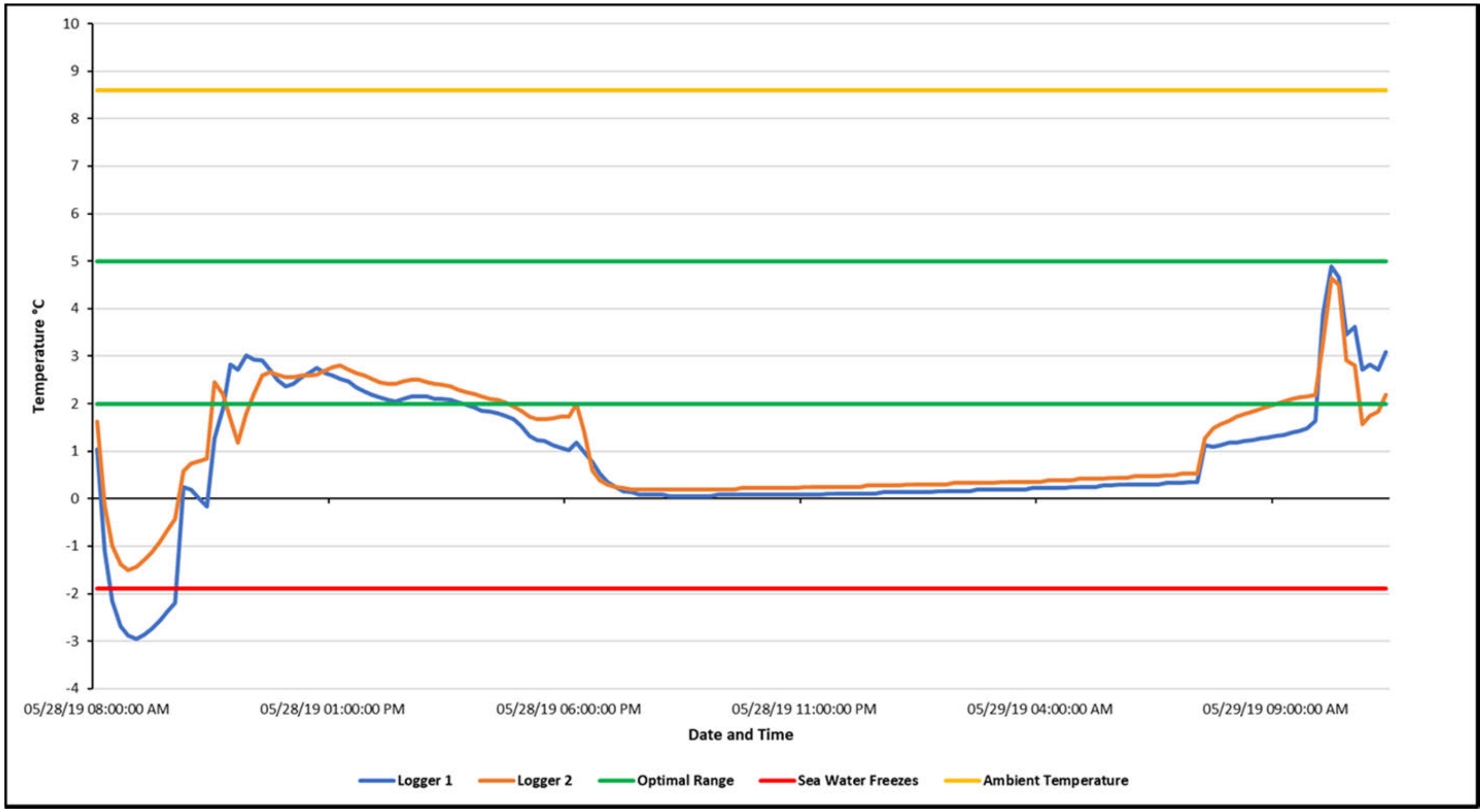
VB7
Grabs that were not sampled

VB7 (Continued)
Grabs that were not sampled





APPENDIX B
Sample Storage Temperatures


10
9
8
7
6
5
4
3
2
1
0
-1
-2
-3
-4
Temperature °C
05/28/19 08:00:00 AM
05/28/19 01:00:00 PM
05/28/19 06:00:00 PM
05/28/19 11:00:00 PM
05/29/19 04:00:00 AM
05/29/19 09:00:00 AM
Date and Time
Logger 1
Logger 2
Optimal Range
Sea Water Freezes
Ambient Temperature

APPENDIX C
Grab Sample Acceptability Criteria

Station	Grab attempts	Grabs that were subsampled	Grab retrieval speeds (cm/s)	Door status	Sediment depths (cm)	Reason for rejecting grab	Free-falls
VB1	5	None	N/A	N/A	N/A	1 - Grab leaked 2 - Grab leaked 3 - Grab leaked 4 - Grab leaked 5 - Grab leaked	No
VB2	5	None	N/A	N/A	N/A	1 - < 5 cm sediment 2 - < 5 cm sediment 3 - < 5 cm sediment 4 - < 5 cm sediment 5 - Grab leaked	No
VB3	5	None	N/A	N/A	N/A	1 - Grab leaked 2 - Grab leaked 3 - Grab leaked 4 - Grab leaked 5 - Grab leaked	No
VB4	5	5	37	Closed	6.5	1 - < 5 cm sediment 2 - Uneven sediment 3 - < 5 cm sediment 4 - Grab leaked	No
VB5	5	None	N/A	N/A	N/A	1 - Grab leaked 2 - Grab leaked 3 - Grab leaked 4 - < 5 cm sediment 5 - < 5 cm sediment	No
ANB-REF	5	2	36	Closed	5	1 - Grab leaked 3 - Grab leaked 4 - Grab leaked 5 - Grab leaked	No
VB6	5	3	37	N/A	6.5	1 - < 5 cm sediment 2 - < 5 cm sediment 4 - Grab leaked 5 - Grab leaked	No
ANB-51	5	None	N/A	N/A	N/A	1 - < 5 cm sediment 2 - Grab leaked 3 - < 5 cm sediment 4 - Grab leaked 5 - < 5 cm sediment	No
VB7	5	None	N/A	N/A	N/A	1 - Grab leaked 2 - Grab leaked 3 - < 5 cm sediment 4 - Grab leaked 5 - < 5 cm sediment	No

Station	Grab Attempt				
	Grab 1	Grab 2	Grab 3	Grab 4	Grab 5
VB1	VV	VV	VV	VV	VV
VB2	VV	VV	VV	VV	VV
VB3	VV	VV	VV	VV	VV
VB4	VV	VV	VV	VV	VV
VB5	VV	VV	VV	VV	VV
ANB-REF	VV	VV	VV	VV	VV
VB6	VV	VV	VV	VV	VV
ANB-51	VV	VV	VV	VV	VV
VB7	VV	VV	VV	VV	VV

VV = 25 kg Van Veen
Grabs there were subsampled are highlighted in green

APPENDIX D
Redox and Sulphide Data Sheets

NRC-IMB Research Facilities
1411 Oxford Street
Suite 367-368
Halifax, NS
B3H 3Z1
Tel: (902) 492-7865
(902) 492-0359
Fax: (902) 492-7734

Redox and Sulphide Test Report

Site #: Victoria Beach (#1040)
Redox Start: 11:02 am on 29-May-19
Sulphide Start: 11:06am on 29-May-19
Sample Collection: 28-May-19
Redox Stop: 11:13am on 29-May-19
Sulphide Stop: 11:15am on 29-May-19

Sample I.D.		Temp	Redox	Sulphide		
Station	**ID #**	**°C**	**mV**	**unadjusted µM**	**mV**	**adjusted µM**
VB4	1	9.1	240.6	0.000	-644.5	0.00
	2	NS	NS	NS	NS	NS
	3	NS	NS	NS	NS	NS
ANB-REF	1	4.6	237.4	0.000	-531.0	0.00
	2	NS	NS	NS	NS	NS
	3	NS	NS	NS	NS	NS
VB6	1	4.8	140.5	0.176	-802.0	1.76
	2	NS	NS	NS	NS	NS
	3	NS	NS	NS	NS	NS

Field Crew: [redacted]

Analysis Crew: [redacted]

Redox Check (mV):
Prior to analy 221.3 mV @ 25°C
Post analysis 222.7 mV @ 25°C

Sulphide Temp: 22.3°C

NS No sample
Redox reading at 2 minutes
Exceeds calibra ion limit
Less than Repor ing Limit (RL)

Equipment:

Sulphide Analysis

Probe kit: NSLAB002
Sulphide probe: SO1-15530
Temperature probe: T021

Redox Analysis

Meter number: 487142
Redox probe: R010
Temperature probe: T007

SAOB + L-AA mixture

Addition: 11:03am
Expiration: 2:03pm

[redacted]

[redacted], M.Sc.
Senior Laboratory Manager

APPENDIX E
Porosity and Percent Organic Matter Data

Porosity and Percent Organic Matter Test Report

NRC-IMB Research Facilities
1411 Oxford Street
Suite 367-368
Halifax, NS
B3H 3Z1
Tel: (902) 492-7865
(902) 492-0359
Fax: (902) 492-7734
www.simcorp.ca

Date: 4-Jun-19
File No.: SW2016-060
Site Name/#: Victoria Beach (#1040)
Province: Nova Scotia

Station	Sample Number	% Porosity Value	% Organic Matter
VB4	1	22.14	1.55
VB4	2	NS	NS
VB4	3	NS	NS
VB6	1	21.86	1.42
VB6	2	NS	NS
VB6	3	NS	NS
ANB-REF	1	22.36	1.56
ANB-REF	2	NS	NS
ANB-REF	3	NS	NS

NS No Sample

Signed off by:
[redacted]
[redacted], M.Sc.
Senior Laboratory Manager

APPENDIX F
Sediment Grain-Size Analysis

NRC-IMB Research Facilities
1411 Oxford Street
Suite 367-368
Halifax, NS
B3H 3Z1
Tel: (902) 492-7865
(902) 492-0359
Fax: (902) 492-7734
www.simcorp.ca

Date: 11-Jun-19
File No.: SW2016-060
Site Name/#: Victoria Beach (#1040)
Province: Nova Scotia

VB4-1			% Fraction
		mm	
Gravel	Pebble	>4	0.23
	Granule	2-4	1.11
Sand	Very Coarse	1-2	3.75
	Coarse	0.5-1	11.59
	Medium	0.25-0.5	43.42
	Fine	0.125-0.25	24.51
	Very Fine	0.063-0.125	3.82
Mud	Silt	0.040 - 0.063	3.85
	Clay	0.004 - 0.040	7.73
% Gravel			1.35
% Sand			87.08
% Mud			11.57

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www.simcorp.ca

VB6-1			**% Fraction**
		mm	
Gravel	Pebble	>4	1.83
	Granule	2-4	2.27
Sand	Very Coarse	1-2	2.16
	Coarse	0.5-1	12.71
	Medium	0.25-0.5	19.49
	Fine	0.125-0.25	25.38
	Very Fine	0.063-0.125	24.77
Mud	Silt	0.040 - 0.063	4.30
	Clay	0.004 - 0.040	7.08
% Gravel			4.11
% Sand			84.51
% Mud			11.38

NRC-IMB Research Facilities
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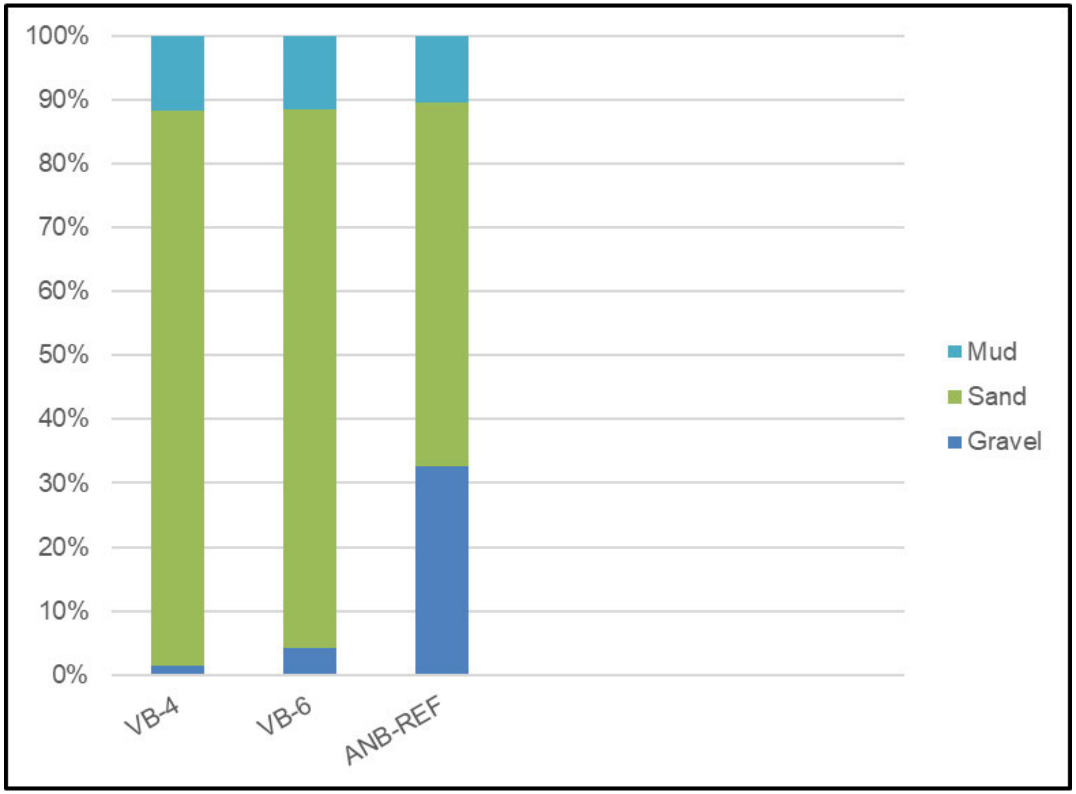
Halifax, NS
B3H 3Z1
Tel: (902) 492-7865
(902) 492-0359
Fax: (902) 492-7734

ANB-REF-1			**% Fraction**
		mm	
Gravel	Pebble	>4	24.69
	Granule	2-4	7.92
Sand	Very Coarse	1-2	6.09
	Coarse	0.5-1	5.98
	Medium	0.25-0.5	15.08
	Fine	0.125-0.25	10.30
	Very Fine	0.063-0.125	19.56
Mud	Silt	0.040 - 0.063	4.33
	Clay	0.004 - 0.040	6.06
% Gravel			32.61
% Sand			57.00
% Mud			10.38

NRC-IMB Research Facilities
1411 Oxford Street
Suite 367-368
Halifax, NS
B3H 3Z1
Tel: (902) 492-7865
(902) 492-0359
Fax: (902) 492-7734
www.simcorp.ca

Figure 1: Grain Size Distribution



Signed off by:

[redacted]

[redacted], M.Sc.
Senior Laboratory Manager

APPENDIX G
Sulphide Probe Calibration Certificate

Calibration Report

NRC-IMB Research Facilities
1411 Oxford Street
Suite 367-368
Halifax, NS
B3H 3Z1
Tel: (902) 492-7865
(902) 492-0359
Fax: (902) 492-7734

Date: 29-May-19
Meter: 537447
Sulfide Probe ID: SO1-15530

Project: SW2016-060 Victoria Beach (#1040)

5-point calibration using 100, 500, 1000, 5 000 and 10 000 µM sulphide standards.

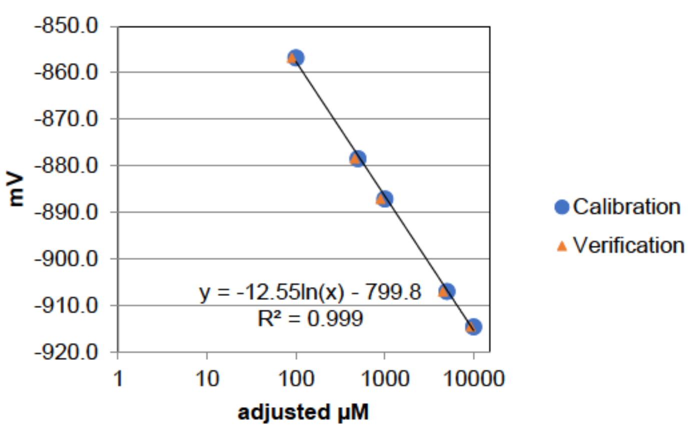
Date calibration performed: 29-May-19
Time calibration completed: 10:51am **Expiration time:** 1:51pm
Calibration performed by: [redacted]

Calibration Temperature: 22.3°C

Calibration -

After calibration the standards were re-measured to verify calibration.

10 µM (really 100 µM)	set at	-856.8 mV	read at	9.01 µM at	-855.4 mV
50 µM (really 500 µM)	set at	-878.5 mV	read at	45.7 µM at	-877.3 mV
100 µM (really 1000 µM)	set at	-887.1 mV	read at	89.3 µM at	-885.7 mV
500 µM (really 5 000 µM)	set at	-907 mV	read at	450 µM at	-905.7 mV
1 000 µM (really 10 000 µM)	set at	-914.6 mV	read at	922 µM at	-913.6 mV



Final slope (meter) = -31.0 mV

10 fold slope (validation)

500 to 5 000 µM: -28.5 mV
1000 to 10 000 µM: -27.5 mV

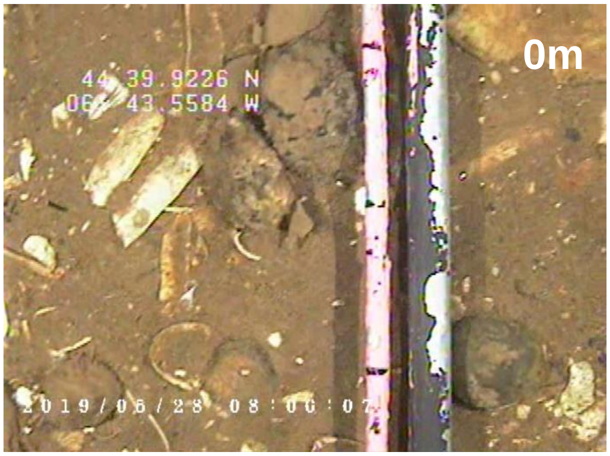
Calibration meets final slope range of -27 to -33 mV and 10-fold slope of -25 to -30 mV.

Signed off by:
[redacted]
[redacted], M.Sc.
Senior Laboratory Manager

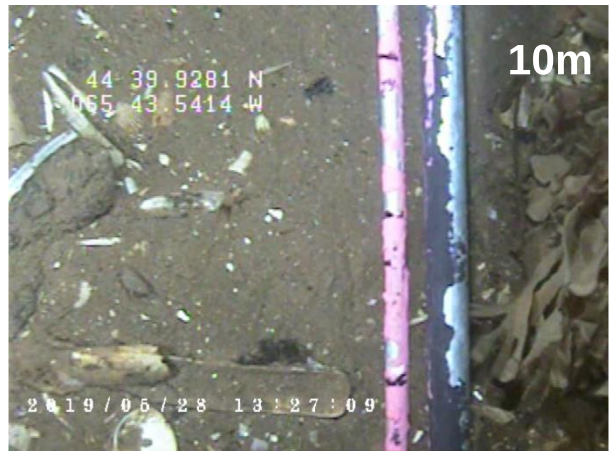
APPENDIX H

Baseline Survey Screen Captures of the Seafloor

VB1



0m
44 39.9226 N

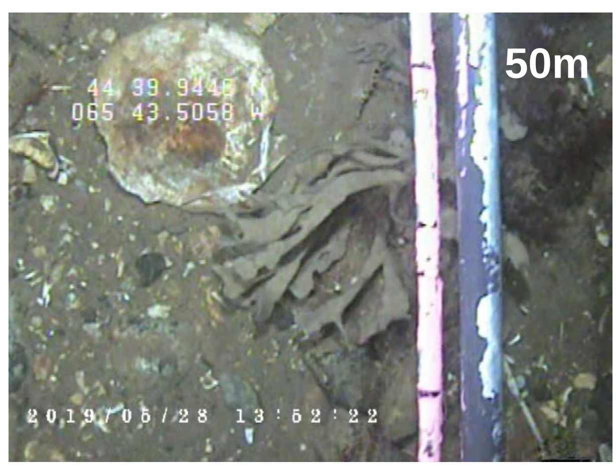


10m
44 39.9281 N
065 43.5414 W

20m
44 39.9296 N
2019/06/28 13:34:57

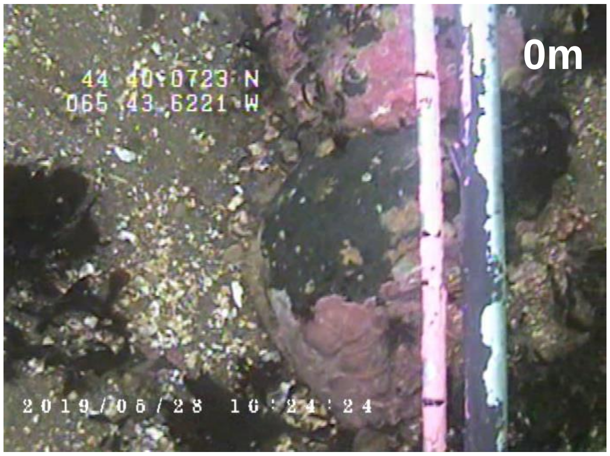
30m
44 39.9337 N
2019/06/28 13:39:11

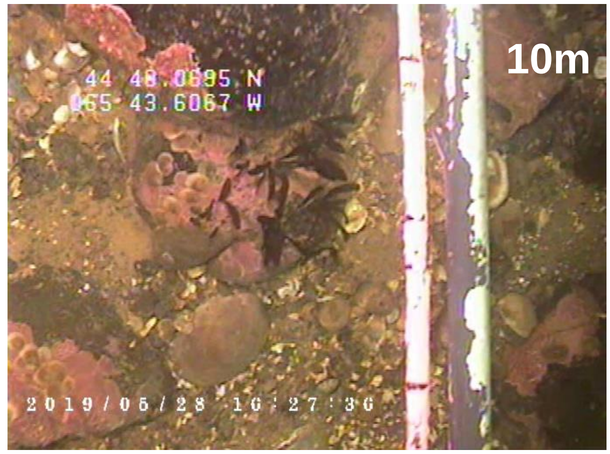
40m
44 39.9377 N
2019/06/28 13:46:06

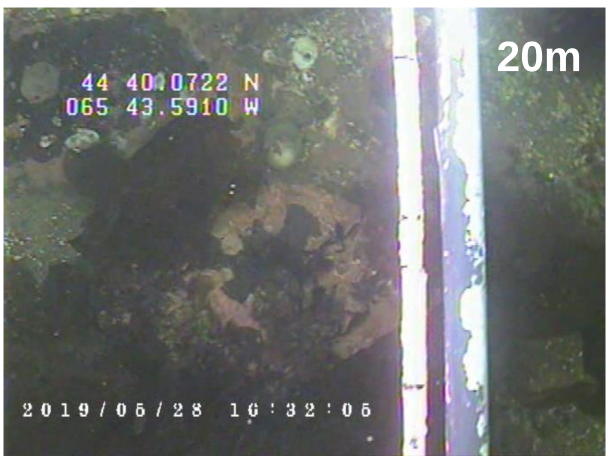


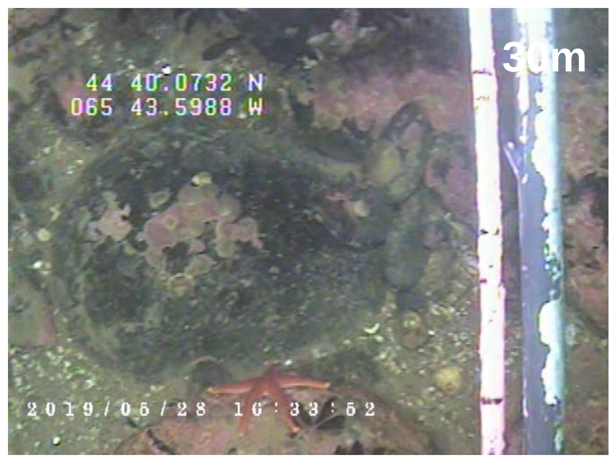
50m
065 43.5058 W
2019/06/28 13:52:22

VB2


0m
44 40.0723 N
065 43.6221 W
2019/06/28 16:24:24


10m
065 43.6067 W
2019/06/28 16:27:36


20m
44 40.0722 N
065 43.5910 W
2019/06/28 16:32:05


30m
44 40.0732 N
065 43.5988 W
2019/06/28 16:33:52


40m
2019/06/28 16:36:47


50m
44 40.0759 N
065 43.5828 W
2019/06/28 16:40:06

VB3


0m
44 40.1462 N
065 43.5098 W
2019/05/28


10m
44 40.1393 N
065 43.5067 W
2019/05/28 16:06:26


20m
44 40.1389 N
065 43.5027 W
2019/05/28 16:08:17


30m
44 40.1443 N
065 43.4893 W
2019/05/28 16:11:46

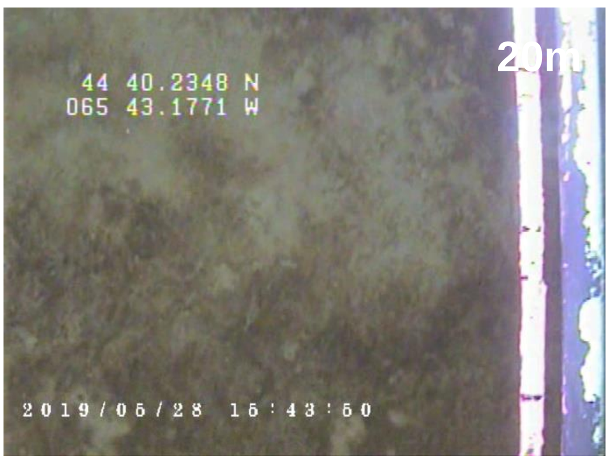

40m
44 40.1376 N
065 43.4838 W
2019/05/28 16:15:28

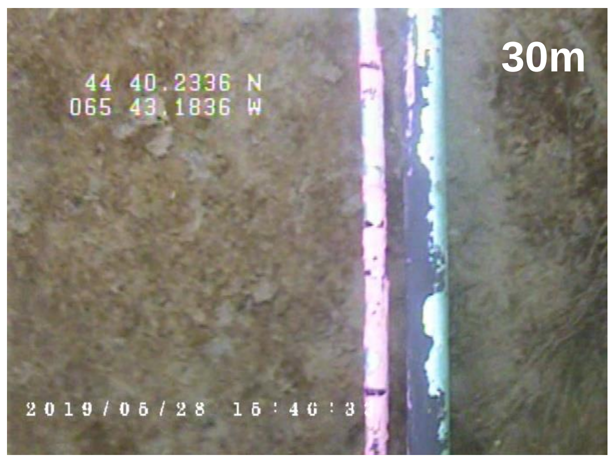

50m
44 40.1393 N
065 43.4726 W
2019/05/28 16:17:2

VB4

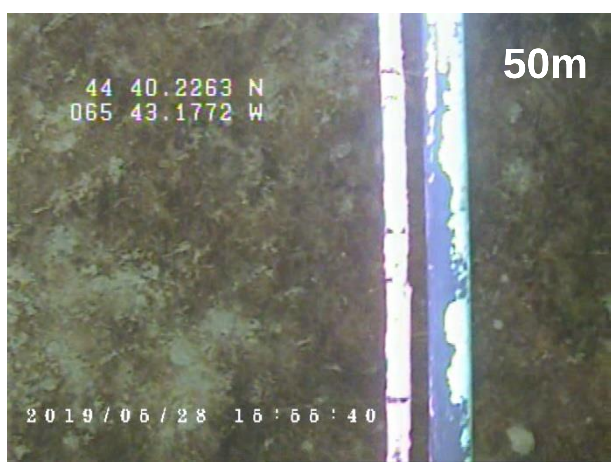

0m
44 40.2528 N
065 43.1703 W
2019/05/28 09:22:40


10m
44 40.2450 N
065 43.1760 W
2019/05/28 15:38:58

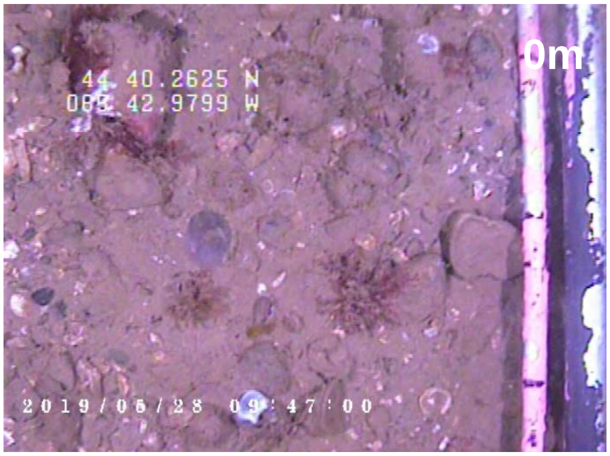

20m
44 40.2348 N
065 43.1771 W
2019/05/28 15:43:50

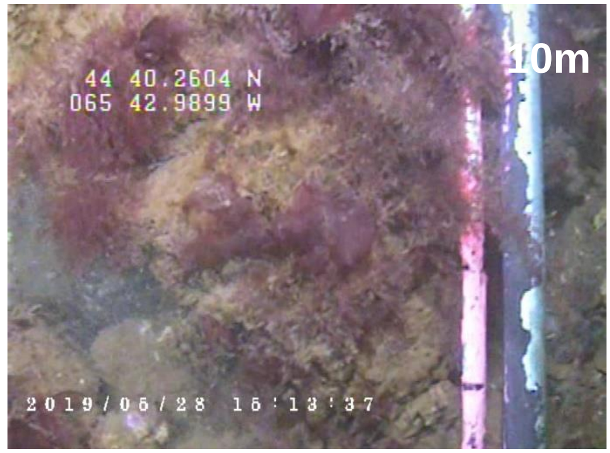

30m
44 40.2336 N
065 43.1836 W
2019/05/28 15:46:3


40m
44 40.2290 N
065 43.1881 W
2019/05/28 15:49:42


50m
44 40.2263 N
065 43.1772 W
2019/05/28 15:55:40

VB5

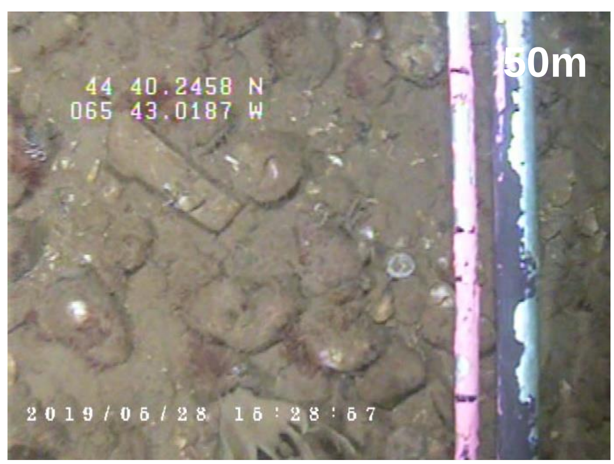

0m
44 40.2625 N
065 42.9799 W
2019/06/28 09:47:00


10m
44 40.2604 N
065 42.9899 W
2019/06/28 15:13:37


20m
44 40.2565 N
065 42.9849 W
2019/06/28 15:17:18


30m
44 40.2552 N
065 43.0084 W
2019/06/28 15:20:14

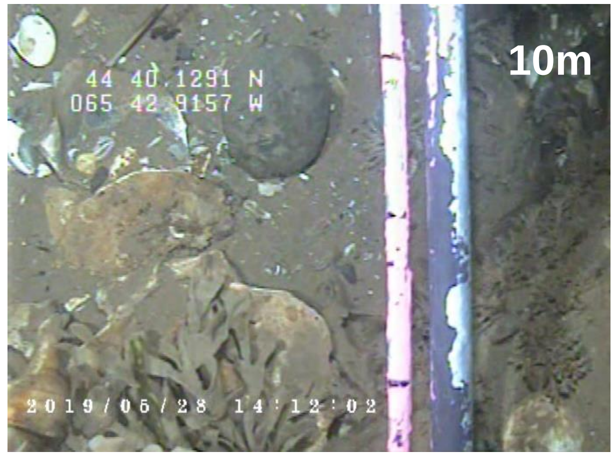

40m
44 40.2477 N
065 43.0119 W
2019/06/28 15:24:57


50m
44 40.2458 N
065 43.0187 W
2019/06/28 15:28:57

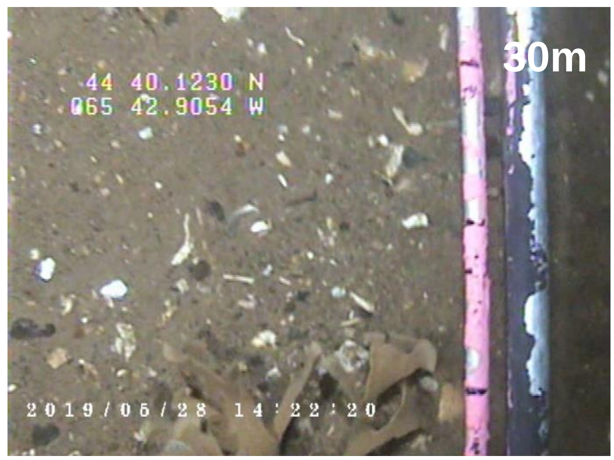
ANB-REF

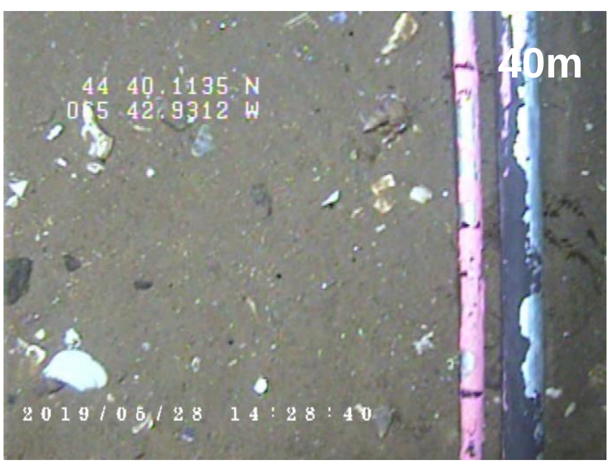
VB6

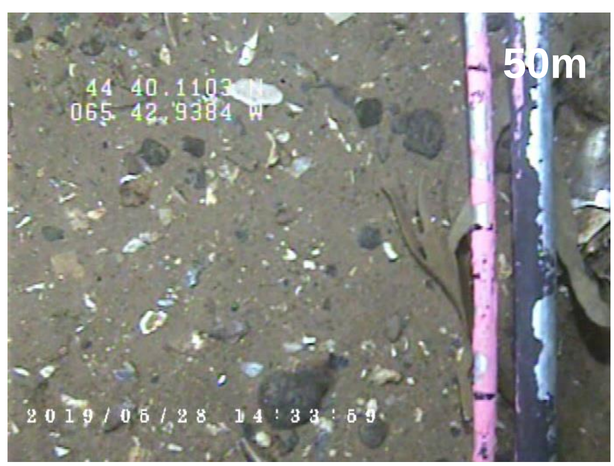

0m
44 40.1155 N
065 42.9060 W
2019/06/28 10:41:11


10m
44 40.1291 N
065 42.9157 W
2019/06/28 14:12:02


20m
44 40.1174 N
065 42.9177 W
2019/06/28 14:16:59


30m
44 40.1230 N
065 42.9054 W
2019/06/28 14:22:20


40m
44 40.1135 N
065 42.9312 W
2019/06/28 14:28:40


50m
44 40.1103 N
065 42.9384 W
2019/06/28 14:33:59

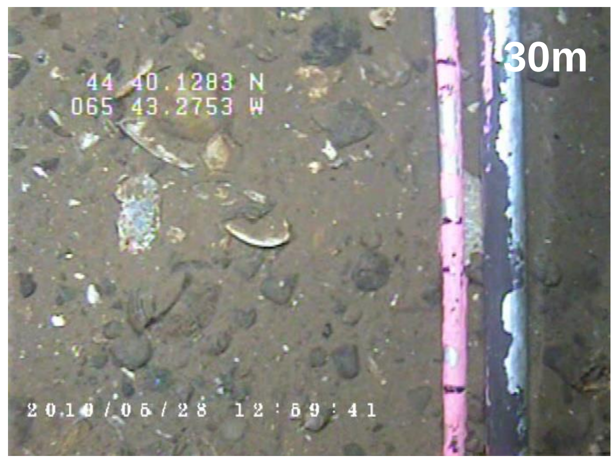
ANB-51

VB7


0m
44 40.1145 N
065 43.2718 W
2019/05/28 11:54:29


10m
44 40.1157 N
065 43.2728 W
2019/05/28 12:45:44

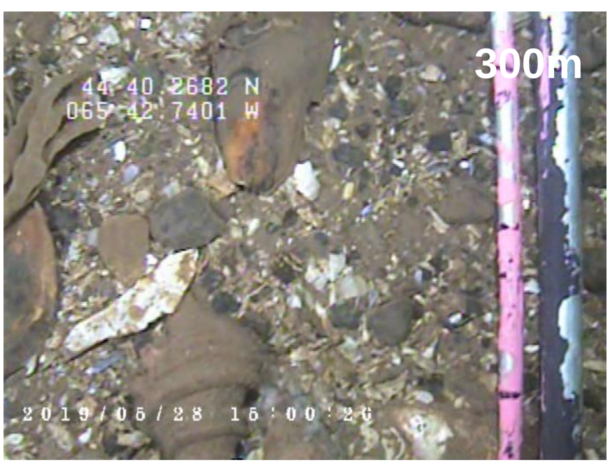

20m
44 40.1212 N
065 43.2771 W
2019/05/28 12:54:22


30m
44 40.1283 N
065 43.2753 W
2019/05/28 12:59:41

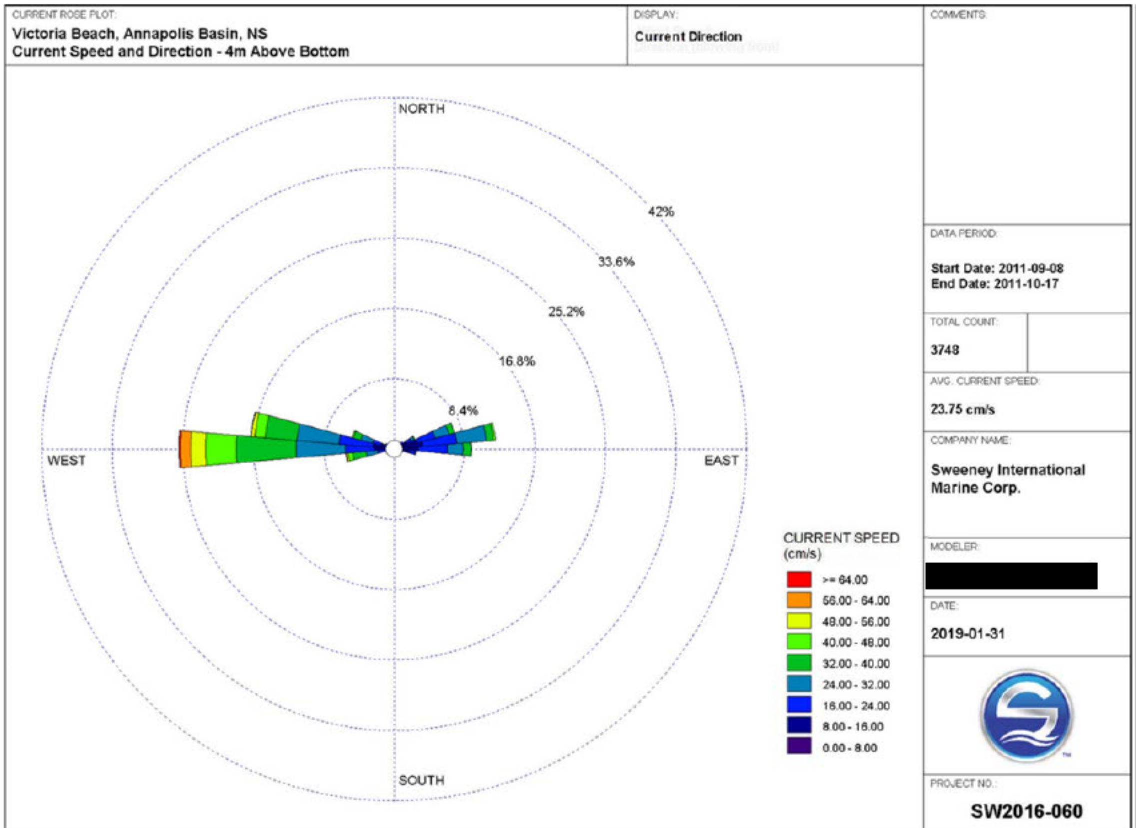

40m
44 40.1344 N
065 43.2788 W
2019/05/28 13:03:16

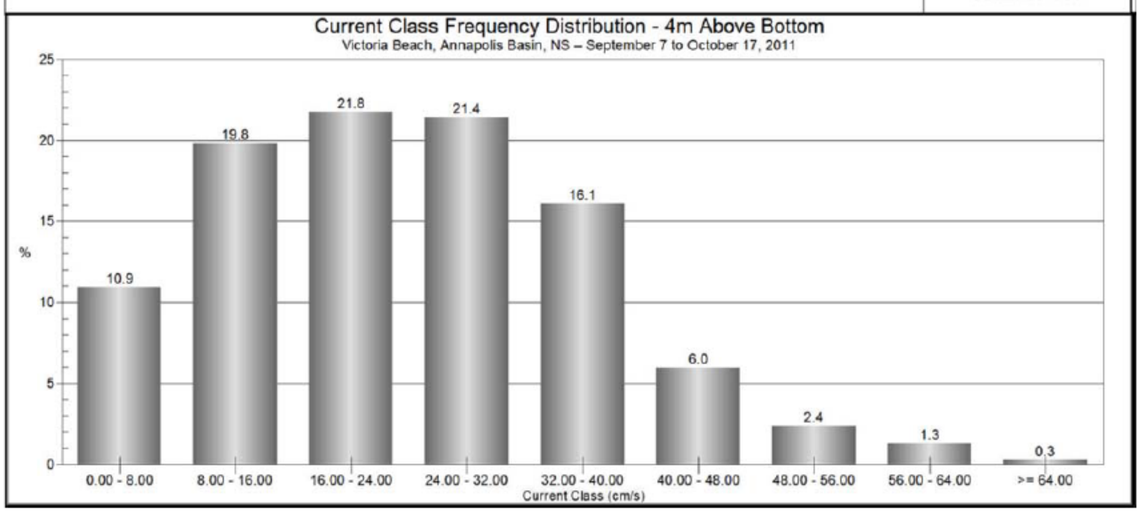

50m
44 40.1426 N
065 43.2879 W
2019/05/28 13:07:24

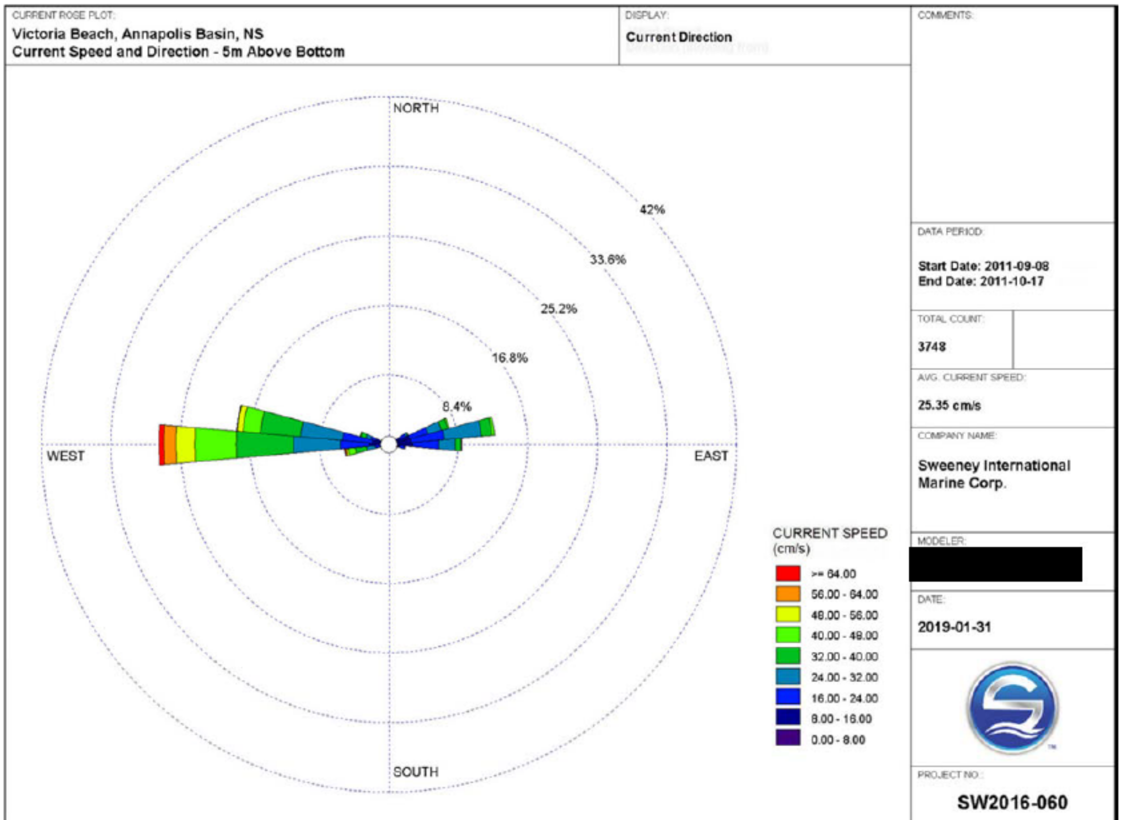
ANB-Reference Transect

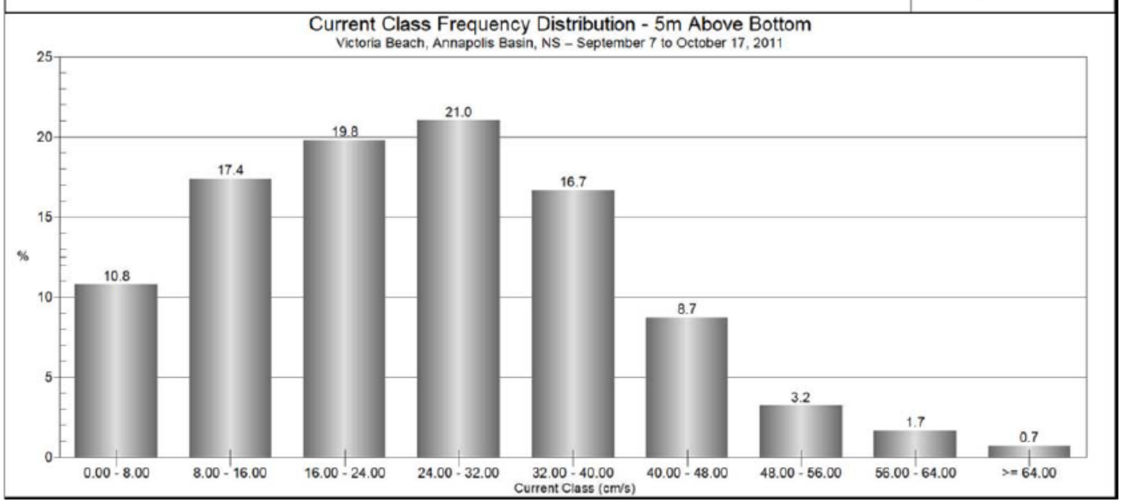


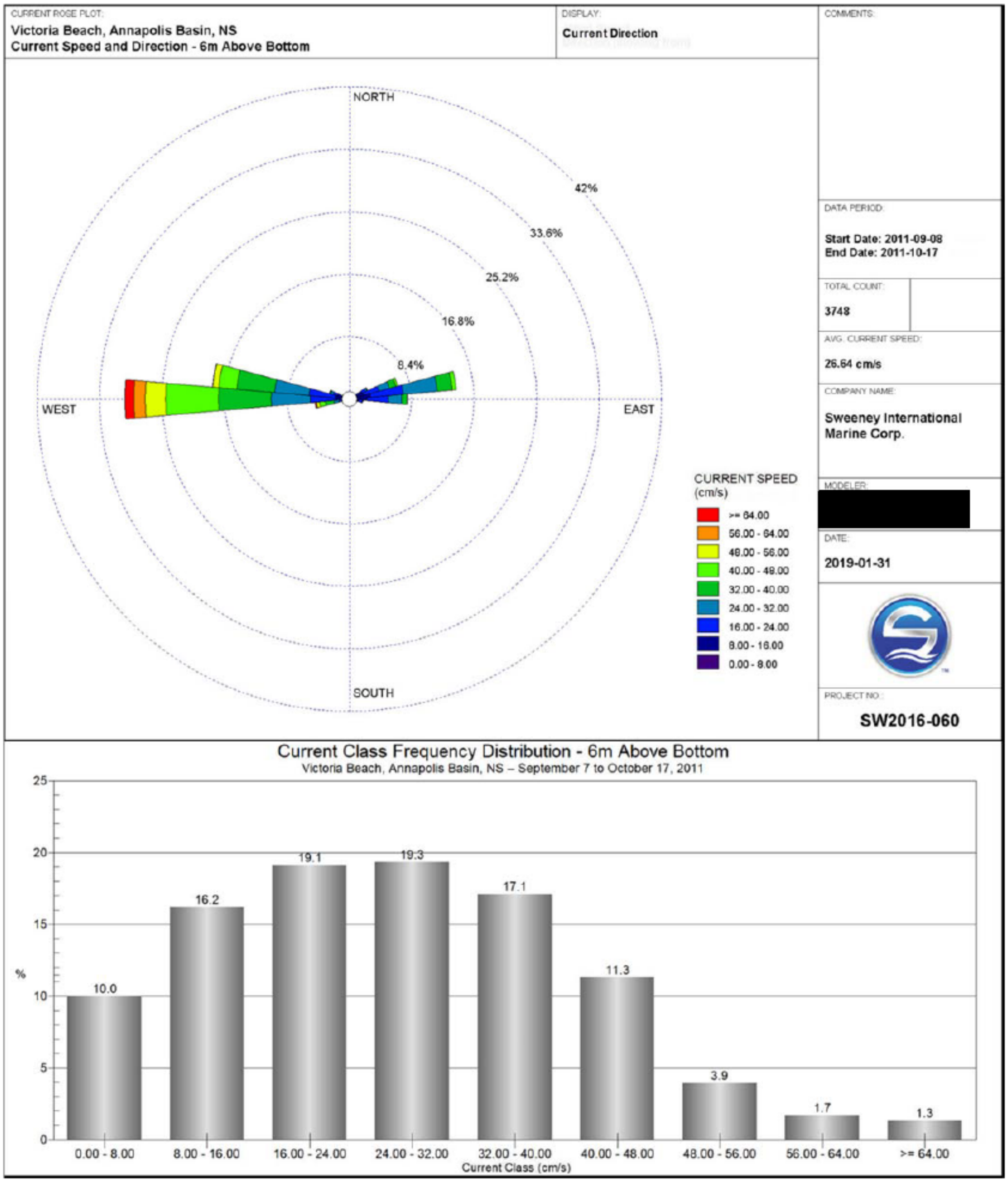
APPENDIX I
ADCP Data


CURRENT ROSE PLOT:
Victoria Beach, Annapolis Basin, NS
Current Speed and Direction - 4m Above Bottom
DISPLAY:
Current Direction
COMMENTS:
NORTH
SOUTH
WEST
EAST
42%
33.6%
25.2%
16.8%
8.4%
CURRENT SPEED (cm/s)
>= 64.00
56.00 - 64.00
48.00 - 56.00
40.00 - 48.00
32.00 - 40.00
24.00 - 32.00
16.00 - 24.00
8.00 - 16.00
0.00 - 8.00
DATA PERIOD:
Start Date: 2011-09-08
End Date: 2011-10-17
TOTAL COUNT:
3748
AVG. CURRENT SPEED:
23.75 cm/s
COMPANY NAME:
Sweeney International Marine Corp.
MODELER:
[redacted]
DATE:
2019-01-31
PROJECT NO.:
SW2016-060


Current Class Frequency Distribution - 4m Above Bottom
Victoria Beach, Annapolis Basin, NS – September 7 to October 17, 2011
%
25
20
15
10
5
0
10.9
19.8
21.8
21.4
16.1
6.0
2.4
1.3
0.3
0.00 - 8.00
8.00 - 16.00
16.00 - 24.00
24.00 - 32.00
32.00 - 40.00
40.00 - 48.00
48.00 - 56.00
56.00 - 64.00
>= 64.00
Current Class (cm/s)

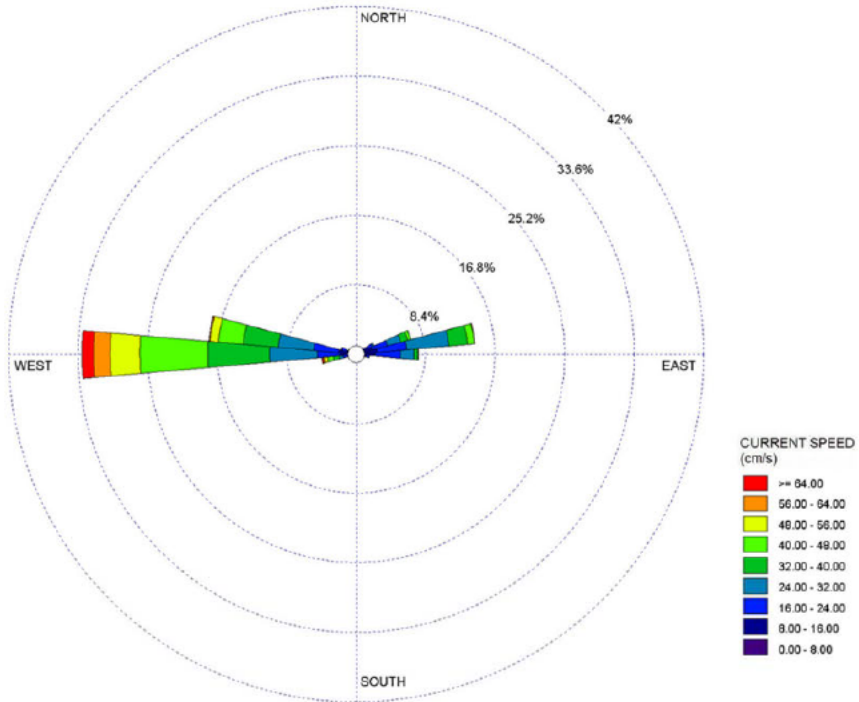

CURRENT ROSE PLOT:
Victoria Beach, Annapolis Basin, NS
Current Speed and Direction - 5m Above Bottom
DISPLAY:
Current Direction
COMMENTS:
NORTH
SOUTH
WEST
EAST
42%
33.6%
25.2%
16.8%
8.4%
CURRENT SPEED (cm/s)
>= 64.00
56.00 - 64.00
48.00 - 56.00
40.00 - 48.00
32.00 - 40.00
24.00 - 32.00
16.00 - 24.00
8.00 - 16.00
0.00 - 8.00
DATA PERIOD:
Start Date: 2011-09-08
End Date: 2011-10-17
TOTAL COUNT:
3748
AVG. CURRENT SPEED:
25.35 cm/s
COMPANY NAME:
Sweeney International Marine Corp.
MODELER:
[redacted]
DATE:
2019-01-31
PROJECT NO.:
SW2016-060


Current Class Frequency Distribution - 5m Above Bottom
Victoria Beach, Annapolis Basin, NS – September 7 to October 17, 2011
%
25
20
15
10
5
0
10.8
17.4
19.8
21.0
16.7
8.7
3.2
1.7
0.7
0.00 - 8.00
8.00 - 16.00
16.00 - 24.00
24.00 - 32.00
32.00 - 40.00
40.00 - 48.00
48.00 - 56.00
56.00 - 64.00
>= 64.00
Current Class (cm/s)


CURRENT ROSE PLOT:
Victoria Beach, Annapolis Basin, NS
Current Speed and Direction - 6m Above Bottom
DISPLAY:
Current Direction
COMMENTS:
NORTH
SOUTH
EAST
WEST
42%
33.6%
25.2%
16.8%
8.4%
CURRENT SPEED (cm/s)
>= 64.00
56.00 - 64.00
48.00 - 56.00
40.00 - 48.00
32.00 - 40.00
24.00 - 32.00
16.00 - 24.00
8.00 - 16.00
0.00 - 8.00
DATA PERIOD:
Start Date: 2011-09-08
End Date: 2011-10-17
TOTAL COUNT:
3748
AVG. CURRENT SPEED:
26.64 cm/s
COMPANY NAME:
Sweeney International Marine Corp.
MODELER:
[redacted]
DATE:
2019-01-31
PROJECT NO.:
SW2016-060
Current Class Frequency Distribution - 6m Above Bottom
Victoria Beach, Annapolis Basin, NS – September 7 to October 17, 2011
%
0
5
10
15
20
25
10.0
16.2
19.1
19.3
17.1
11.3
3.9
1.7
1.3
0.00 - 8.00
8.00 - 16.00
16.00 - 24.00
24.00 - 32.00
32.00 - 40.00
40.00 - 48.00
48.00 - 56.00
56.00 - 64.00
>= 64.00
Current Class (cm/s)

CURRENT ROSE PLOT:
Victoria Beach, Annapolis Basin, NS
Current Speed and Direction - 7m Above Bottom

DISPLAY:
Current Direction



COMMENTS:

DATA PERIOD:
Start Date: 2011-09-08
End Date: 2011-10-17

TOTAL COUNT:
3748

AVG. CURRENT SPEED:
27.73 cm/s

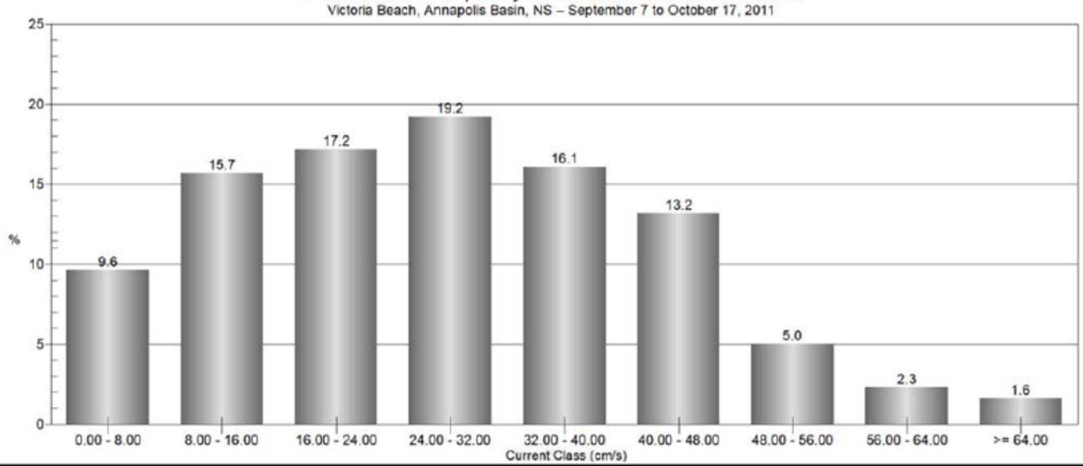
COMPANY NAME:
Sweeney International Marine Corp.

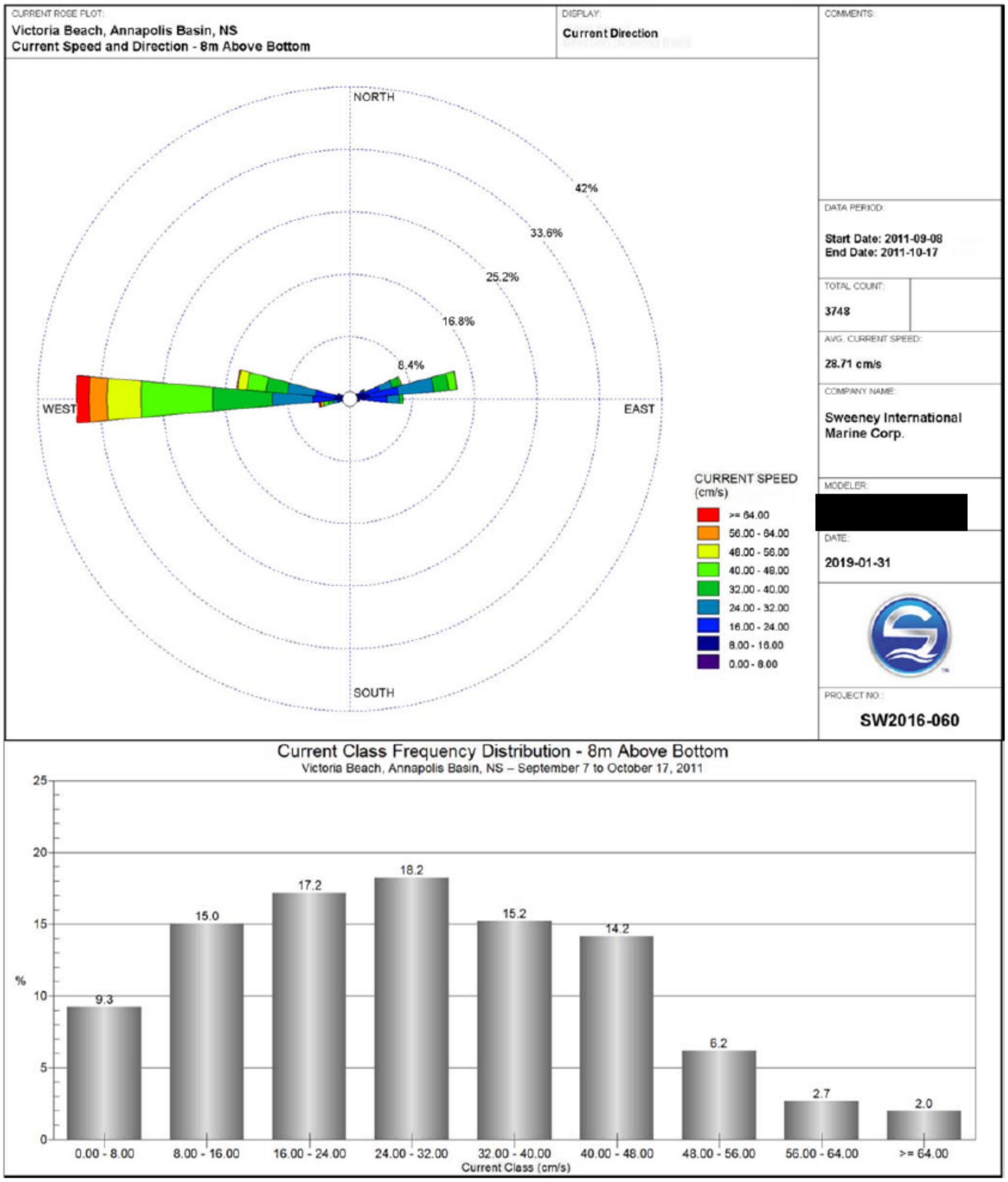
MODELER:
[redacted]

DATE:
2019-01-31

PROJECT NO.:
SW2016-060

Current Class Frequency Distribution - 7m Above Bottom
Victoria Beach, Annapolis Basin, NS – September 7 to October 17, 2011

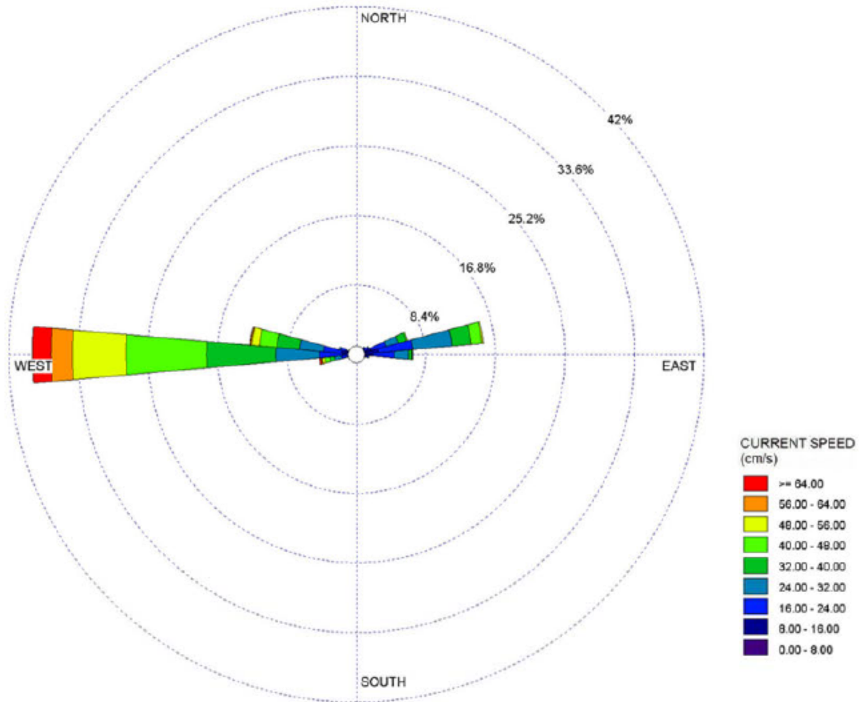



CURRENT ROSE PLOT:
Victoria Beach, Annapolis Basin, NS
Current Speed and Direction - 8m Above Bottom
DISPLAY:
Current Direction
COMMENTS:
NORTH
42%
33.6%
25.2%
16.8%
8.4%
WEST
EAST
SOUTH
CURRENT SPEED (cm/s)
>= 64.00
56.00 - 64.00
48.00 - 56.00
40.00 - 48.00
32.00 - 40.00
24.00 - 32.00
16.00 - 24.00
8.00 - 16.00
0.00 - 8.00
DATA PERIOD:
Start Date: 2011-09-08
End Date: 2011-10-17
TOTAL COUNT:
3748
AVG. CURRENT SPEED:
28.71 cm/s
COMPANY NAME:
Sweeney International Marine Corp.
MODELER:
[redacted]
DATE:
2019-01-31
PROJECT NO.:
SW2016-060
Current Class Frequency Distribution - 8m Above Bottom
Victoria Beach, Annapolis Basin, NS – September 7 to October 17, 2011
%
25
20
15
10
5
0
9.3
15.0
17.2
18.2
15.2
14.2
6.2
2.7
2.0
0.00 - 8.00
8.00 - 16.00
16.00 - 24.00
24.00 - 32.00
32.00 - 40.00
40.00 - 48.00
48.00 - 56.00
56.00 - 64.00
>= 64.00
Current Class (cm/s)

CURRENT ROSE PLOT:
Victoria Beach, Annapolis Basin, NS
Current Speed and Direction - 9m Above Bottom

DISPLAY:
Current Direction

COMMENTS:



DATA PERIOD:
Start Date: 2011-09-08
End Date: 2011-10-17

TOTAL COUNT:
3748

AVG. CURRENT SPEED:
29.57 cm/s

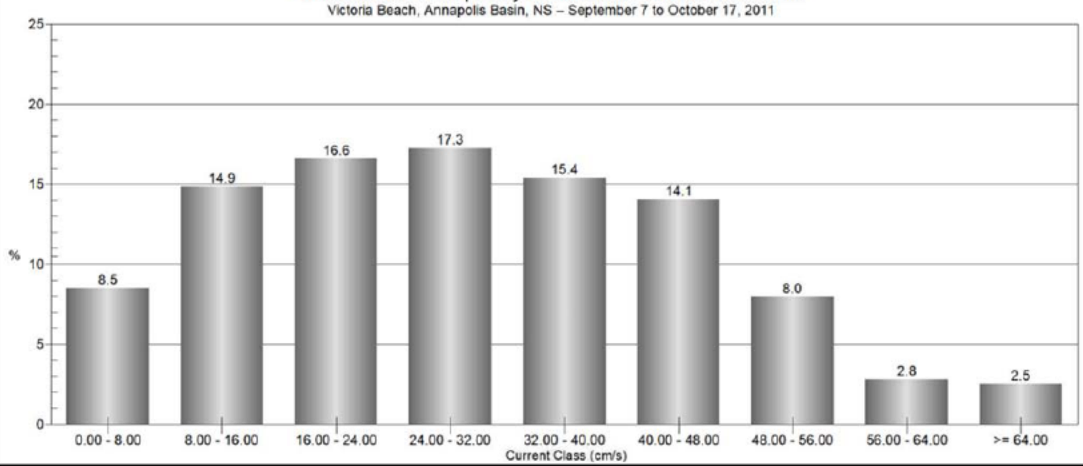
COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

DATE:
2019-01-31

PROJECT NO.:
SW2016-060

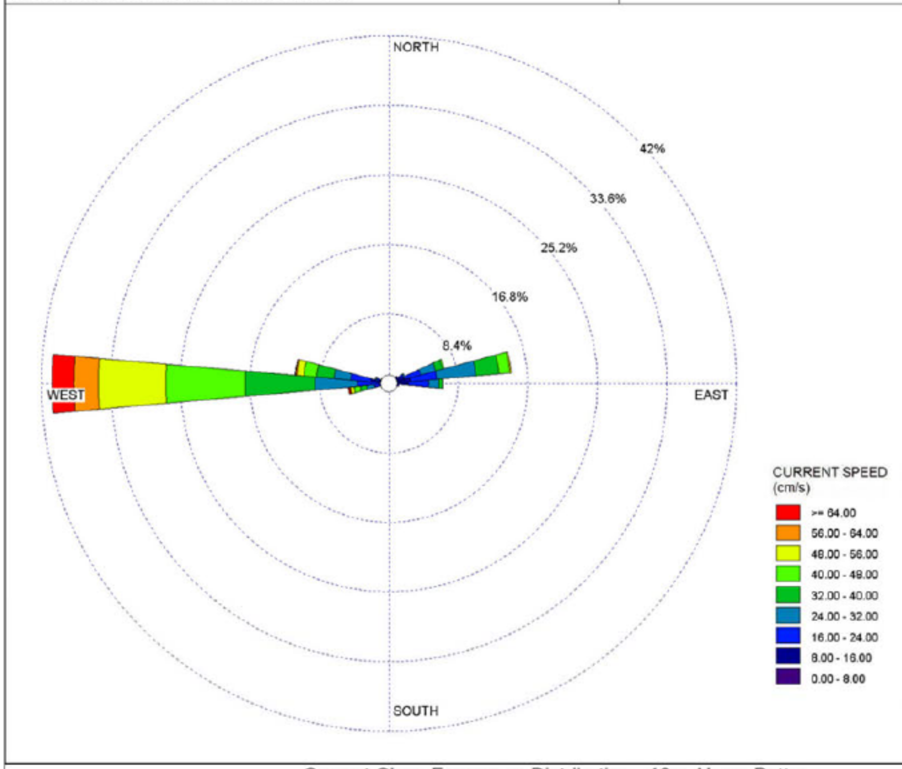
Current Class Frequency Distribution - 9m Above Bottom
Victoria Beach, Annapolis Basin, NS – September 7 to October 17, 2011



CURRENT ROSE PLOT:
Victoria Beach, Annapolis Basin, NS
Current Speed and Direction - 10m Above Bottom

DISPLAY:
Current Direction

COMMENTS:



DATA PERIOD:
Start Date: 2011-09-08
End Date: 2011-10-17

TOTAL COUNT:
3748

AVG. CURRENT SPEED:
30.31 cm/s

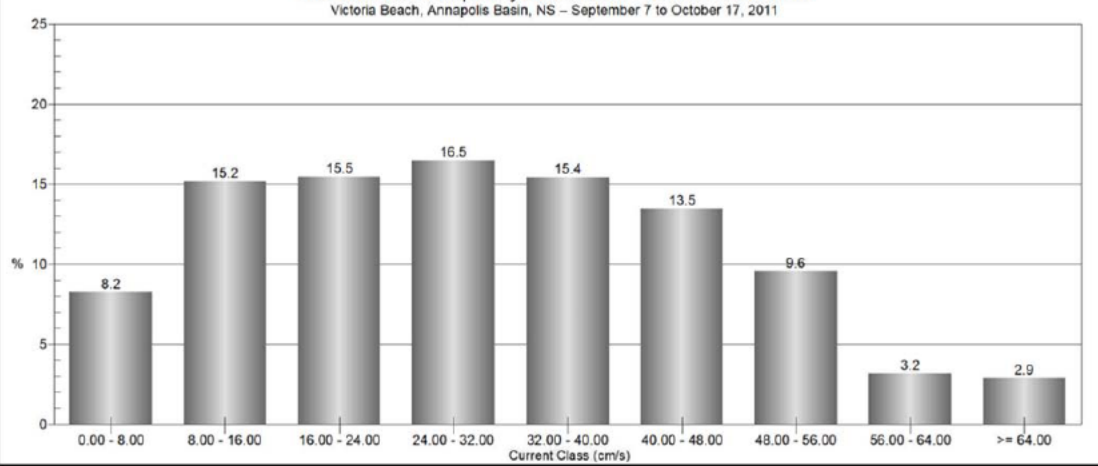
COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

DATE:
2019-01-31

PROJECT NO.:
SW2016-060

Current Class Frequency Distribution - 10m Above Bottom
Victoria Beach, Annapolis Basin, NS – September 7 to October 17, 2011



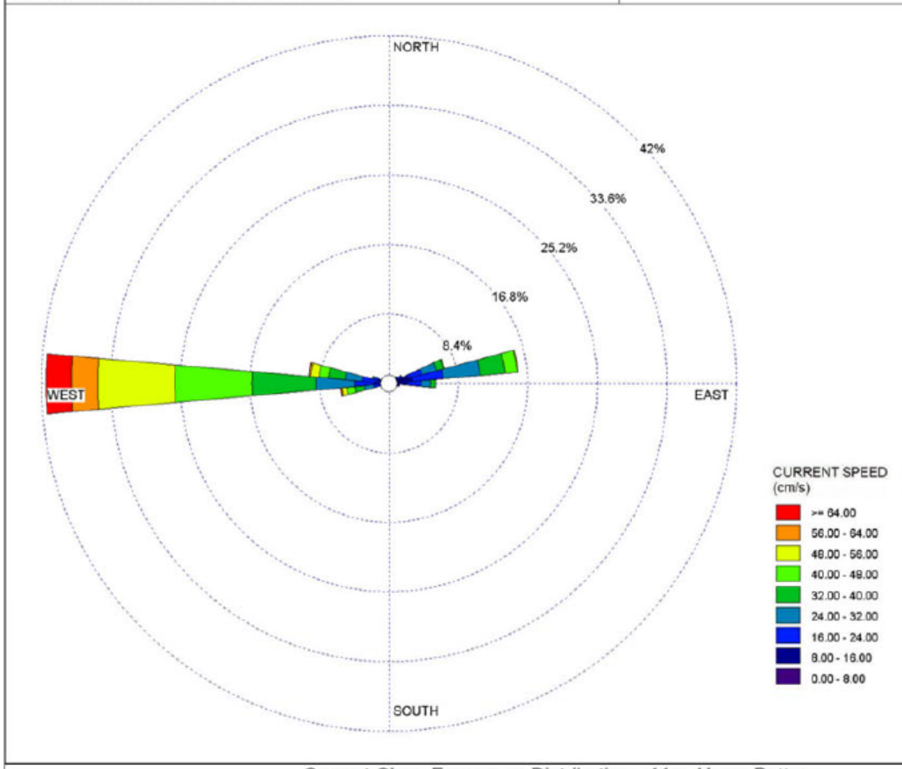
CURRENT ROSE PLOT:

Victoria Beach, Annapolis Basin, NS
Current Speed and Direction - 11m Above Bottom

DISPLAY:

Current Direction

COMMENTS:



DATA PERIOD:

Start Date: 2011-09-08
End Date: 2011-10-17

TOTAL COUNT:

3748

AVG. CURRENT SPEED:

30.98 cm/s

COMPANY NAME:

Sweeney International Marine Corp.

MODELER:

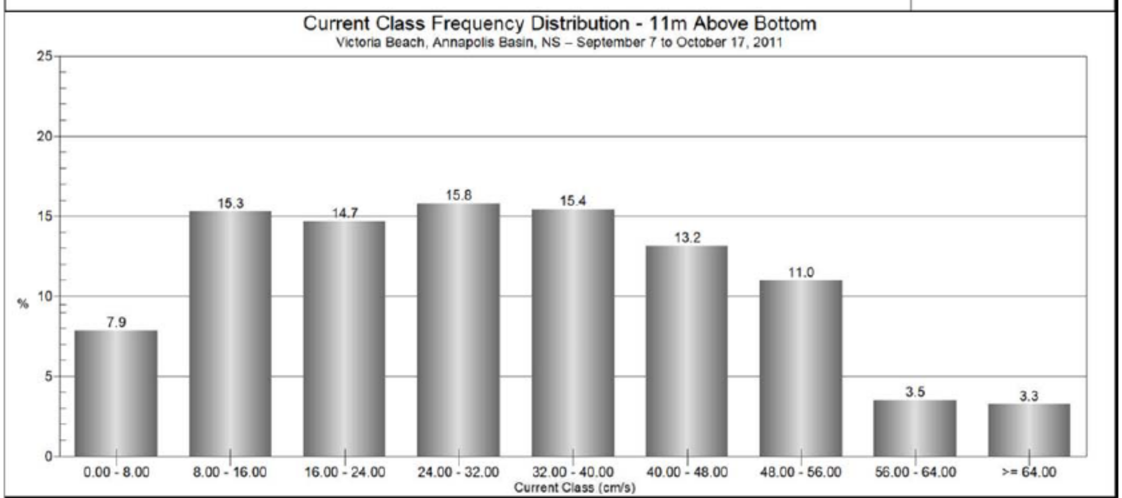
[redacted]

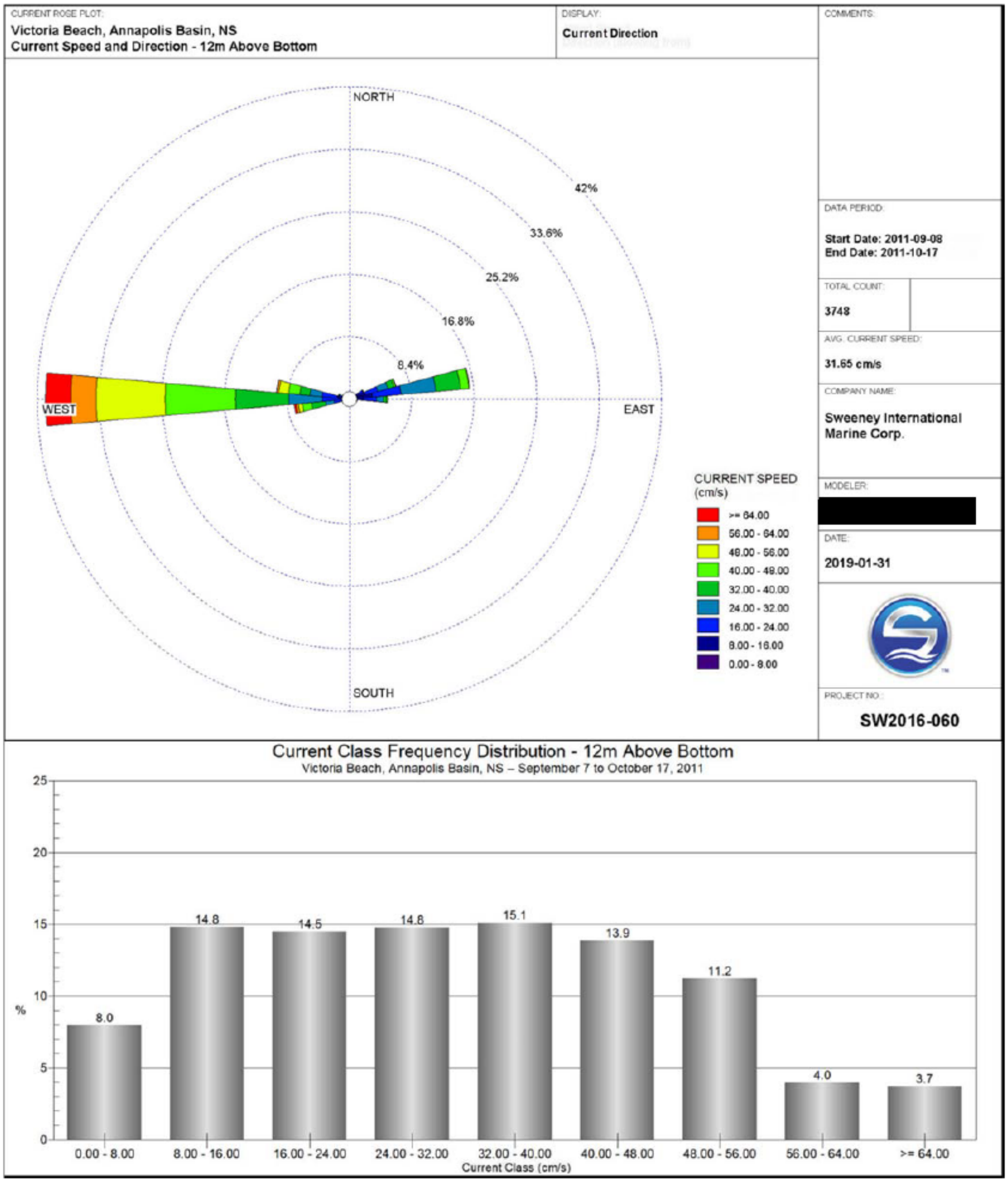
DATE:

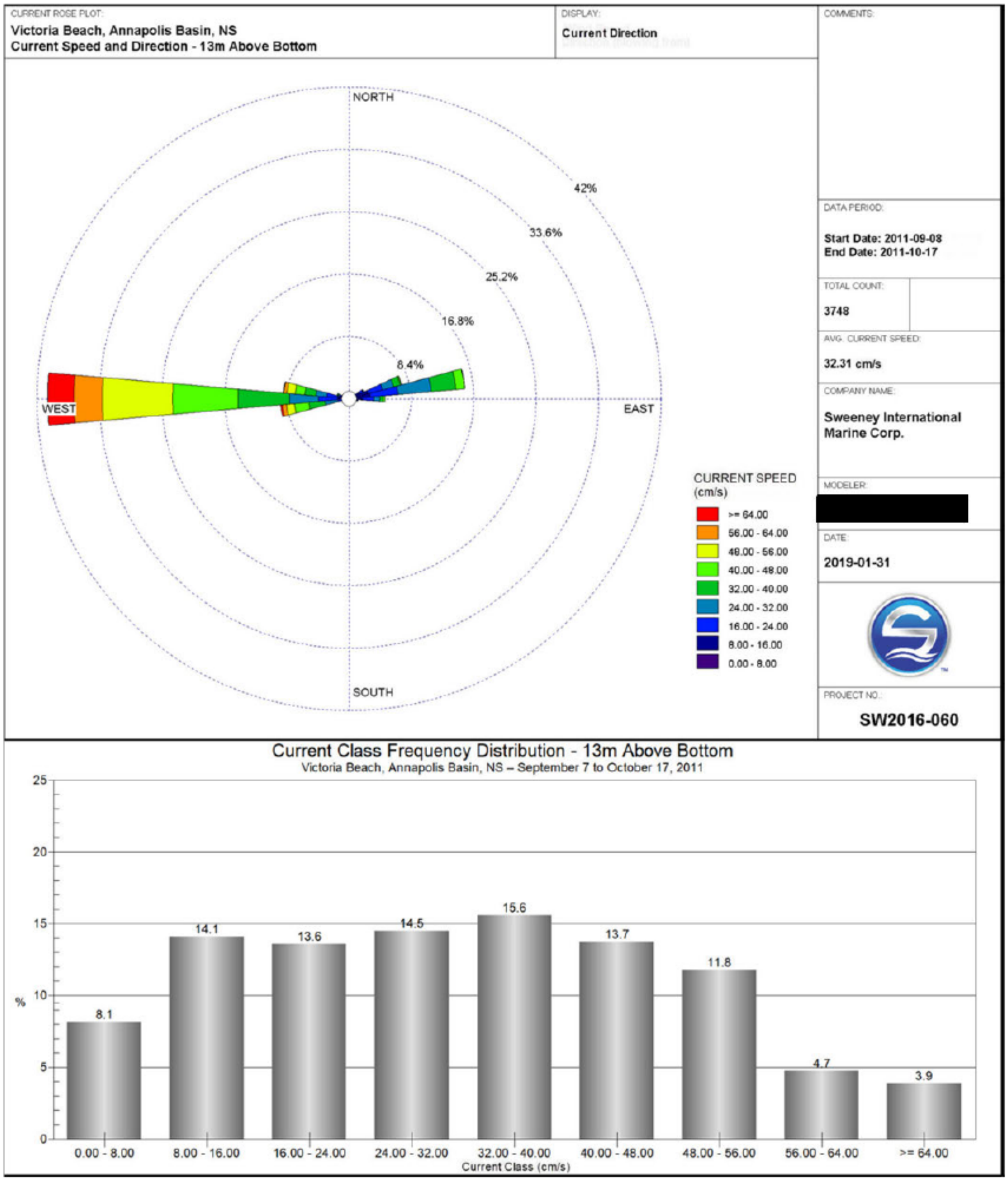
2019-01-31

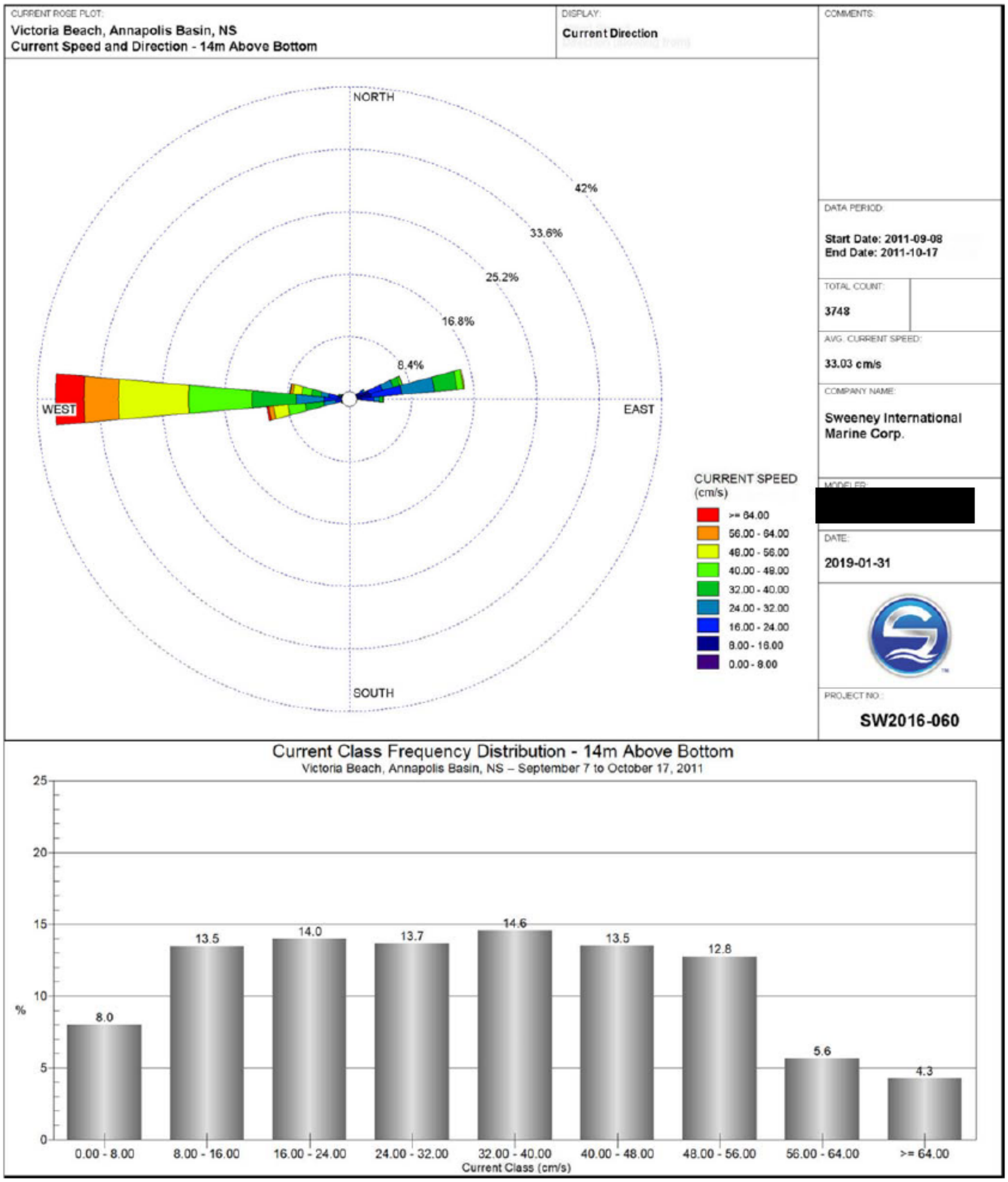
PROJECT NO.:

SW2016-060



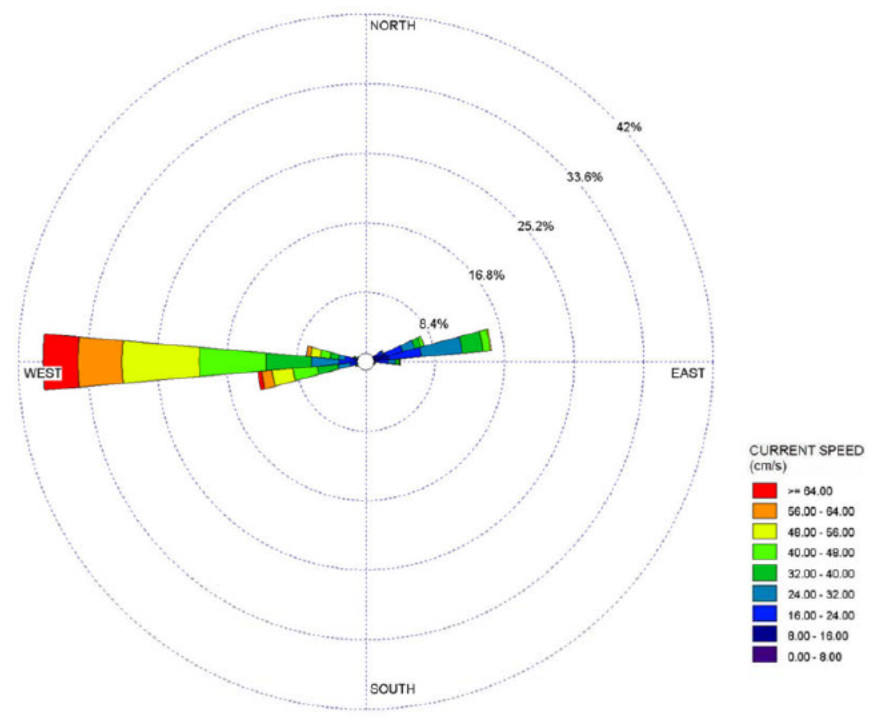

CURRENT ROSE PLOT:
Victoria Beach, Annapolis Basin, NS
Current Speed and Direction - 12m Above Bottom
DISPLAY:
Current Direction
COMMENTS:
NORTH
SOUTH
EAST
WEST
8.4%
16.8%
25.2%
33.6%
42%
CURRENT SPEED (cm/s)
>= 64.00
56.00 - 64.00
48.00 - 56.00
40.00 - 48.00
32.00 - 40.00
24.00 - 32.00
16.00 - 24.00
8.00 - 16.00
0.00 - 8.00
DATA PERIOD:
Start Date: 2011-09-08
End Date: 2011-10-17
TOTAL COUNT:
3748
AVG. CURRENT SPEED:
31.65 cm/s
COMPANY NAME:
Sweeney International Marine Corp.
MODELER:
[redacted]
DATE:
2019-01-31
PROJECT NO.:
SW2016-060
Current Class Frequency Distribution - 12m Above Bottom
Victoria Beach, Annapolis Basin, NS – September 7 to October 17, 2011
%
Current Class (cm/s)
0.00 - 8.00
8.00 - 16.00
16.00 - 24.00
24.00 - 32.00
32.00 - 40.00
40.00 - 48.00
48.00 - 56.00
56.00 - 64.00
>= 64.00
8.0
14.8
14.5
14.8
15.1
13.9
11.2
4.0
3.7
0
5
10
15
20
25


CURRENT ROSE PLOT:
Victoria Beach, Annapolis Basin, NS
Current Speed and Direction - 13m Above Bottom
DISPLAY:
Current Direction
COMMENTS:
NORTH
SOUTH
EAST
WEST
42%
33.6%
25.2%
16.8%
8.4%
CURRENT SPEED (cm/s)
>= 64.00
56.00 - 64.00
48.00 - 56.00
40.00 - 48.00
32.00 - 40.00
24.00 - 32.00
16.00 - 24.00
8.00 - 16.00
0.00 - 8.00
DATA PERIOD:
Start Date: 2011-09-08
End Date: 2011-10-17
TOTAL COUNT:
3748
AVG. CURRENT SPEED:
32.31 cm/s
COMPANY NAME:
Sweeney International Marine Corp.
MODELER:
[redacted]
DATE:
2019-01-31
PROJECT NO.:
SW2016-060
Current Class Frequency Distribution - 13m Above Bottom
Victoria Beach, Annapolis Basin, NS – September 7 to October 17, 2011
%
25
20
15
10
5
0
8.1
14.1
13.6
14.5
15.6
13.7
11.8
4.7
3.9
0.00 - 8.00
8.00 - 16.00
16.00 - 24.00
24.00 - 32.00
32.00 - 40.00
40.00 - 48.00
48.00 - 56.00
56.00 - 64.00
>= 64.00
Current Class (cm/s)


CURRENT ROSE PLOT:
Victoria Beach, Annapolis Basin, NS
Current Speed and Direction - 14m Above Bottom
DISPLAY:
Current Direction
COMMENTS:
DATA PERIOD:
Start Date: 2011-09-08
End Date: 2011-10-17
TOTAL COUNT:
3748
AVG. CURRENT SPEED:
33.03 cm/s
COMPANY NAME:
Sweeney International Marine Corp.
MODELER:
[redacted]
DATE:
2019-01-31
PROJECT NO.:
SW2016-060
NORTH
SOUTH
EAST
WEST
42%
33.6%
25.2%
16.8%
8.4%
CURRENT SPEED (cm/s)
>= 64.00
56.00 - 64.00
48.00 - 56.00
40.00 - 48.00
32.00 - 40.00
24.00 - 32.00
16.00 - 24.00
8.00 - 16.00
0.00 - 8.00
Current Class Frequency Distribution - 14m Above Bottom
Victoria Beach, Annapolis Basin, NS – September 7 to October 17, 2011
%
25
20
15
10
5
0
8.0
13.5
14.0
13.7
14.6
13.5
12.8
5.6
4.3
0.00 - 8.00
8.00 - 16.00
16.00 - 24.00
24.00 - 32.00
32.00 - 40.00
40.00 - 48.00
48.00 - 56.00
56.00 - 64.00
>= 64.00
Current Class (cm/s)

CURRENT ROSE PLOT:
Victoria Beach, Annapolis Basin, NS
Current Speed and Direction - 15m Above Bottom

DISPLAY:
Current Direction



COMMENTS:

DATA PERIOD:
Start Date: 2011-09-08
End Date: 2011-10-17

TOTAL COUNT:
3748

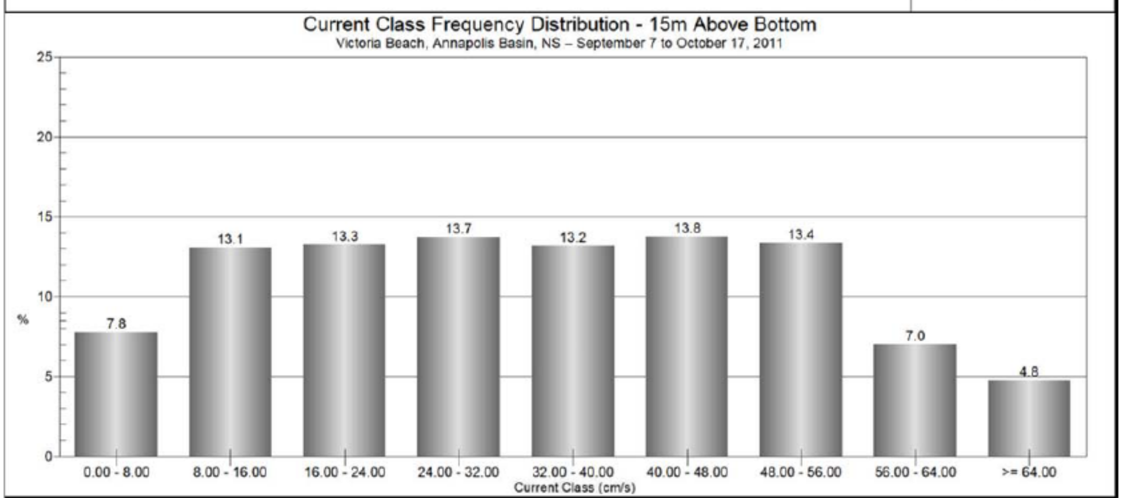
AVG. CURRENT SPEED:
33.87 cm/s

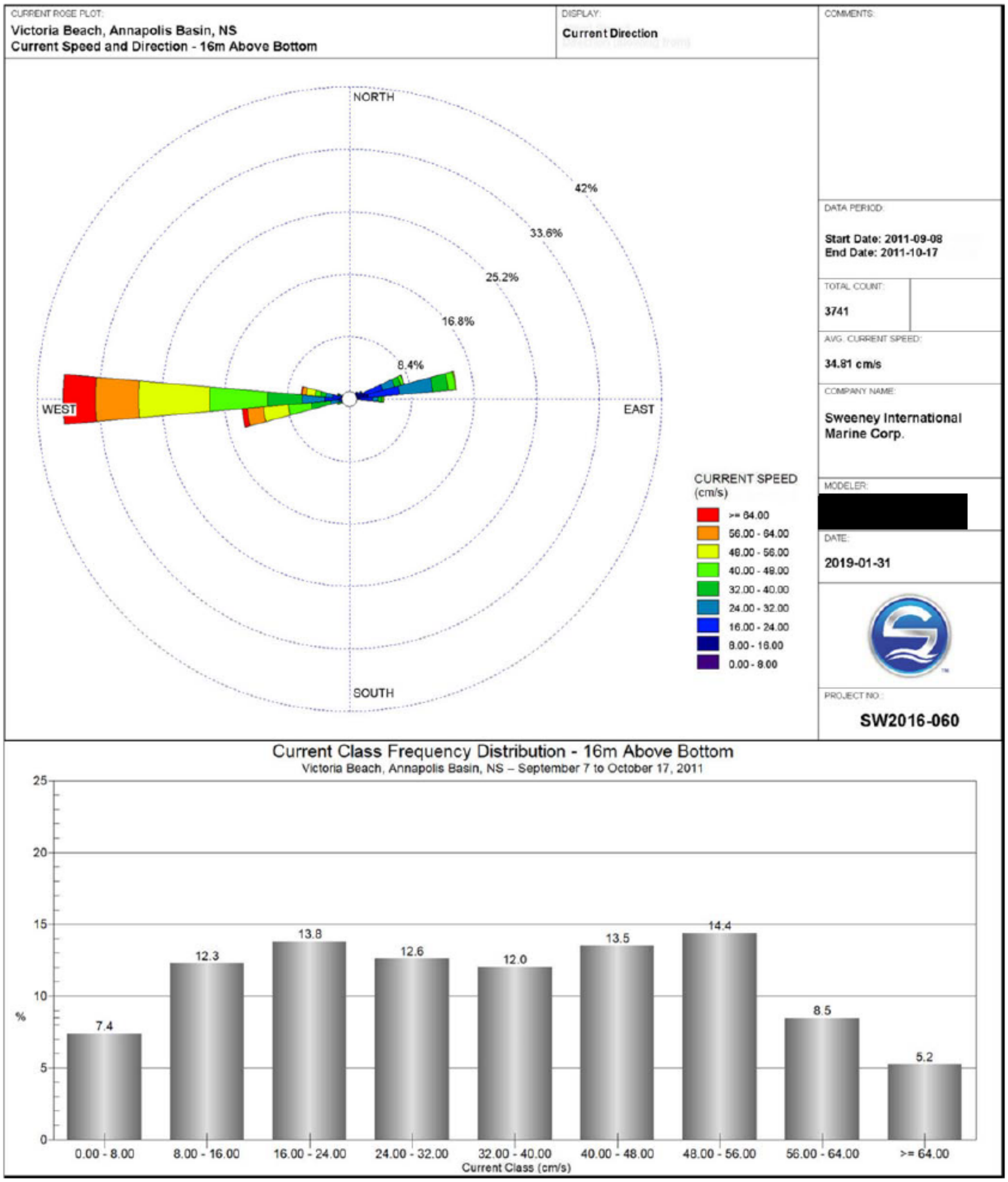
COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

DATE:
2019-01-31

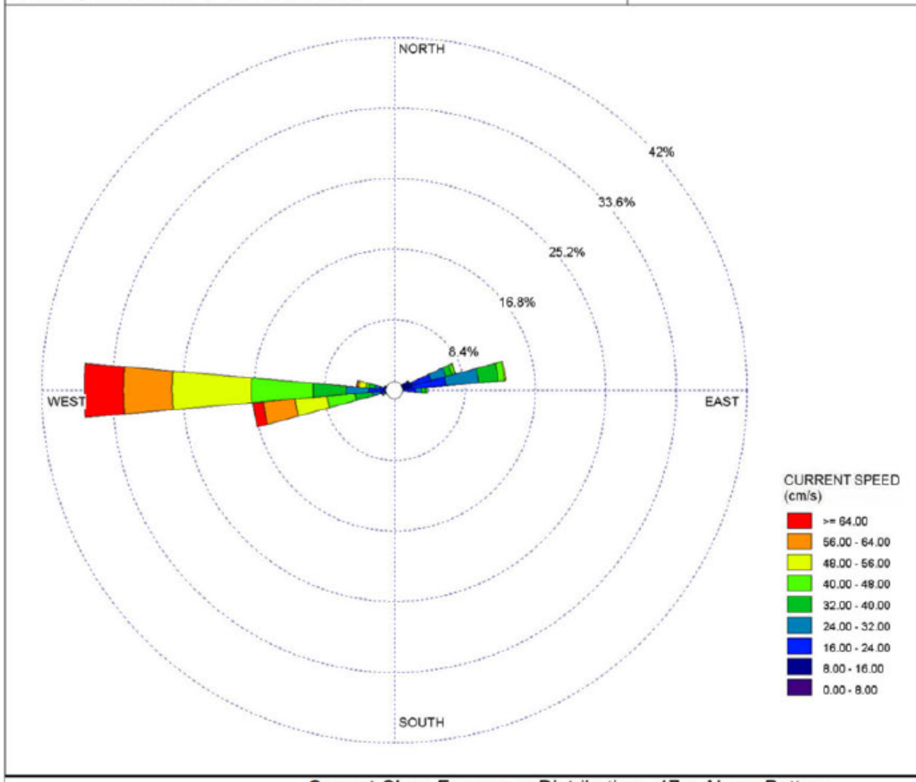
PROJECT NO.:
SW2016-060




CURRENT ROSE PLOT:
Victoria Beach, Annapolis Basin, NS
Current Speed and Direction - 16m Above Bottom
DISPLAY:
Current Direction
COMMENTS:
NORTH
SOUTH
WEST
EAST
42%
33.6%
25.2%
16.8%
8.4%
CURRENT SPEED (cm/s)
>= 64.00
56.00 - 64.00
48.00 - 56.00
40.00 - 48.00
32.00 - 40.00
24.00 - 32.00
16.00 - 24.00
8.00 - 16.00
0.00 - 8.00
DATA PERIOD:
Start Date: 2011-09-08
End Date: 2011-10-17
TOTAL COUNT:
3741
AVG. CURRENT SPEED:
34.81 cm/s
COMPANY NAME:
Sweeney International Marine Corp.
MODELER:
[redacted]
DATE:
2019-01-31
PROJECT NO.:
SW2016-060
Current Class Frequency Distribution - 16m Above Bottom
Victoria Beach, Annapolis Basin, NS – September 7 to October 17, 2011
25
20
15
10
5
0
%
7.4
12.3
13.8
12.6
12.0
13.5
14.4
8.5
5.2
0.00 - 8.00
8.00 - 16.00
16.00 - 24.00
24.00 - 32.00
32.00 - 40.00
40.00 - 48.00
48.00 - 56.00
56.00 - 64.00
>= 64.00
Current Class (cm/s)

CURRENT ROSE PLOT:
Victoria Beach, Annapolis Basin, NS
Current Speed and Direction - 17m Above Bottom

DISPLAY:
Current Direction



COMMENTS:

DATA PERIOD:
Start Date: 2011-09-08
End Date: 2011-10-17

TOTAL COUNT:
3556

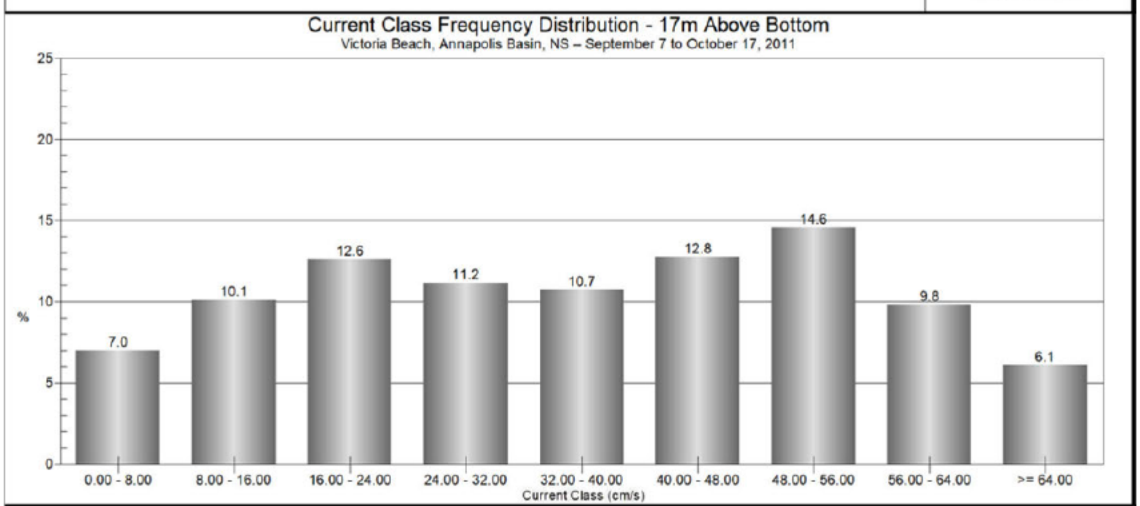
AVG. CURRENT SPEED:
36.39 cm/s

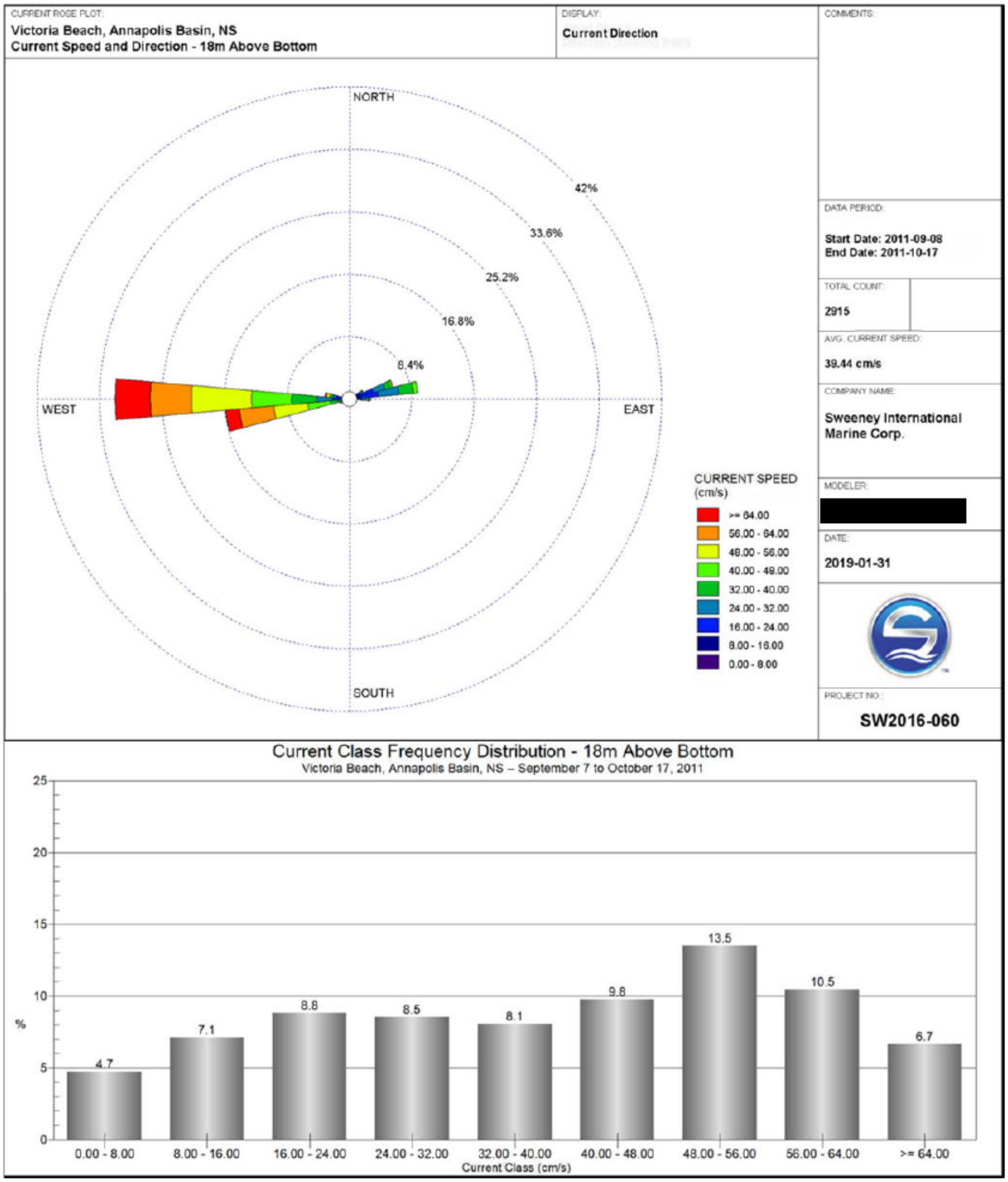
COMPANY NAME:
Sweeney International Marine Corp.

[redacted]

DATE:
2019-01-31

PROJECT NO.:
SW2016-060




CURRENT ROSE PLOT:
Victoria Beach, Annapolis Basin, NS
Current Speed and Direction - 18m Above Bottom
DISPLAY:
Current Direction
COMMENTS:
NORTH
SOUTH
WEST
EAST
42%
33.6%
25.2%
16.8%
8.4%
CURRENT SPEED (cm/s)
>= 64.00
56.00 - 64.00
48.00 - 56.00
40.00 - 48.00
32.00 - 40.00
24.00 - 32.00
16.00 - 24.00
8.00 - 16.00
0.00 - 8.00
DATA PERIOD:
Start Date: 2011-09-08
End Date: 2011-10-17
TOTAL COUNT:
2915
AVG. CURRENT SPEED:
39.44 cm/s
COMPANY NAME:
Sweeney International Marine Corp.
MODELER:
[redacted]
DATE:
2019-01-31
PROJECT NO.:
SW2016-060
Current Class Frequency Distribution - 18m Above Bottom
Victoria Beach, Annapolis Basin, NS – September 7 to October 17, 2011
25
20
15
10
5
0
%
4.7
7.1
8.8
8.5
8.1
9.8
13.5
10.5
6.7
0.00 - 8.00
8.00 - 16.00
16.00 - 24.00
24.00 - 32.00
32.00 - 40.00
40.00 - 48.00
48.00 - 56.00
56.00 - 64.00
>= 64.00
Current Class (cm/s)

CURRENT ROSE PLOT:
Victoria Beach, Annapolis Basin, NS
Current Speed and Direction - 19m Above Bottom

DISPLAY:
Current Direction

COMMENTS:

DATA PERIOD:
Start Date: 2011-09-08
End Date: 2011-10-17

TOTAL COUNT:
2378

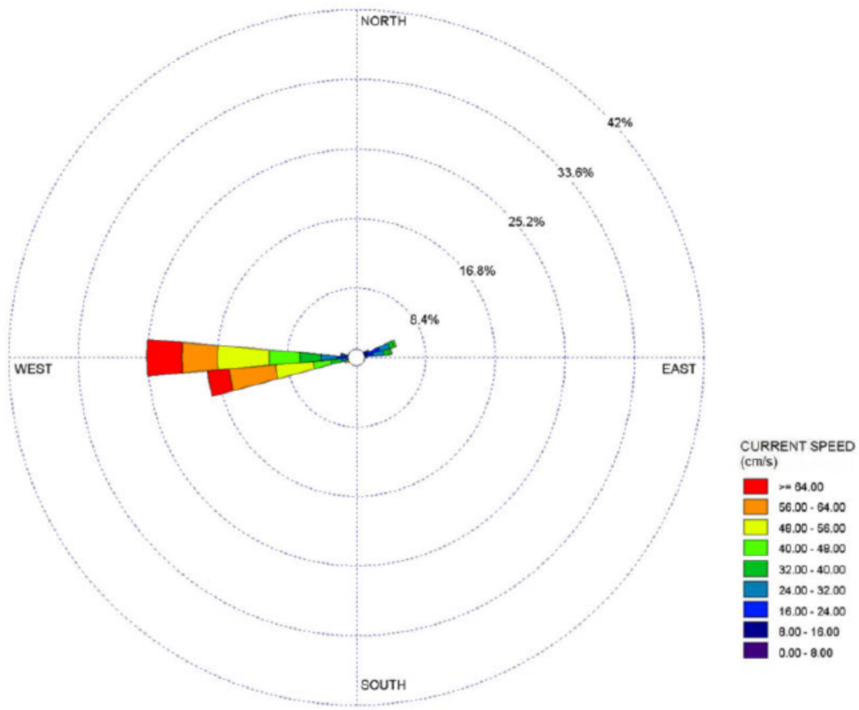
AVG. CURRENT SPEED:
40.94 cm/s

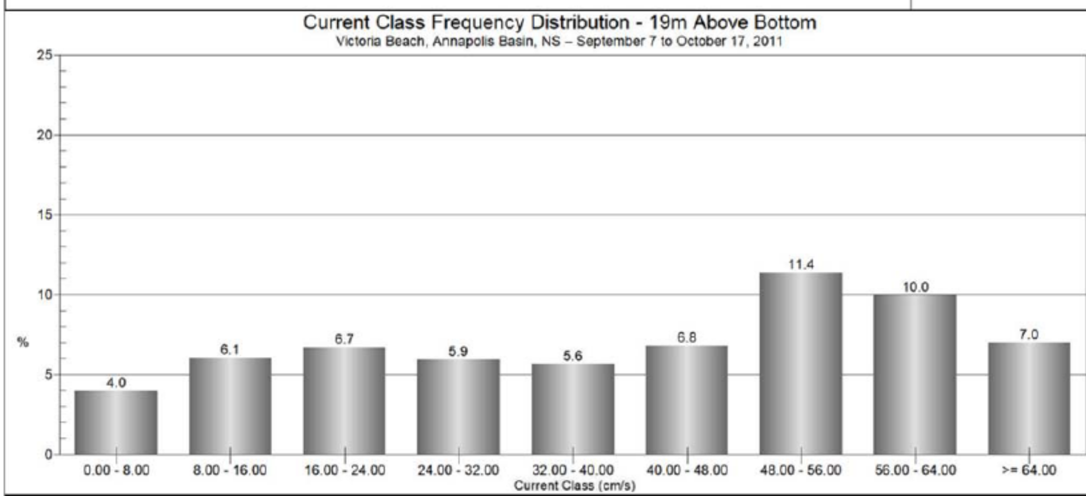
COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

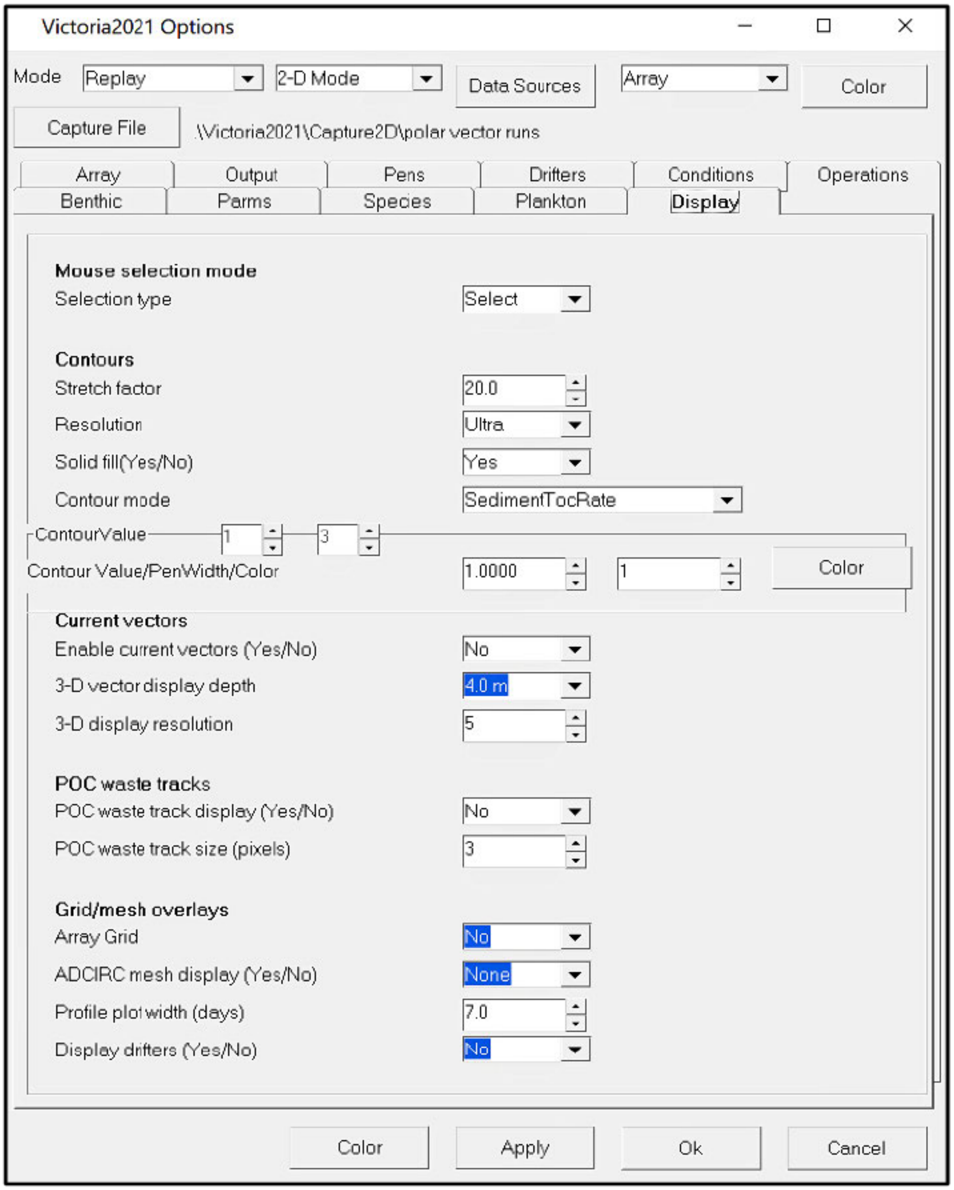
DATE:
2019-01-31

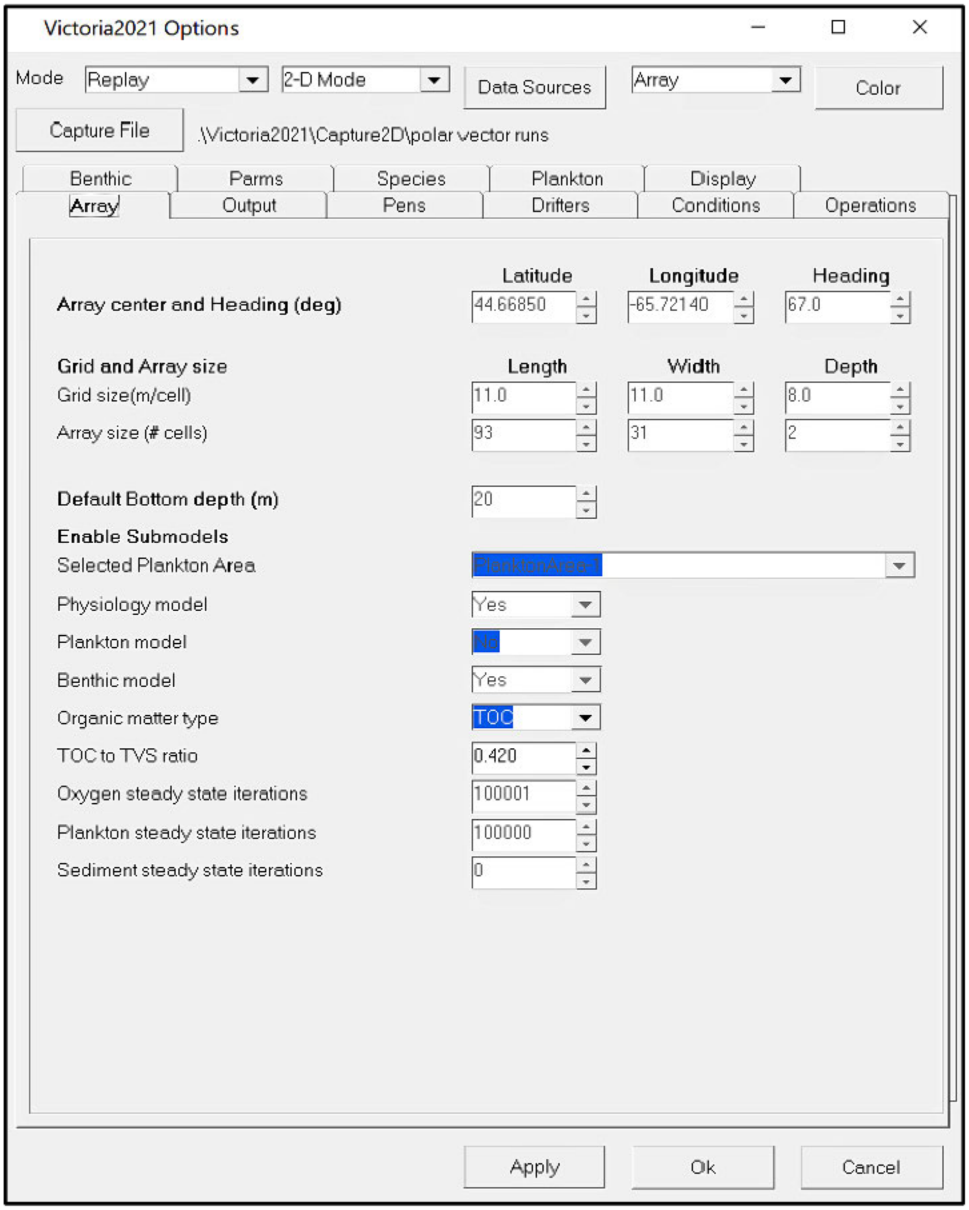
PROJECT NO.:
SW2016-060



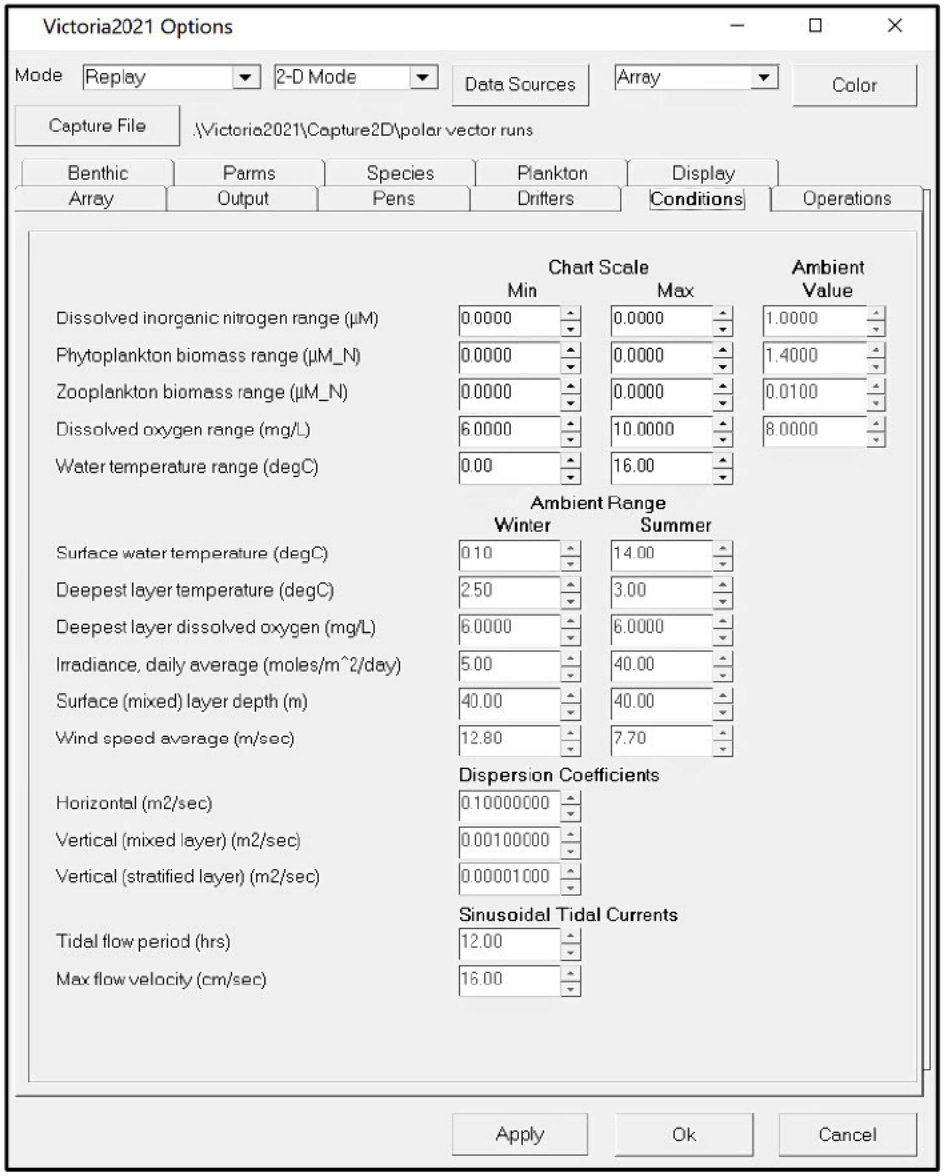


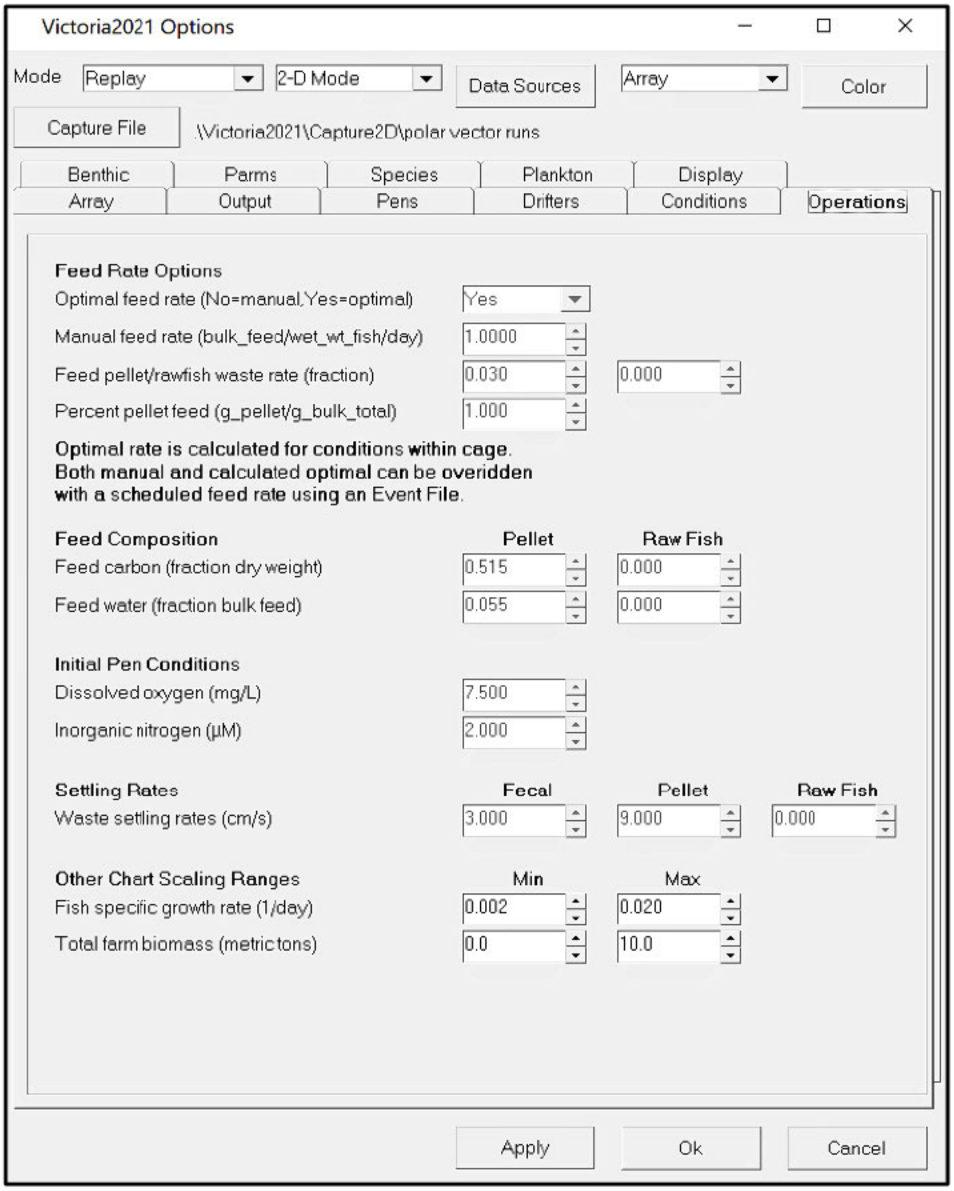
Appendix J
AquaModel Settings


Victoria2021 Options
Mode
Replay
2-D Mode
Data Sources
Array
Color
Capture File
\Victoria2021\Capture2D\polar vector runs
Array
Output
Pens
Drifters
Conditions
Operations
Benthic
Parms
Species
Plankton
Display
Mouse selection mode
Selection type
Select
Contours
Stretch factor
20.0
Resolution
Ultra
Solid fill(Yes/No)
Yes
Contour mode
SedimentTocRate
ContourValue
1
3
Contour Value/PenWidth/Color
1.0000
1
Color
Current vectors
Enable current vectors (Yes/No)
No
3-D vector display depth
4.0 m
3-D display resolution
5
POC waste tracks
POC waste track display (Yes/No)
No
POC waste track size (pixels)
3
Grid/mesh overlays
Array Grid
No
ADCIRC mesh display (Yes/No)
None
Profile plot width (days)
7.0
Display drifters (Yes/No)
No
Color
Apply
Ok
Cancel

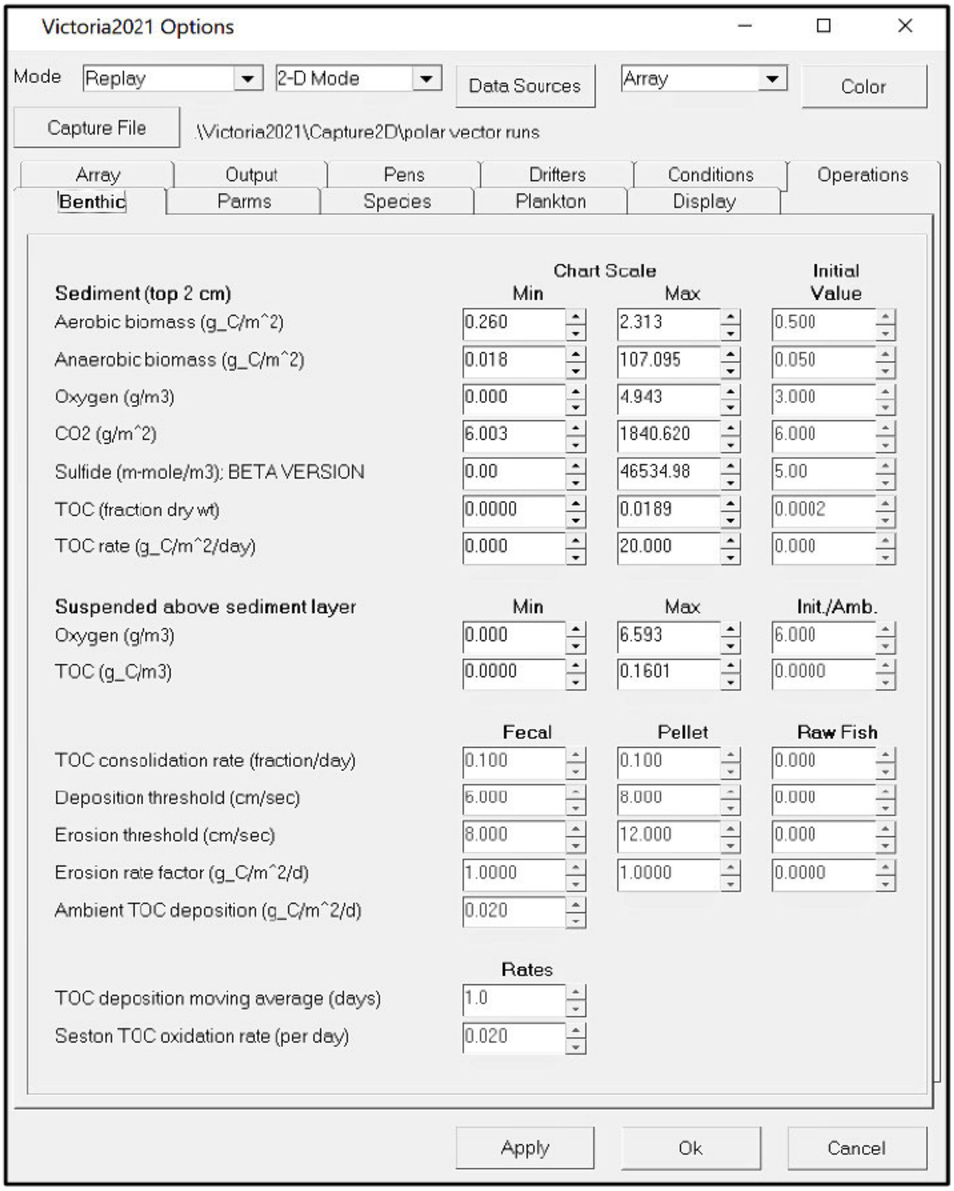

Victoria2021 Options
Mode
Replay
2-D Mode
Data Sources
Array
Color
Capture File
.\Victoria2021\Capture2D\polar vector runs
Benthic
Parms
Species
Plankton
Display
Array
Output
Pens
Drifters
Conditions
Operations
Latitude
Longitude
Heading
Array center and Heading (deg)
44.66850
-65.72140
67.0
Grid and Array size
Length
Width
Depth
Grid size(m/cell)
11.0
11.0
8.0
Array size (# cells)
93
31
2
Default Bottom depth (m)
20
Enable Submodels
Selected Plankton Area
Physiology model
Yes
Plankton model
Benthic model
Yes
Organic matter type
TOC
TOC to TVS ratio
0.420
Oxygen steady state iterations
100001
Plankton steady state iterations
100000
Sediment steady state iterations
0
Apply
Ok
Cancel

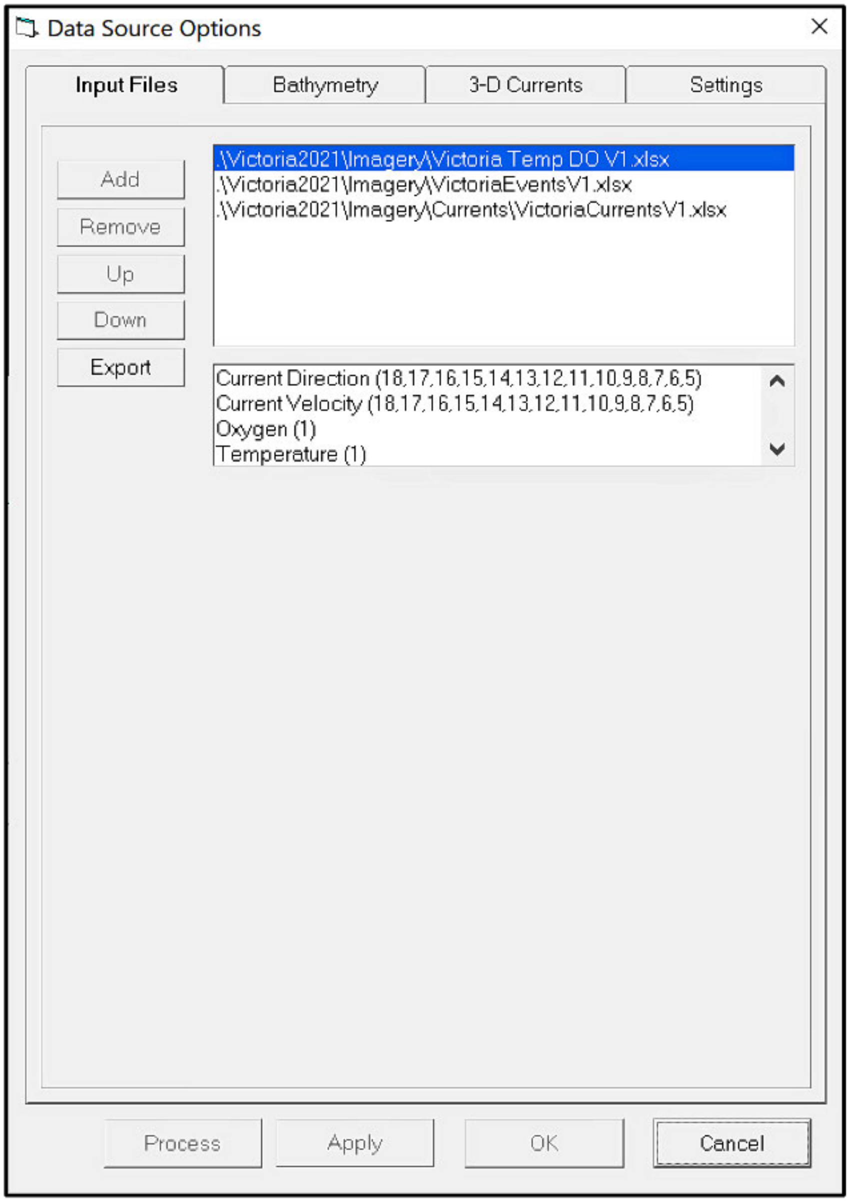

Victoria2021 Options
Mode
Replay
2-D Mode
Data Sources
Array
Color
Capture File
.\Victoria2021\Capture2D\polar vector runs
Benthic
Parms
Species
Plankton
Display
Array
Output
Pens
Drifters
Conditions
Operations
Pen
1
of
20
Species
AtlanticSalmonNS
Pen Shape
Circular
Pen Color
Black
Pen lat/lon/depth (deg,m)
44.66797
-65.72425
4.5
Pen size L/W/H (m)
28.21
28.21
9.00
Fish weight/density/Ox Lim (g;kg/m3;mg/L)
150.0000
0.6911
5.0000
Pen temperature offset (degC)
0.00
Apply
Ok
Cancel

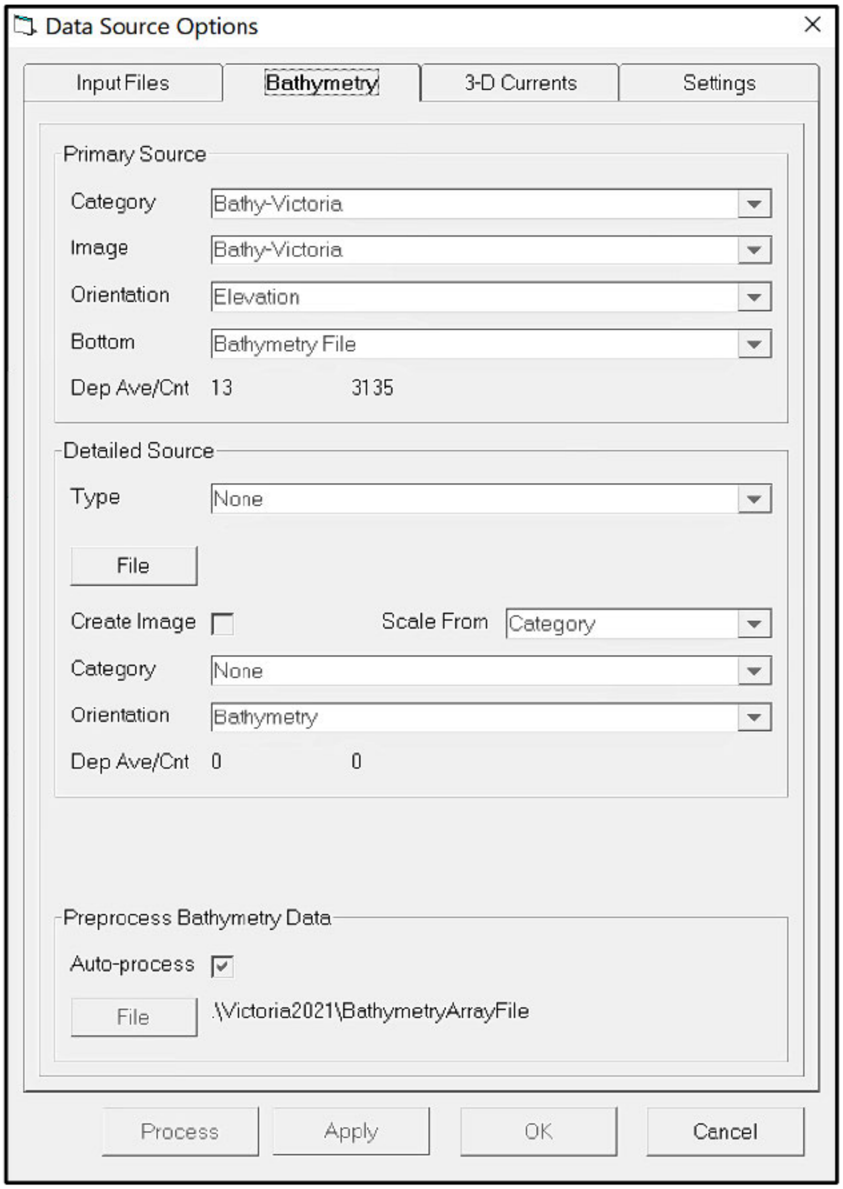

Victoria2021 Options
Mode
Replay
2-D Mode
Data Sources
Array
Color
Capture File
.\Victoria2021\Capture2D\polar vector runs
Benthic
Parms
Species
Plankton
Display
Array
Output
Pens
Drifters
Conditions
Operations
Chart Scale
Min
Max
Ambient Value
Dissolved inorganic nitrogen range (µM) 0.0000 0.0000 1.0000
Phytoplankton biomass range (µM_N) 0.0000 0.0000 1.4000
Zooplankton biomass range (µM_N) 0.0000 0.0000 0.0100
Dissolved oxygen range (mg/L) 6.0000 10.0000 8.0000
Water temperature range (degC) 0.00 16.00
Ambient Range
Winter
Summer
Surface water temperature (degC) 0.10 14.00
Deepest layer temperature (degC) 2.50 3.00
Deepest layer dissolved oxygen (mg/L) 6.0000 6.0000
Irradiance, daily average (moles/m^2/day) 5.00 40.00
Surface (mixed) layer depth (m) 40.00 40.00
Wind speed average (m/sec) 12.80 7.70
Dispersion Coefficients
Horizontal (m2/sec) 0.10000000
Vertical (mixed layer) (m2/sec) 0.00100000
Vertical (stratified layer) (m2/sec) 0.00001000
Sinusoidal Tidal Currents
Tidal flow period (hrs) 12.00
Max flow velocity (cm/sec) 16.00
Apply
Ok
Cancel

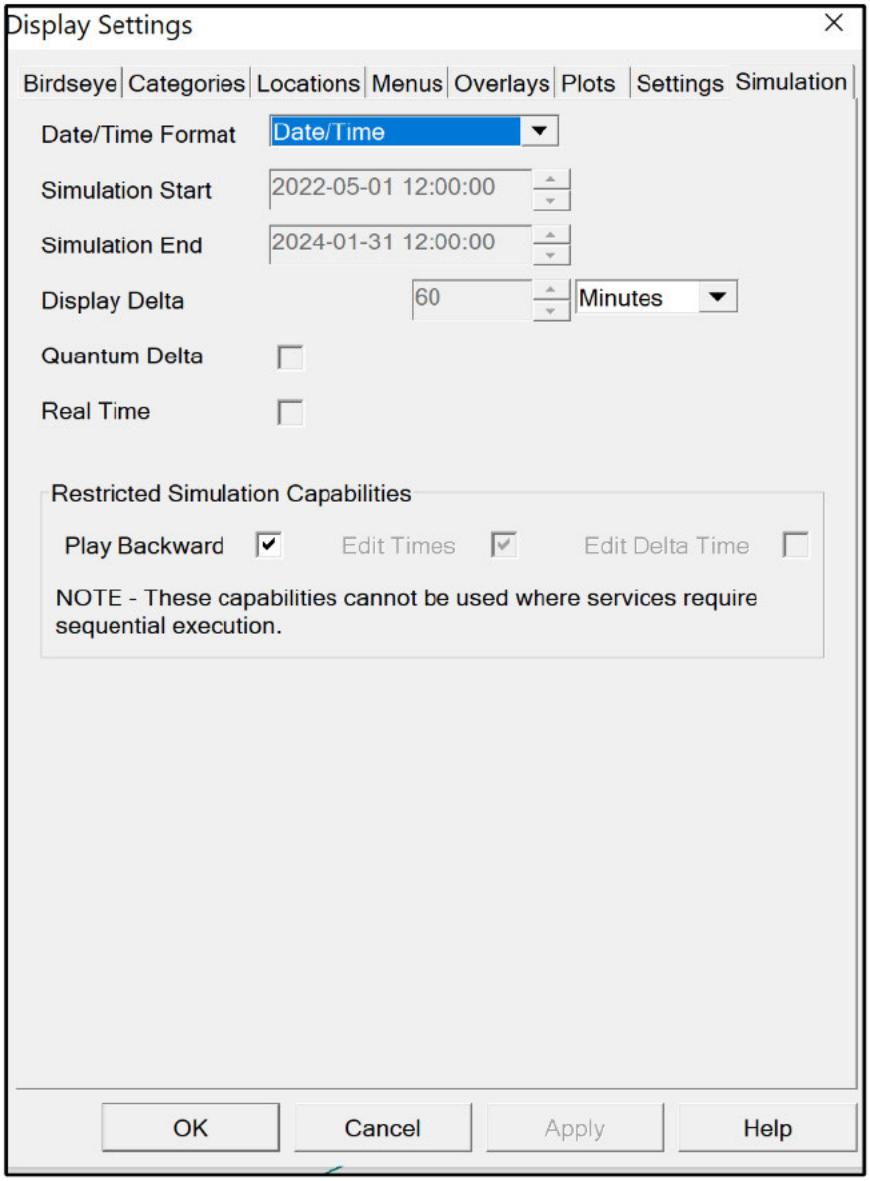


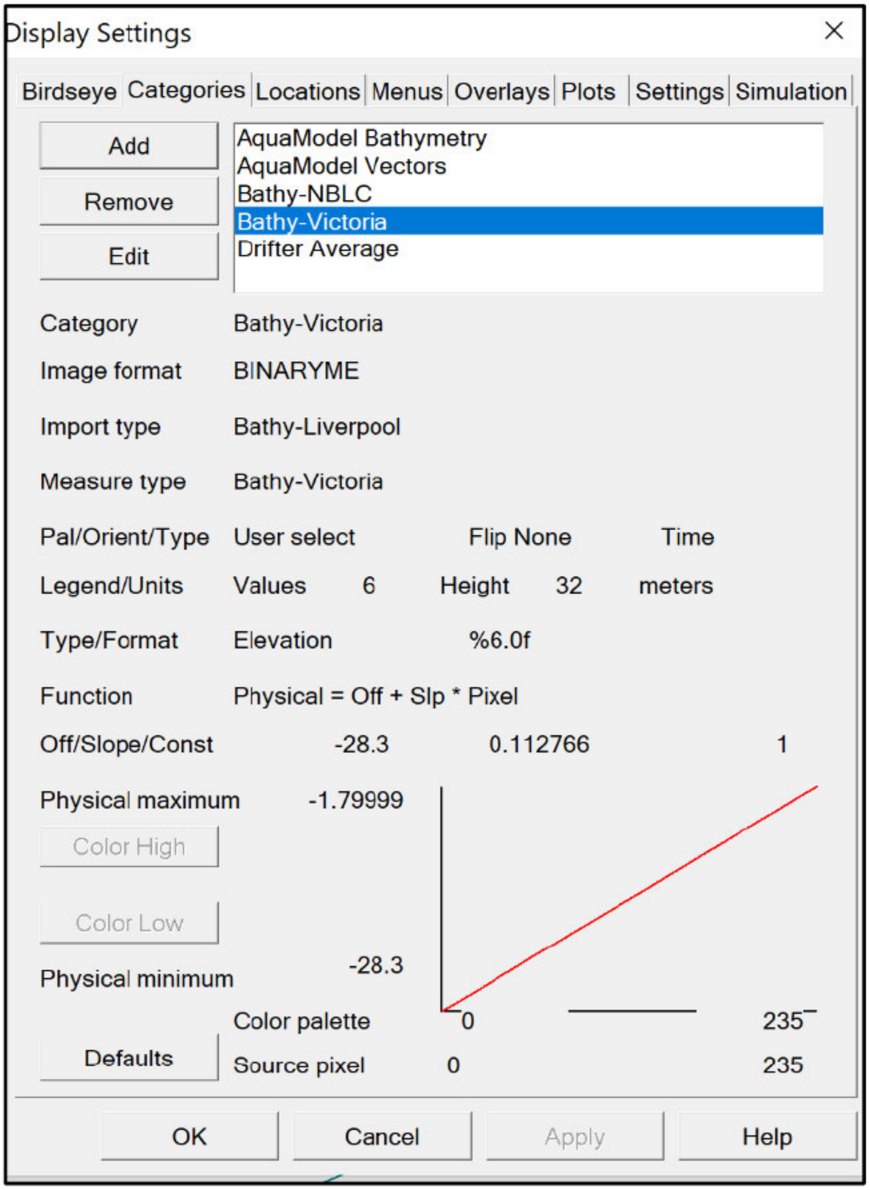
Victoria2021 Options
Mode
Replay
2-D Mode
Data Sources
Array
Color
Capture File
.\Victoria2021\Capture2D\polar vector runs
Benthic
Parms
Species
Plankton
Display
Array
Output
Pens
Drifters
Conditions
Operations
Feed Rate Options
Optimal feed rate (No=manual,Yes=optimal)
Yes
Manual feed rate (bulk_feed/wet_wt_fish/day)
1.0000
Feed pellet/rawfish waste rate (fraction)
0.030
0.000
Percent pellet feed (g_pellet/g_bulk_total)
1.000
Optimal rate is calculated for conditions within cage.
Both manual and calculated optimal can be overidden
with a scheduled feed rate using an Event File.
Feed Composition
Pellet
Raw Fish
Feed carbon (fraction dry weight)
0.515
0.000
Feed water (fraction bulk feed)
0.055
0.000
Initial Pen Conditions
Dissolved oxygen (mg/L)
7.500
Inorganic nitrogen (µM)
2.000
Settling Rates
Fecal
Pellet
Raw Fish
Waste settling rates (cm/s)
3.000
9.000
0.000
Other Chart Scaling Ranges
Min
Max
Fish specific growth rate (1/day)
0.002
0.020
Total farm biomass (metric tons)
0.0
10.0
Apply
Ok
Cancel

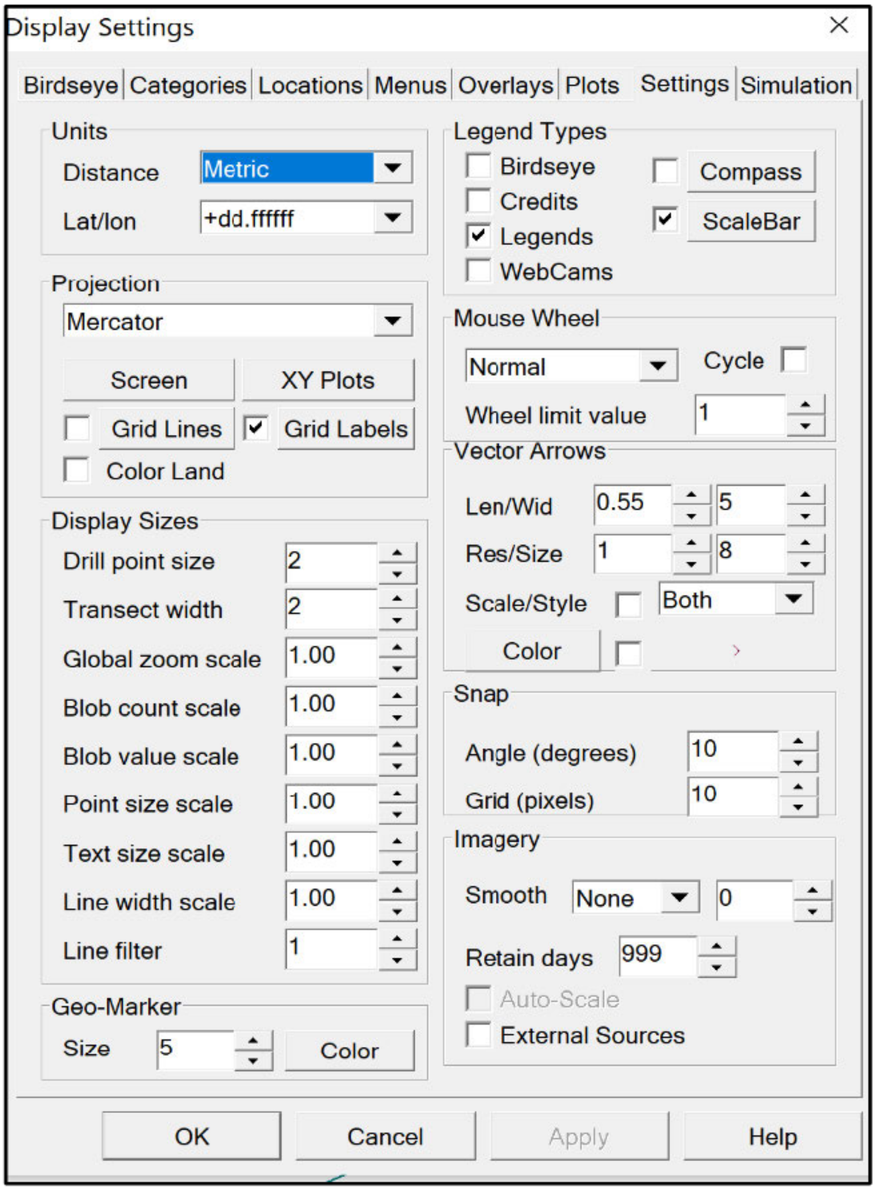

Victoria2021 Options
Mode
Replay
2-D Mode
Data Sources
Array
Color
Capture File
.\Victoria2021\Capture2D\polar vector runs
Array
Output
Pens
Drifters
Conditions
Operations
Benthic
Parms
Species
Plankton
Display
Chart Scale
Initial Value
Sediment (top 2 cm)
Min
Max
Aerobic biomass (g_C/m^2) 0.260 2.313 0.500
Anaerobic biomass (g_C/m^2) 0.018 107.095 0.050
Oxygen (g/m3) 0.000 4.943 3.000
CO2 (g/m^2) 6.003 1840.620 6.000
Sulfide (m-mole/m3); BETA VERSION 0.00 46534.98 5.00
TOC (fraction dry wt) 0.0000 0.0189 0.0002
TOC rate (g_C/m^2/day) 0.000 20.000 0.000
Suspended above sediment layer
Min
Max
Init./Amb.
Oxygen (g/m3) 0.000 6.593 6.000
TOC (g_C/m3) 0.0000 0.1601 0.0000
Fecal
Pellet
Raw Fish
TOC consolidation rate (fraction/day) 0.100 0.100 0.000
Deposition threshold (cm/sec) 6.000 8.000 0.000
Erosion threshold (cm/sec) 8.000 12.000 0.000
Erosion rate factor (g_C/m^2/d) 1.0000 1.0000 0.0000
Ambient TOC deposition (g_C/m^2/d) 0.020
Rates
TOC deposition moving average (days) 1.0
Seston TOC oxidation rate (per day) 0.020
Apply
Ok
Cancel

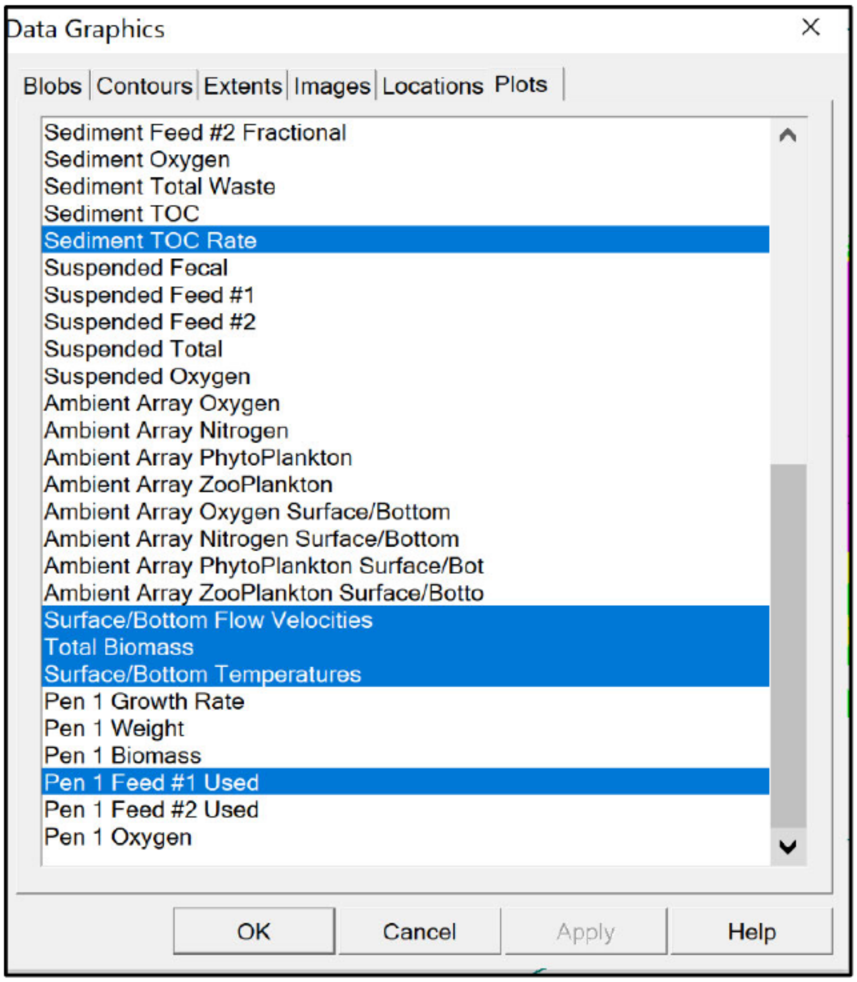

Data Source Options
Input Files
Bathymetry
3-D Currents
Settings
Add
Remove
Up
Down
Export
.\Victoria2021\Imagery\Victoria Temp DO V1.xlsx
.\Victoria2021\Imagery\VictoriaEventsV1.xlsx
.\Victoria2021\Imagery\Currents\VictoriaCurrentsV1.xlsx
Current Direction (18,17,16,15,14,13,12,11,10,9,8,7,6,5)
Current Velocity (18,17,16,15,14,13,12,11,10,9,8,7,6,5)
Oxygen (1)
Temperature (1)
Process
Apply
OK
Cancel


Data Source Options
Input Files
Bathymetry
3-D Currents
Settings
Primary Source
Category
Bathy-Victoria
Image
Bathy-Victoria
Orientation
Elevation
Bottom
Bathymetry File
Dep Ave/Cnt
13
3135
Detailed Source
Type
None
File
Create Image
Scale From
Category
Category
None
Orientation
Bathymetry
Dep Ave/Cnt
0
0
Preprocess Bathymetry Data
Auto-process
File
.\Victoria2021\BathymetryArrayFile
Process
Apply
OK
Cancel

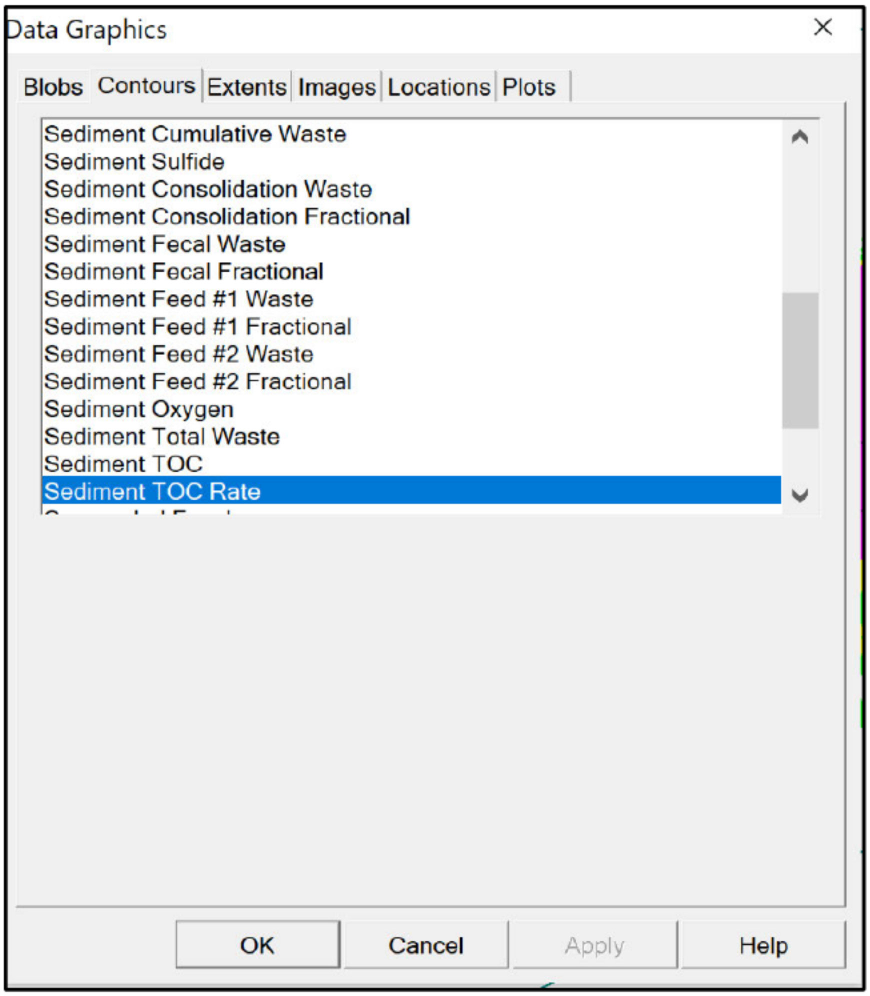

Display Settings
Birdseye
Categories
Locations
Menus
Overlays
Plots
Settings
Simulation
Date/Time Format
Date/Time
Simulation Start
2022-05-01 12:00:00
Simulation End
2024-01-31 12:00:00
Display Delta
60
Minutes
Quantum Delta
Real Time
Restricted Simulation Capabilities
Play Backward
Edit Times
Edit Delta Time
NOTE - These capabilities cannot be used where services require sequential execution.
OK
Cancel
Apply
Help

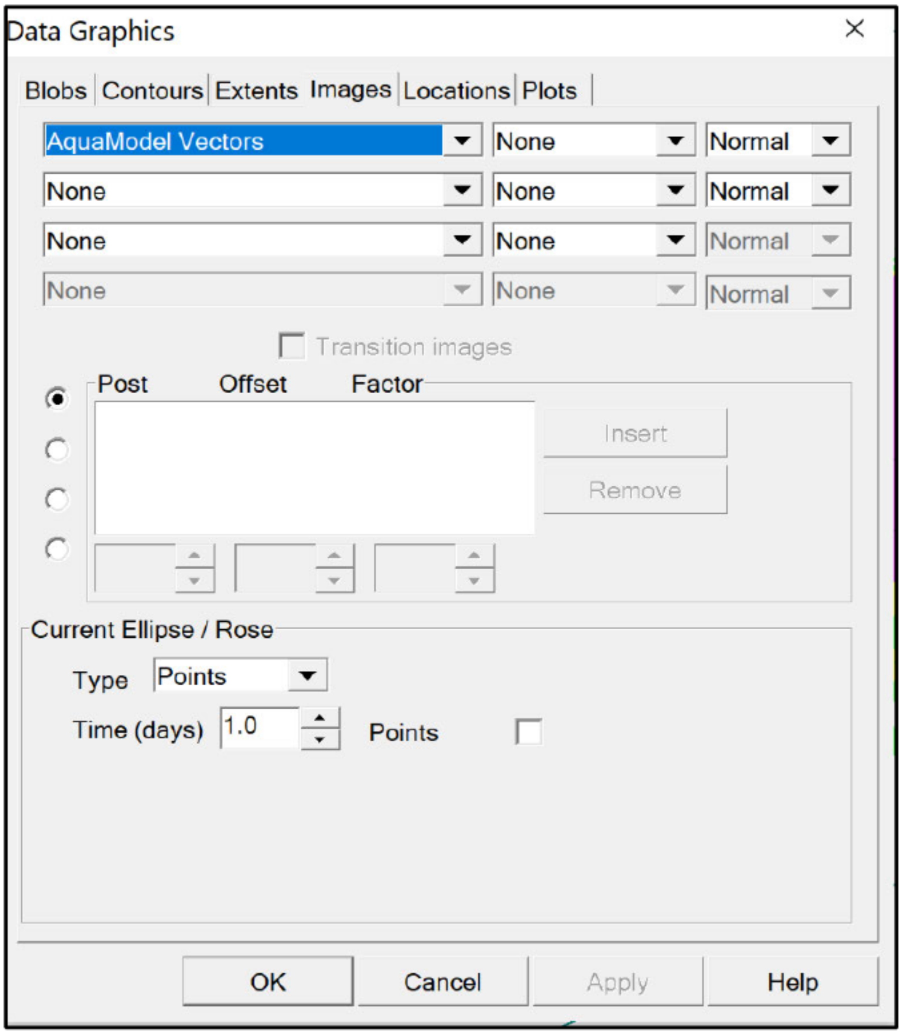

Display Settings
Birdseye
Categories
Locations
Menus
Overlays
Plots
Settings
Simulation
Add
Remove
Edit
AquaModel Bathymetry
AquaModel Vectors
Bathy-NBLC
Bathy-Victoria
Drifter Average
Category Bathy-Victoria
Image format BINARYME
Import type Bathy-Liverpool
Measure type Bathy-Victoria
Pal/Orient/Type User select Flip None Time
Legend/Units Values 6 Height 32 meters
Type/Format Elevation %6.0f
Function Physical = Off + Slp * Pixel
Off/Slope/Const -28.3 0.112766 1
Physical maximum -1.79999
Color High
Color Low
Physical minimum -28.3
Color palette 0 235
Defaults
Source pixel 0 235
OK
Cancel
Apply
Help

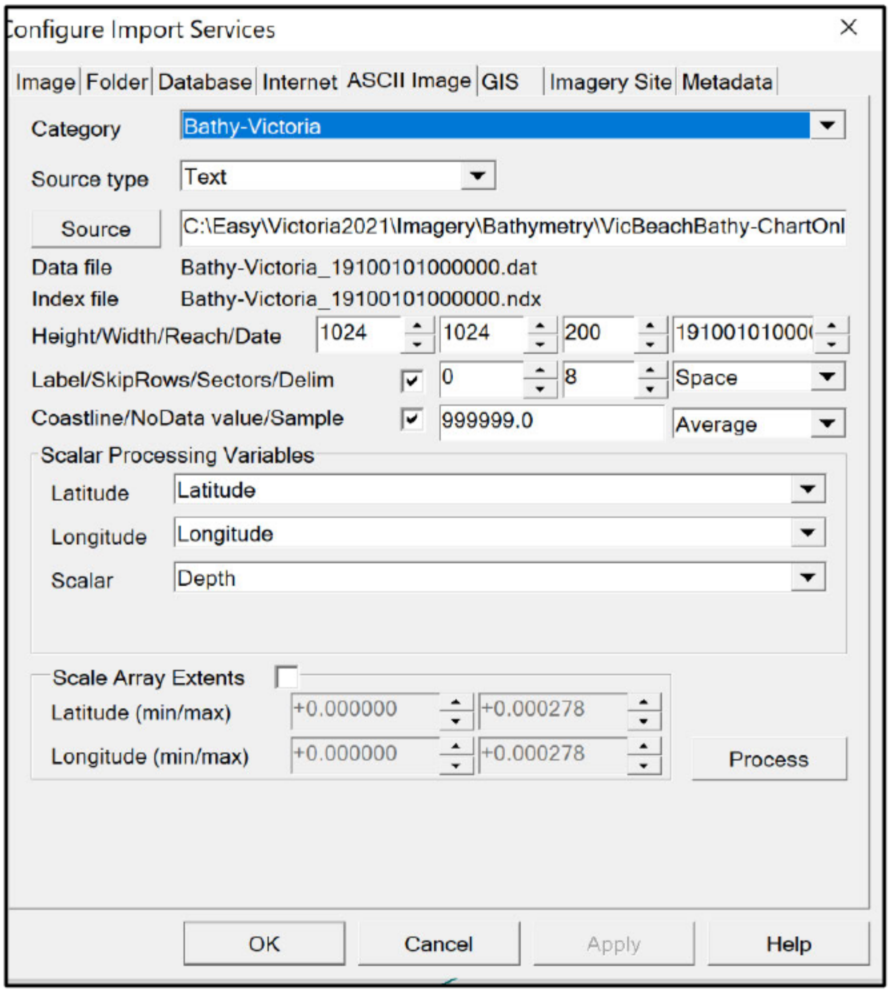

Display Settings
Birdseye
Categories
Locations
Menus
Overlays
Plots
Settings
Simulation
Units
Distance
Metric
Lat/lon
+dd.ffffff
Projection
Mercator
Screen
XY Plots
Grid Lines
Grid Labels
Color Land
Display Sizes
Drill point size
2
Transect width
2
Global zoom scale
1.00
Blob count scale
1.00
Blob value scale
1.00
Point size scale
1.00
Text size scale
1.00
Line width scale
1.00
Line filter
1
Geo-Marker
Size
5
Color
Legend Types
Birdseye
Credits
Legends
WebCams
Compass
ScaleBar
Mouse Wheel
Normal
Cycle
Wheel limit value
1
Vector Arrows
Len/Wid
0.55
5
Res/Size
1
8
Scale/Style
Both
Color
Snap
Angle (degrees)
10
Grid (pixels)
10
Imagery
Smooth
None
0
Retain days
999
Auto-Scale
External Sources
OK
Cancel
Apply
Help



Data Graphics
Blobs
Contours
Extents
Images
Locations
Plots
Sediment Feed #2 Fractional
Sediment Oxygen
Sediment Total Waste
Sediment TOC
Sediment TOC Rate
Suspended Fecal
Suspended Feed #1
Suspended Feed #2
Suspended Total
Suspended Oxygen
Ambient Array Oxygen
Ambient Array Nitrogen
Ambient Array PhytoPlankton
Ambient Array ZooPlankton
Ambient Array Oxygen Surface/Bottom
Ambient Array Nitrogen Surface/Bottom
Ambient Array PhytoPlankton Surface/Bot
Ambient Array ZooPlankton Surface/Botto
Surface/Bottom Flow Velocities
Total Biomass
Surface/Bottom Temperatures
Pen 1 Growth Rate
Pen 1 Weight
Pen 1 Biomass
Pen 1 Feed #1 Used
Pen 1 Feed #2 Used
Pen 1 Oxygen
OK
Cancel
Apply
Help


Data Graphics
Blobs
Contours
Extents
Images
Locations
Plots
Sediment Cumulative Waste
Sediment Sulfide
Sediment Consolidation Waste
Sediment Consolidation Fractional
Sediment Fecal Waste
Sediment Fecal Fractional
Sediment Feed #1 Waste
Sediment Feed #1 Fractional
Sediment Feed #2 Waste
Sediment Feed #2 Fractional
Sediment Oxygen
Sediment Total Waste
Sediment TOC
Sediment TOC Rate
OK
Cancel
Apply
Help


Data Graphics
Blobs
Contours
Extents
Images
Locations
Plots
AquaModel Vectors
None
Normal
None
None
Normal
None
None
Normal
None
None
Normal
Transition images
Post
Offset
Factor
Insert
Remove
Current Ellipse / Rose
Type
Points
Time (days)
1.0
Points
OK
Cancel
Apply
Help


Configure Import Services
Image
Folder
Database
Internet
ASCII Image
GIS
Imagery Site
Metadata
Category
Bathy-Victoria
Source type
Text
Source
C:\Easy\Victoria2021\Imagery\Bathymetry\VicBeachBathy-ChartOnl
Data file
Bathy-Victoria_19100101000000.dat
Index file
Bathy-Victoria_19100101000000.ndx
Height/Width/Reach/Date
1024
1024
200
Label/SkipRows/Sectors/Delim
0
8
Space
Coastline/NoData value/Sample
999999.0
Average
Scalar Processing Variables
Latitude
Latitude
Longitude
Longitude
Scalar
Depth
Scale Array Extents
Latitude (min/max)
+0.000000
+0.000278
Longitude (min/max)
+0.000000
+0.000278
Process
OK
Cancel
Apply
Help

APPENDIX K
Habitat Map

Sweeney International Marine Corp.

T: (506) 467-9014
F: (506) 467-9503

46 Milltown Blvd
St. Stephen, NB
E3L 1G3

HABITAT MAP OF MARINE AQUACULTURE SITE

VICTORIA BEACH #1040

ANNAPOLIS BASIN
ANNAPOLIS COUNTY
PROVINCE OF NOVA SCOTIA
2019

Project #: SW2016-060

Drawn By: [redacted]
Marine Environmental Biologist

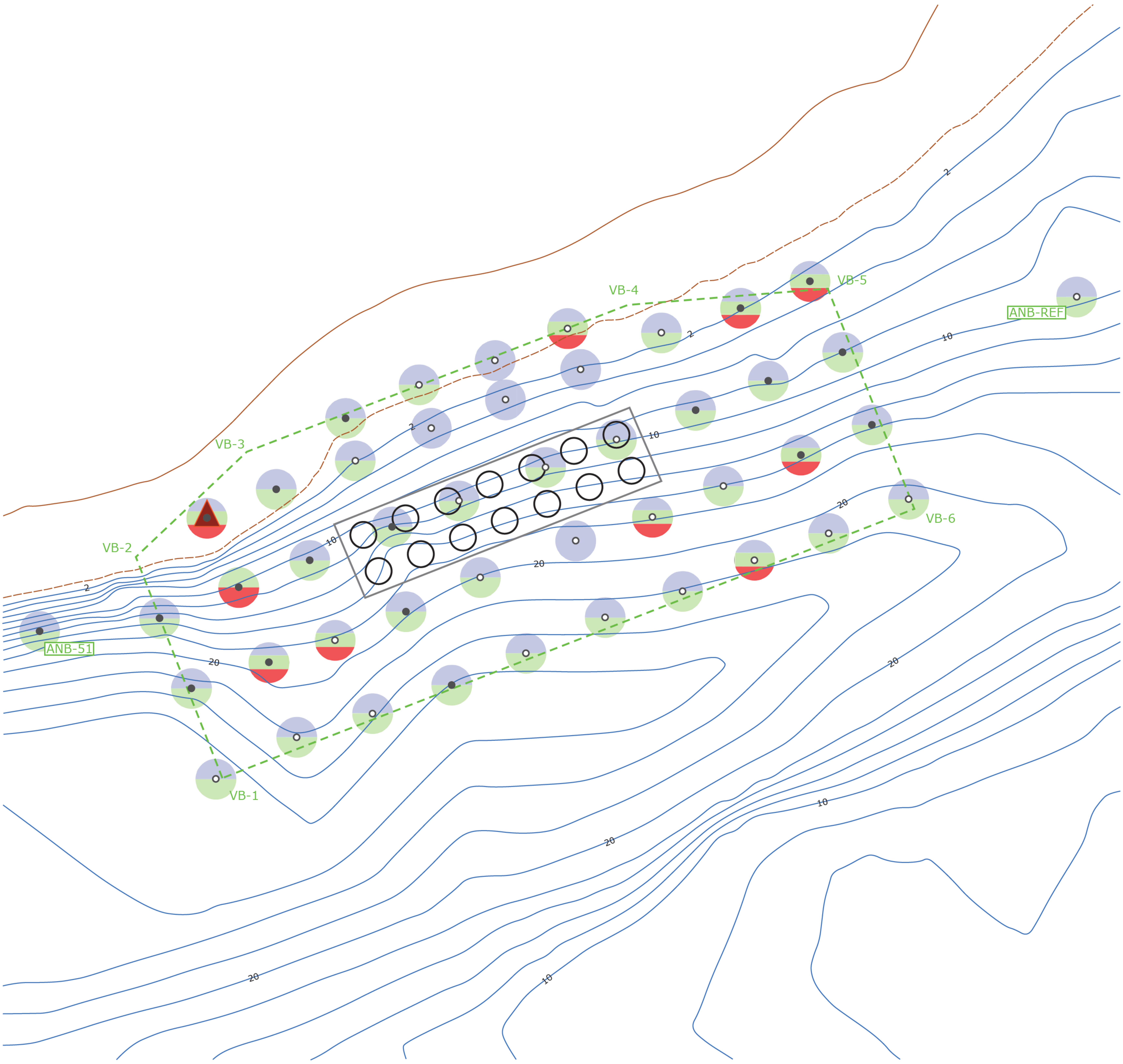
Date: June 26, 2019

N
Nova Scotia Grid North

Scale 1 : 3000

50 0 50 100 150 200 250

meters



LEGEND

- Bedrock/Boulder/Rockwall Sediment Type
- Rubble/Cobble/Gravel Sediment Type
- Sand/Silt/Mud Sediment Type
- Sand/Silt/Mud Over Bedrock Sediment Type
- Rubble/Cobble/Gravel Over Bedrock Sediment Type
- Sand/Silt/Mud Over Rubble/Cobble/Gravel Sediment Type
- All Sediment Types Present
- Ordinary High Water Mark
- Lowest Low Water Ordinary Spring Tide
- Bathymetry Depth Contour
- Lease Corner GPS Coordinates
- Proposed Cage Array
- 100 m Plastic Circular Cage
- Hard-Bottomed Video Observation Station
- Soft-Bottomed Video Observation Station
- Small Mixed Rhodophyta Bed

Proposed Cage Array Approximate GPS Coordinates (NAD83)

NW	N44° 40.180'	W65° 43.166'
NE	N44° 40.132'	W65° 43.134'
SE	N44° 40.048'	W65° 43.405'
SW	N44° 40.096'	W65° 43.436'

Proposed Lease Approximate GPS Coordinates (NAD83)

VB-1	N44° 39.926'	W65° 43.532'
VB-2	N44° 40.070'	W65° 43.619'
VB-3	N44° 40.142'	W65° 43.519'
VB-4	N44° 40.248'	W65° 43.171'
VB-5	N44° 40.263'	W65° 42.986'
VB-6	N44° 40.119'	W65° 42.899'

Revisions

1	Final Version	June 26, 2019

THIS MAP HAD THE UTM GRID USE THE BATHYMETRIC CHART FOR THE EXACT MAGNETIC DECLINATION.

ALL LATITUDE AND LONGITUDE ARE DEGREE-DECIMAL MINUTES.

SEDIMENT TYPE MARKERS SERVE ONLY AS VISUAL REPRESENTATIVES OF THE CHARACTERISTICS FOUND AT EACH VIDEO OBSERVATION STATION.

BATHYMETRY DATA FOR DEPTH CONTOURS WERE DERIVED CHS WORK SHEET #4396 AND LAND CONTOURS WERE PROVIDED BY THE HOMEPORT MAPPING SOFTWARE AND GARMIN BLUECHART DATA: HXCA015R-CANADA G2 HD v2016.0

OBSERVATIONAL DATA FOR HABITAT SURVEY WERE PROVIDED BY SIMCORP FIELD CREW ON MAY 29, 2019. OBSERVATIONAL DATA FOR REFERENCE STATION WAS PROVIDED BY SIMCORP FIELD CREW ON MAY 28, 2019.

DIGITAL CHART #: CA576008
PAPER CHART #: 4396
UTM NAD83
ZONE: 20

APPENDIX L
Fish and Fish Habitat Survey Station Screen Captures of the Seafloor

Figure J-1: VBFH1 – VBFH8 video screen captures

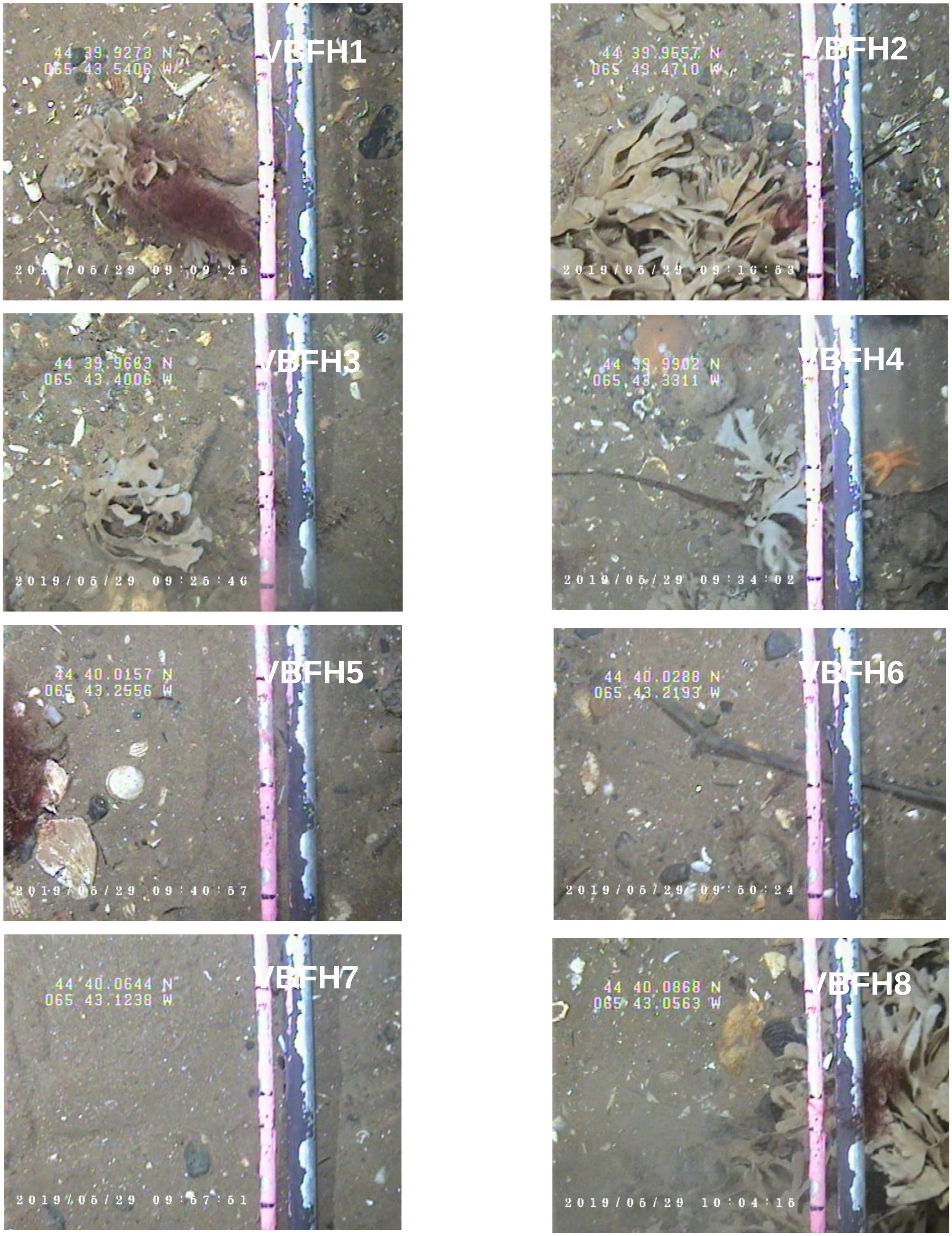


Figure J-2: VBFH9 – VBFH16 video screen captures

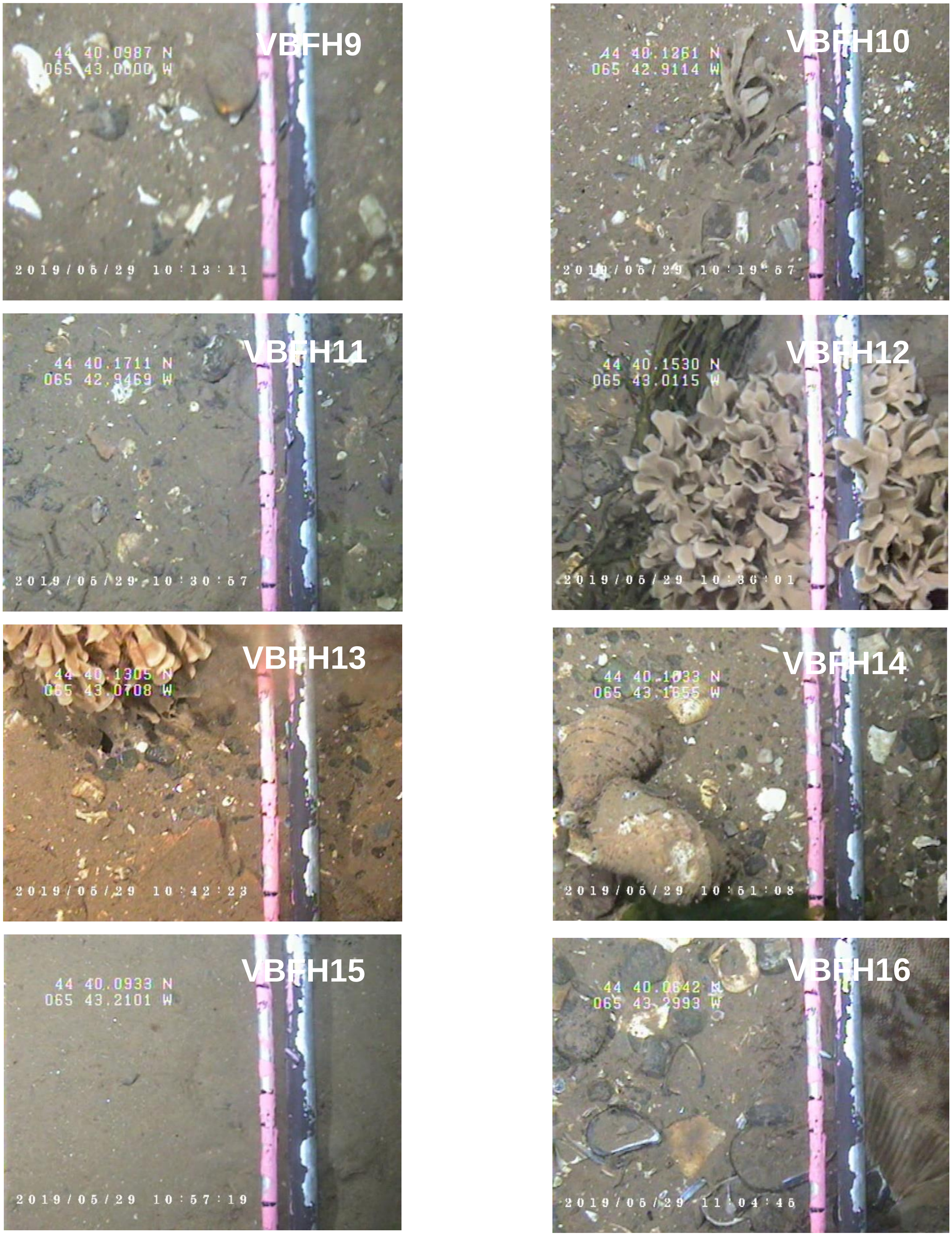


Figure J-3: VBFH17 – VBFH24 video screen captures

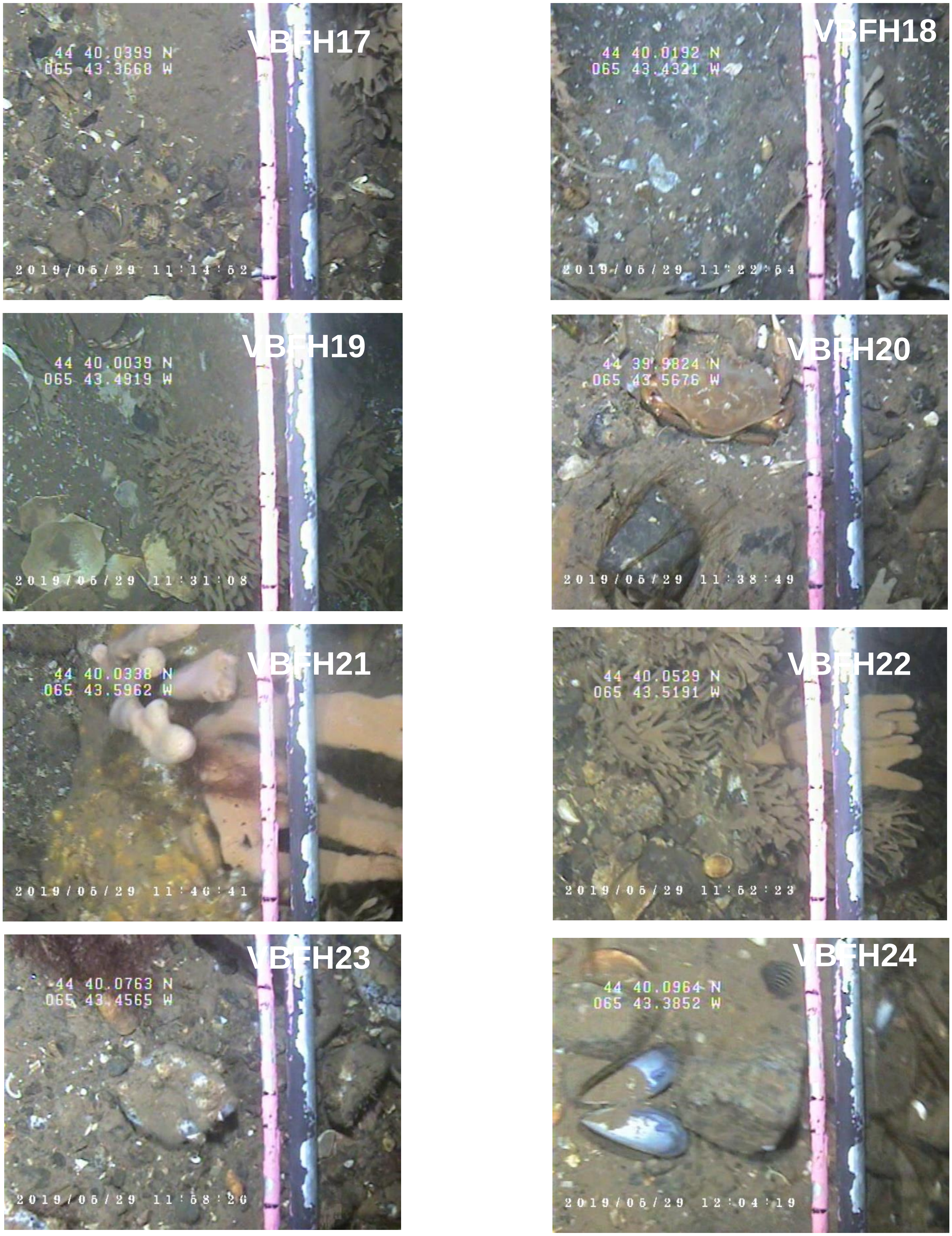


Figure J-4: VBFH25 – VBFH32 video screen captures

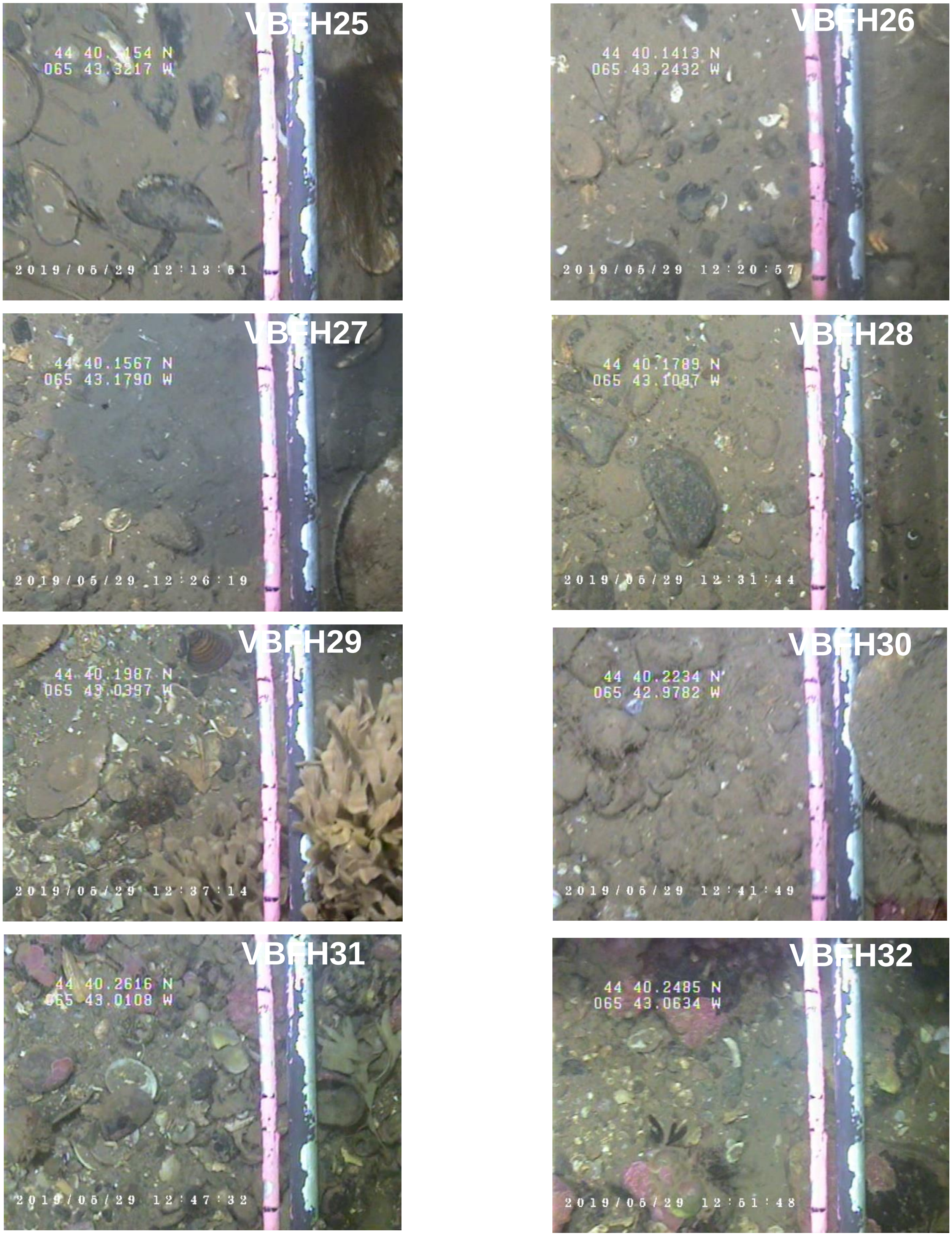


Figure J-5: VBFH33 – VBFH40 video screen captures

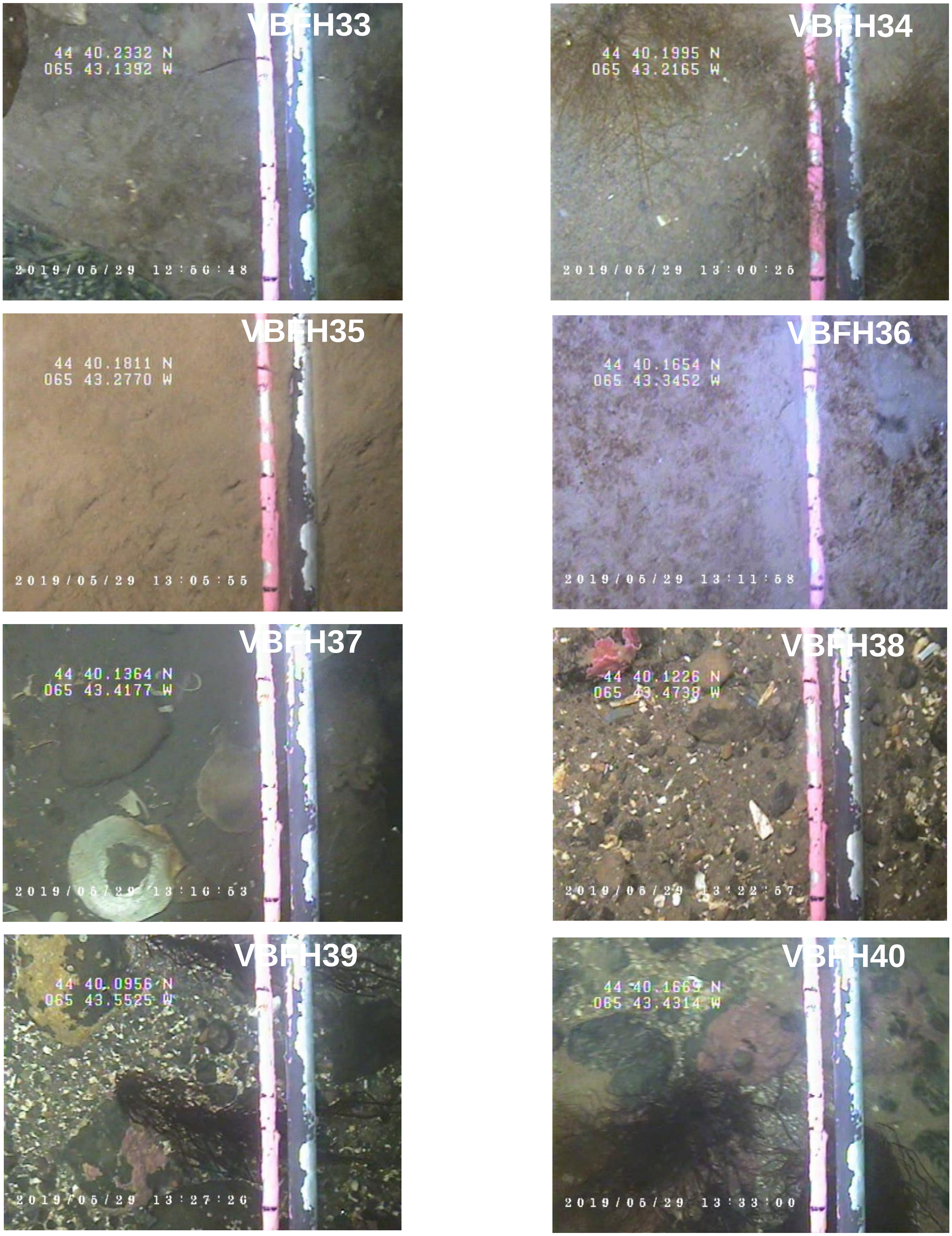
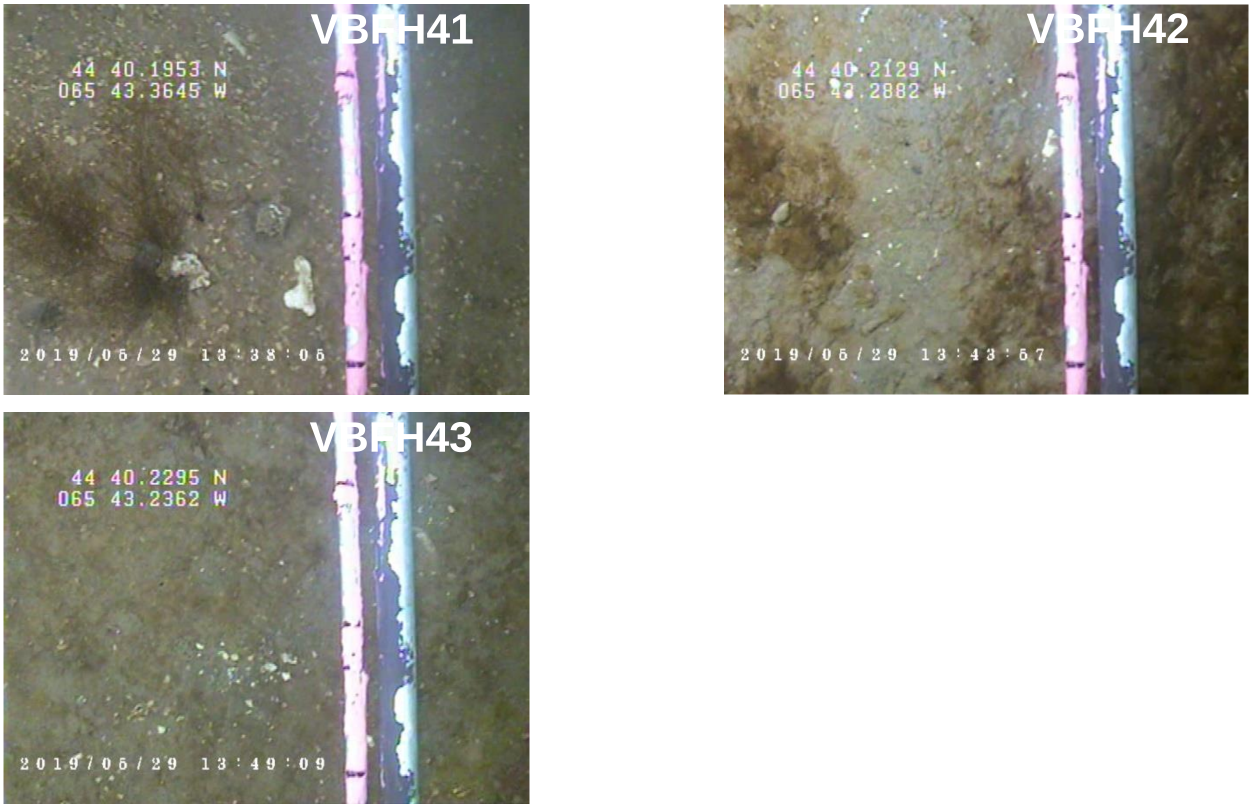


Figure J-6: VBFH41 – VBFH43 video screen captures



APPENDIX M
Comprehensive Species List Observed during the Fish and Fish Habitat Survey of Victoria Beach (#1040)

Common Name	Station																					
	VBFH1	VBFH2	VBFH3	VBFH4	VBFH5	VBFH6	VBFH7	VBFH8	VBFH9	VBFH10	VBFH11	VBFH12	VBFH13	VBFH14	VBFH15	VBFH16	VBFH17	VBFH18	VBFH19	VBFH20	VBFH21	VBFH22
Coralline Algae																						
Eel Pout																						
Encrusting Algae																					5%	<5%
Encrusting Sponge																						<5%
Finger Sponge												2		1							6	5
Flounder																1			1			
Flustra	5%	5%	<5%	5%	<5%	<5%	<5%	10%	5%	5%	10%	15%	<5%	10%	<5%	5%	<5%	<5%	10%	5%	10%	10%
Fucus				<5%		<5%			<5%	<5%		<5%	<5%			<5%				<5%	<5%	
Green Crab																						
Green Sea Urchin																						
Henricia Sea Star				2							1			1								1
Hermit Crab	2	2	1		5	2	3	1	1	1	7	2	1		1	3	1	1	2	2		
Kelp																						
Lobster																						
Mixed Rhodophyta	<5%	<5%	<5%	<5%	<5%						<5%	<5%	5%	5%	<5%		<5%	<5%		<5%	<5%	5%
Mussel																	1					
Northern Sea Star																						
Oyster Thief				<5%		<5%																
Quahog									1					1								
Rock Crab								1	1			1	1	1		3			4	2		1
Sculpin																1						
Sea Colander																						
Unidentifiable Juvenile Fish																						
Unidentifiable Sponge		<5%																				
Urticina Anemone													1									
Whelk							1	1		1				2	1	1	1					

Common Name	Station																						
	VBFH23	VBFH24	VBFH25	VBFH26	VBFH27	VBFH28	VBFH29	VBFH30	VBFH31	VBFH32	VBFH33	VBFH34	VBFH35	VBFH36	VBFH37	VBFH38	VBFH39	VBFH40	VBFH41	VBFH42	VBFH43	ANB-REF	ANB-51
Coralline Algae									20%	15%						<5%	15%	20%			5%		
Eel Pout				1																			
Encrusting Algae									5%								<5%					<5%	
Encrusting Sponge	<5%																						
Finger Sponge							3		1	1													
Flounder																							
Flustra	5%	<5%	<5%	<5%	<5%	<5%	5%	<5%	<5%						<5%							5%	<5%
Fucus	<5%					<5%								<5%				<5%					<5%
Green Crab		1									1												
Green Sea Urchin																2	1						
Henricia Sea Star							1		3														
Hermit Crab	2	4		1		6						3			1	3	1						2
Kelp														<5%		<5%	<5%		5%				
Lobster																	1						
Mixed Rhodophyta	<5%	<5%	<5%	5%	<5%	<5%	<5%	<5%	5%	10%	<5%	<5%	<5%	<5%	<5%		20%	15%	5%		5%		5%
Mussel																							
Northern Sea Star									1														2
Oyster Thief													<5%										
Quahog																							
Rock Crab	1	3	1	1	1							1			1		1	1					
Sculpin																			1				
Sea Colander									5%	15%													
Unidentifiable Juvenile Fish													1										
Unidentifiable Sponge																							
Urticina Anemone																							
Whelk	1					1								2									

***Sweeney International Marine Corp*.**
46 Milltown Blvd.
St. Stephen, NB
E3L 1G3

SIMCorp Environmental Sciences Lab
120 Milltown Blvd.
St. Stephen, NB
E3L 1G6

APPENDIX C
Wildlife Interaction Plan

Wildlife Interaction Plan

for Marine Salmonid Farms on the East Coast of North America

Version 22.04-07

Table of Contents

Appendices

Agrilaser® Handheld User Manual
CAF Safe Operation Agreement: Bird Control Group Agrilaser® Handheld 200/500

Maine
USFWS: Maine Coastal Islands National Wildlife Refuge Complex

New Brunswick
NB Protected Wildlife ID Chart

Newfoundland
NL Protected Wildlife ID Chart

Nova Scotia
NS Protected Wildlife ID Chart

SECTION 1 - Local Laws and Regulations for Wildlife Management and Protection

1.1 Canadian Federal Legislation

- **Aquaculture Activities Regulations (AAR), 2015** - Fisheries and Oceans Canada has developed the Aquaculture Activities Regulations, to clarify conditions under which aquaculture operators may treat their fish and deposit organic matter, while ensuring the protection of fish and fish habitat and sector sustainability.
- **Canadian Environmental Assessment Act, 2012** - CEAA is an environmental assessment focused on potential adverse environmental effects that are within federal jurisdiction, including: fish and fish habitat; other aquatic species; migratory birds; federal lands; effects that cross provincial or international boundaries; effects that impact on Aboriginal peoples, such as their use of lands and resources for traditional purposes; changes to the environment that are directly linked to or necessarily incidental to any federal decisions about a project. If there is a Provincial requirement for an environmental assessment or review, the applicant has an exemption form the CEAA.
- **Canadian Environmental Protection Act, 1999** - an Act respecting pollution prevention and the protection of the environment and human health to contribute to sustainable development.
- **Fisheries Act, 1985** - established to manage and protect Canada's fisheries resources. It applies to all fishing zones, territorial seas and inland waters of Canada and is binding to federal, provincial, and territorial governments.
- **Marine Mammal Regulations, 1993** - regulations that govern the fishing and hunting and in effect treatment of marine mammals in Canada[1].
- **Migratory Birds Convention Act, 1994** - protecting and conserving migratory birds.
- **Oceans Act, 1997** - Canada made a legal commitment to conserve, protect, and develop the oceans in a sustainable manner.
- **Species at Risk Act (SARA), 2002** - the purposes of this Act are to prevent wildlife species from being extirpated or becoming extinct, to provide for the recovery of wildlife species that are extirpated, endangered, or threatened because of human activity and to manage species of special concern to prevent them from becoming endangered or threatened.

1.2 Canadian Provincial Legislation

1.2.1 New Brunswick

- **Fish and Wildlife Act, 1980** - *policies and programs created under this Act help to maintain diversity of wildlife species in New Brunswick. Among other things, it enables the provincial government to create wildlife refuges and wildlife management areas, it regulates hunting, fishing, possession, and sale of wildlife in the province, and it establishes the provincial Wildlife Fund.*
- **Species at Risk Act (SARA), 2012** - *the purposes of this Act are to prevent wildlife species from being extirpated or becoming extinct, to provide for the recovery of wildlife species that are extirpated, endangered, or threatened as a result of human activity and to manage species of special concern to prevent them from becoming endangered or threatened.*

[1] Previously, Nuisance Seal Licences (NSL) were issued by the Department of Fisheries and Oceans (DFO) to aquaculture sites which allowed farmers to intentionally kill a nuisance seal. In March 2019, the Minister of Fisheries, Oceans, and the Coast Guard issued a statement that that the DFO has ceased the issuance of the licence in efforts to meet the requirements of the US Marine Mammal Protection Act, Import Provisions scheduled to come into force on January 1, 2022. The Minister also stated that the "DFO will undertake regulatory amendments to the Marine Mammal Regulations (MMR) to either amend or repeal provisions respecting the issuance of NSLs for aquaculture purposes. https://www.dfo-mpo.gc.ca/fisheries-peches/consultation/mmr-par-rmm-rap-eng.html

1.2.2 Nova Scotia

- **Fisheries and Coastal Resources Act**, **1996** - *this Act revises the outstanding fisheries law and promotes programs to encourage the development of a sustainable fishery. It sets standards for aquaculture, harvesting, and fish processing, and expands the recreational fishery. It also outlines the requirements for administration, and enforcement.*
- **Endangered Species Act, 1998** - *the purpose of this Act is to provide for the protection, designation, recovery, and other relevant aspects of conservation of species at risk in the province, including habitat protection.*

1.2.3 Newfoundland

- **Endangered Species Act, 2001** - p*rovides special protection for plant and animal species considered to be endangered, threatened, or vulnerable in the province.*
- **Wilderness and Ecological Reserves Act, 1990** - *an act to provide for the natural areas in the province to be set aside for the benefit, education, and enjoyment of the people of the province.*

1.3 United States Federal Legislation

- **Endangered Species Act of 1973** (16 U.S.C 1531 et seq.) - requires federal agencies, in consultation with the U.S. Fish and Wildlife Service (USFWS) and/or the U.S National Oceanic and Atmosphere Administration (NOAA) Fisheries Service, to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat of such species.
- **Clean Water Act of 1972 (Formerly the Federal Water Pollution Control Act of 1948)** (33 U.S.C 1251 et seq.) - under this Act, it is unlawful for any person to discharge any pollutant from a point of source into navigable waters, unless a permit is obtained under its provisions.
- **Migratory Bird Treaty Act of 1918** (16 U.S.C 703-712) - protecting and conserving migratory birds, or the parts, nests, or eggs of such birds.
- **Marine Mammal Protection Act of 1972** - prohibits the hunt, harassment, capture or killing of any marine mammal or attempts to do so. Also prohibits the import and export of marine mammals, in whole or parts. Three federal entities share responsibility for implementation of the Act: NOAA, USFWS and the Marine Mammal Commission.

1.4 US State Legislation

1.4.1 Maine

- **Maine Endangered Species Act, 1975** – *the Department of Inland Fisheries and Wildlife administers the Act (MESA) and is responsible for monitoring resident inland fish and wildlife (including invertebrates). The Department, through scientific studies, determines whether a species should be listed as endangered or threatened.*
- **Maine Marine Endangered Species Act, 2003** – *enacted to separate marine species from the inland species, the Act (MMESA) is administered by the Maine department of Marine resources.*
- **Maine Coastal Management Program, 1978** - *led by the Maine Department of Agriculture, Conservation, and Forestry. The coastal management program consists of a network of 19 state laws with four state agencies working in cooperation with local governments, nonprofit organizations, private businesses, and the public to improve management of coastal resources. Maine's coastal zone extends to the inland boundary of all towns bordering tidal waters and includes all coastal islands.*

SECTION 2 - Operating Permit Considerations for Wildlife Management and Protection

2.1 Maine

2.1.1 DMR Lease

The Department of Marine Resources (DMR) Rule Chapter 2.37; Area Resources (Essential Habitats/Endangered Species) – under the Maine Endangered Species Act a state agency or municipal government shall not permit, license, fund or carry out projects occurring partly or wholly within the Essential Habitat, without the approval of the Commissioner of Maine Department of Inland Fisheries and Wildlife (MDIFW). Applicants are required to provide a signed statement to confirm the proposed lease either does not fall within the boundary of an Essential Habitat or that the applicant has contacted MDIFW, and preliminary review will grant approval for the Maine DMR to issue an aquaculture lease within part or the entire boundary of a designated Essential Habitat. No nuisance shall be permitted to exist on the leased premises. Lessee shall not operate in a manner as to be detrimental to public health, personal property or marine resources, or as to create a serious threat to the marine environment.

2.1.2 ACOE Permit

Appendix C: Special Conditions which are intended to minimize potential impact to Atlantic salmon, Atlantic salmon critical habitat, other fisheries, benthic habitat, and local water quality.

2.1.3 DEP MEPDES Permit

Refer to the Atlantic Salmon Aquaculture General Permit PART II, Section I. Protection of Atlantic Salmon. In summary, only salmon of North American strain are permitted, and fish must be marked to identify their origin.

2.2 New Brunswick

2.2.1 Commercial Aquaculture Licence

Schedule A – Operating Terms and Conditions; this licence may be suspended or revoked should the licensee fail to acquire or comply with any approvals, permits or licences which may be required under the *Clean Water Act,* the *Clean Environment Act*, the *Canadian Navigable Waters Act*, the Federal *Fisheries* Act or the *Crown Lands and Forests Act*, the *Public Health Act,* the *Seafood Processing Act*, the *Fish and Wildlife Act,* or any other applicable law.

2.2.2 Approval to Operate

Schedule A – Terms and Conditions (E); the Approval Holder operate the Facility in accordance with the most recent version of the *Environmental Management Program for the Marine Finfish Cage Aquaculture Industry in New Brunswick,* issued by the Department of Environment and Local Government. The Approval Holder shall ensure that all chemicals are stored in a manner such that any spill is contained and not released to the environment.

2.3 Newfoundland

2.3.1 Lease for Aquaculture

Schedule C; the use of the demised premises will, for its intended purpose, be subject to and in accordance with all provincial acts and regulations respecting the promotion of efficient aquaculture and environmental control. The Lessee agrees that upon cancellation or non-renewal of this Lease, the demised premises shall be restored to a condition satisfactory to the Minister, which restoration shall include the removal of all buoys, mooring lines, anchors, floating structures, and any other items placed or installed in or on the demised premises.

2.3.2 Aquaculture Licence

Licence Conditions: Licensees must ensure that all required plans are approved by the department. These plans include but are not limited to: Environmental and Waste Management Plan; Integrated Pest Management Plan; Biosecurity Plan; and Fish Health Management Plan.

2.3.3 Marine Aquaculture Water Use Licence

Appendix A – Terms and Conditions: The Licensee/Holder shall not impair, pollute, or cause to be polluted the quality of water. In the event that the site is no longer being used during the term created by this Licence, the Licencee/Holder shall remove the aquaculture gear and other work(s)/system(s) associated with and restore all areas affected by this facility to a state that resembles local natural conditions.

2.4 Nova Scotia

2.4.1 Lease

The Lessee must adhere to the Farm Management Plan, as it is in effect for this lease from time to time, and any failure to adhere to the Farm Management Plan is a breach of the lease. The Lessee agrees to comply with any permits, protocols, approvals, licences, or permissions (the "licencing requirements") which may be required under the laws of the relevant municipality, the Province or Canada. The Lessee is responsible for confirming any licencing requirements and ensuring compliance with them.

2.4.2 Licence

The Licencee must adhere to the Farm Management Plan, as it is in effect for this licence from time to time, and any failure to adhere to the Farm Management Plan is a breach of the licence. The Licencee agrees to comply with any permits, protocols, approvals, licences, or permissions (the "licencing requirements") which may be required under the laws of the relevant municipality, the Province or Canada. The Lessee is responsible for confirming any licencing requirements and ensuring compliance with them.

SECTION 3 - Ecologically and Biologically Sensitive and Significant Areas

An Ecologically and Biologically Sensitive Area (EBSA or EBSAs) is an area that has been determined to be of high ecological or biological significance and as such, should receive a higher level of risk aversion when activities are occurring to avoid disruption of the overall ecosystem and structure. It is important that employees are aware of areas that are in proximity to their farm and avoid impacting these areas intentionally and follow company protocols regarding garbage containment, proper fuel and chemical storage, equipment maintenance, among others to reduce the risk of unintentional damage.

3.1 Atlantic Canada EBSAs

Both the DFO and the Convention on Biological Diversity (CBD) have criteria for evaluating areas. These criteria consider biological functions, physical oceanography, structural habitat features and biodiversity. Criteria established by DFO to rank an area are uniqueness; aggregation; fitness consequences, plus 2 additional modifying criteria: resilience and naturalness. Criteria established by the CBD are uniqueness or rarity; special importance for life history stages of species; importance for threatened, endangered or declining species and/or habitats; vulnerability, fragility, sensitivity, or slow recovery; biological diversity and naturalness. Both the DFO and CBD criteria were used to establish the EBSAs.

There are three sub-regions within the DFO Maritimes Region in which EBSAs were identified: the Bay of Fundy, the Atlantic coast of Nova Scotia and the offshore Scotian Shelf.

The Bay of Fundy forms a significant part of the Gulf of Maine. A total of 16 areas (**Fig.1**) were identified (DFO[2]) as EBSAs with the Bay of Fundy, Gulf of Maine. There is no formal list of Ecologically Sensitive Species (ESS) in the Bay of Fundy yet, but there is the presence of potential ESS and the reason that some areas have been established as an EBSA.

In the Atlantic coast sub-region, Cape St. Mary's to Cape North, a total of 38 areas (**Fig. 2**) were identified (DFO[3]) as EBSAs.

[2] 2014. DFO CSAS Research Document 2013/065. Identification and Review of Ecologically and Biologically Significant Areas in the Bay of Fundy.
[3] 2014. DFO Canadian Technical Report of Fisheries and Aquatic Sciences 3107. Ecologically and Biologically Significant Areas in the Atlantic Coastal Region of Nova Scotia.

Figure 1. Location of identified Bay of Fundy EBSAs – boundaries represent a best approximation of where a significant feature or features exist.

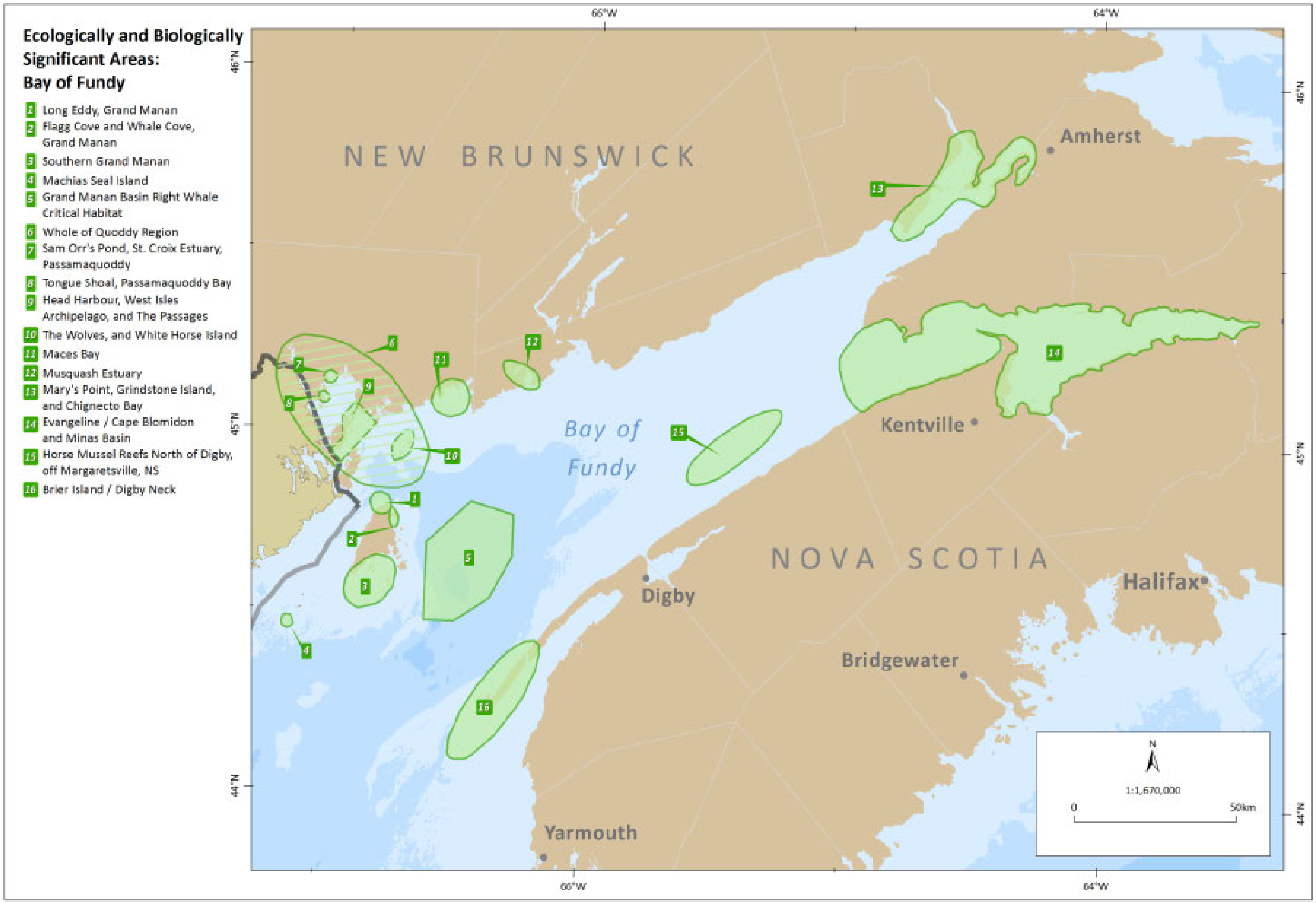
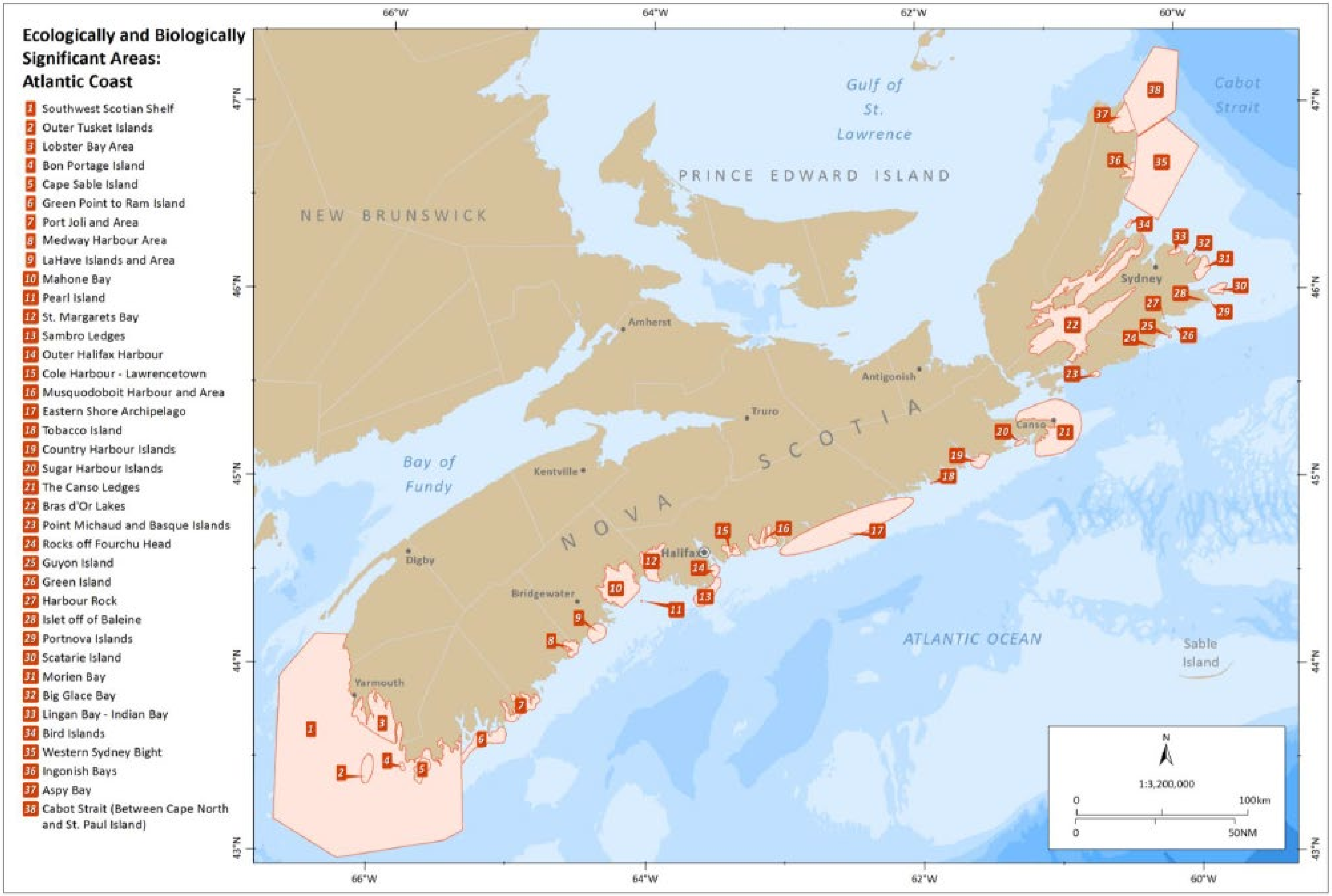
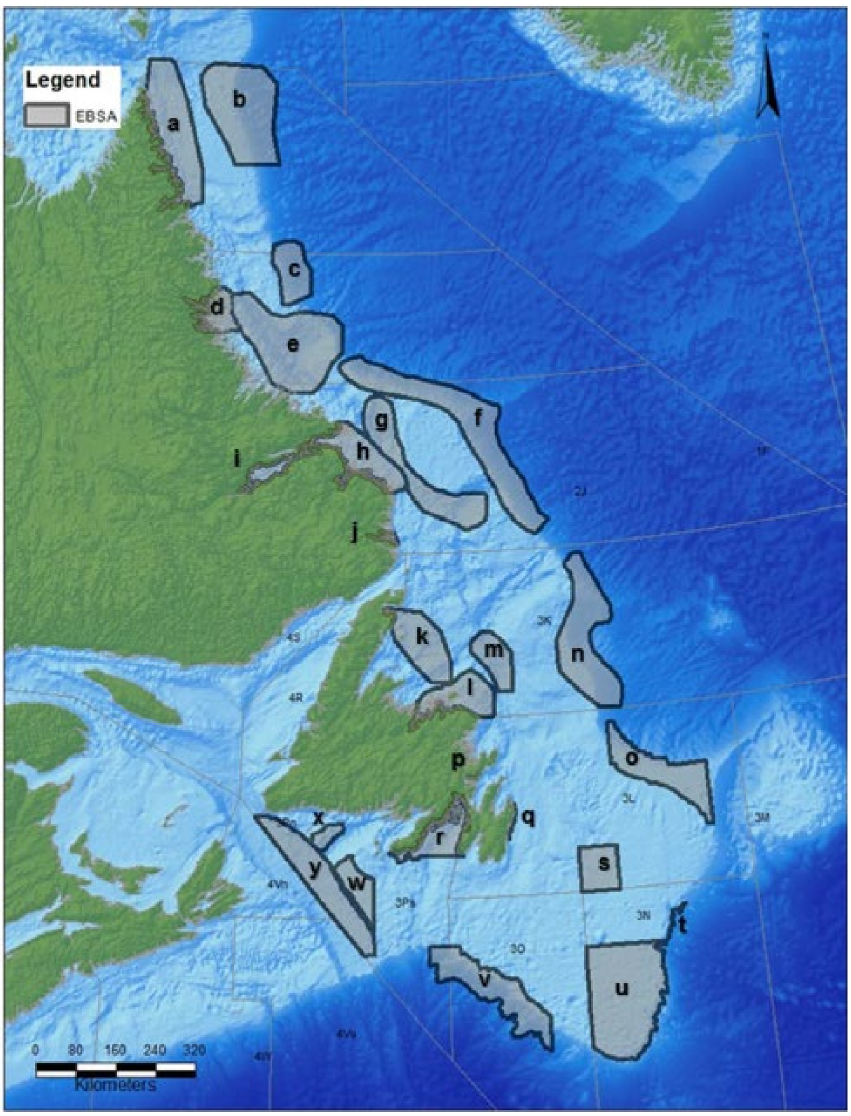


Figure 2. Location of identified Atlantic coast sub-region EBSAs – boundaries represent a best approximation of where a significant feature or features exist.



Within the DFO Newfoundland and Labrador Region 26 EBSAs have been identified in the Newfoundland and Labrador Shelves Bioregion since 2007 (**Fig. 3**)[4]. One of the 26 EBSAs is a transitory EBSA that encompasses the southern extent of pack ice. Unlike other EBSAs, the location of the southern pack ice is transitory and varies both within and among years, as it is influenced by winds and currents. However, it is usually located south of Hamilton Inlet, as far south as Notre Dame Bay. Although it cannot be defined by rigid boundaries, the southern pack ice is an area that is highly productive and ecologically important within the Newfoundland shelf ecosystem and the North Atlantic.

Figure 3. EBSAs in the Newfoundland and Labrador Bioregion: a) Northern Labrador, b) Outer Shelf Saglek Bank, c) Outer Shelf Nain Bank, d) Nain Area, e) Hopedale Saddle, f) Labrador Slope, g) Labrador Marginal Trough, h) Hamilton Inlet, i) Lake Melville, j) Gilbert Bay, k) Grey Islands, l) Fogo Shelf m) Notre Dame Channel, n) Orphan Spur, o) Northeast Shelf and Slope, p) Smith Sound, q) Eastern Avalon, r) Placentia Bay Extension, s) Virgin Rocks, t) Lilly Canyon-Carson Canyon, u) Southeast Shoal and Tail of the Banks, v) Southwest Shelf Edge and Slope, w) St. Pierre Bank, x) Burgeo Bank, and y) Laurentian Channel.



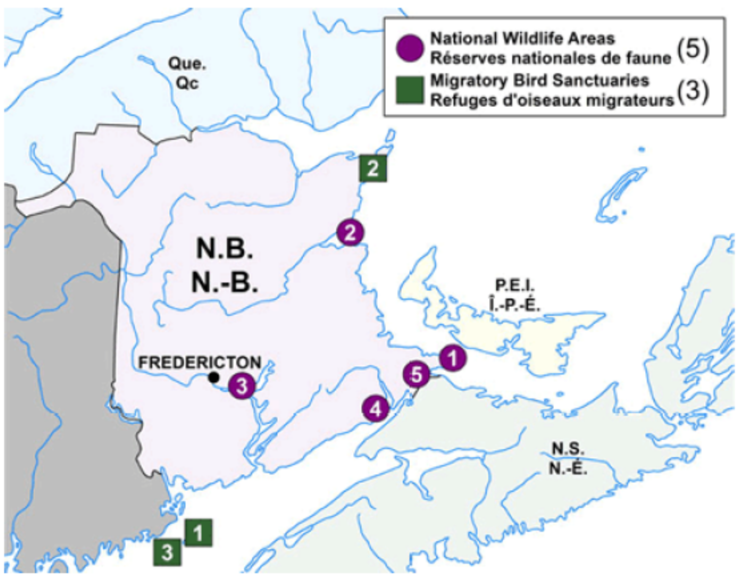
[4] DFO. 2016. Refinement of Information Relating to Ecologically and Biologically Significant Areas (EBSAs) Identified in the Newfoundland and Labrador (NL) Bioregion. DFO Can. Sci. Advis. Sec. Sci. Resp. 2016/032.

3.1.1 National Wildlife Areas and Migratory Bird Sanctuaries

According to the Canada Wildlife Act, National Wildlife Areas are created and managed for the purposes of wildlife conservation, research, and interpretation. There are currently 55 National Wildlife Areas across Canada containing nationally significant habitats for animals or plants. The National Wildlife Areas managed by Environment and Climate Change Canada (ECCC) protect over 2.1 million hectares of habitat with over 75% of that area protecting marine habitat[5].

Migratory Bird Sanctuaries (MBS) are listed under the Schedule in the Migratory Bird Sanctuary Regulations, which prescribe rules and prohibitions regarding the taking, injuring, destruction or molestation of migratory birds or their nests or eggs in the sanctuaries. Hunting of listed species under the Act is not permitted in any Migratory Bird Sanctuary. At present, there are 92 MBS across Canada, comprising almost 11.5 million hectares of migratory bird habitat that provides safe refuge for migratory birds in the terrestrial and marine environment. The Canadian Wildlife Service of Environment Canada is the agency responsible for MBS, although the sanctuaries can be located on federal, provincial, or private land[6].

Figure 4. National Wildlife Areas and Migratory Bird Sanctuaries in New Brunswick.



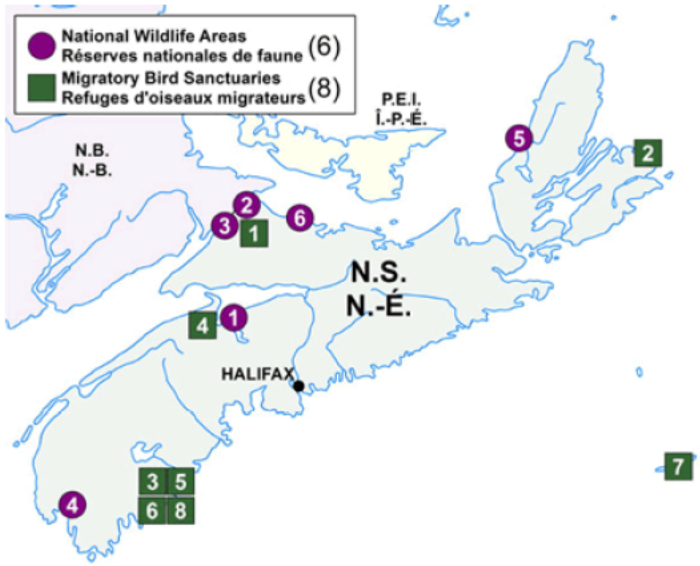
National Wildlife Areas			
No.	**Name**	**Year Established**	**Size in Hectares**
1	Cape Jourimain	1980	654
2	Portage Island	1979	349
3	Portobello Creek	1995	3,011
4	Shepody	1980	1,062
5	Tintamarre	1977	1,970

Migratory Bird Sanctuaries			
No.	**Name**	**Year Established**	**Size in Hectares**
1	Grand Manan MBS	1931	433
2	Inkerman MBS	1998	16
3	Machias Seal Island MBS	1944	1,046

[5] https://www.canada.ca/en/environment-climate-change/services/national-wildlife-areas/locations.html

[6] https://www.canada.ca/en/environment-climate-change/services/migratory-bird-sanctuaries/locations.html

Figure 5. National Wildlife Areas and Migratory Bird Sanctuaries in Nova Scotia.



National Wildlife Areas			
No.	**Name**	**Year Established**	**Size in Hectares**
1	Boot Island	1979	107
2	Chignecto	1982	409
3	John Lusby Marsh	1978	552
4	Sand Pond	1977	531
5	Sea Wolf Island	1982	76
6	Wallace Bay	1980	701
#	Isle Haute	In Progress	80

Migratory Bird Sanctuaries			
No.	**Name**	**Year Established**	**Size in Hectares**
1	Amherst Point	1947	433
2	Big Glace Bay Lake	1939	393
3	Port Herbert	1941	346
4	Kentville	1939	506
5	Port Joli	1941	397
6	Sable River	1941	313
7	Sable Island	1977	3,100
8	Haley Lake	1980	95

There are no designated National Wildlife Areas in Newfoundland and Labrador, however, there are 3 designated Migratory Bird Sanctuaries. The first two are located near Belle Isle, off the northeast coast of Newfoundland, the third is in the Bonavista Bay region of northeastern Newfoundland, adjacent to Terra Nova Provincial Park.

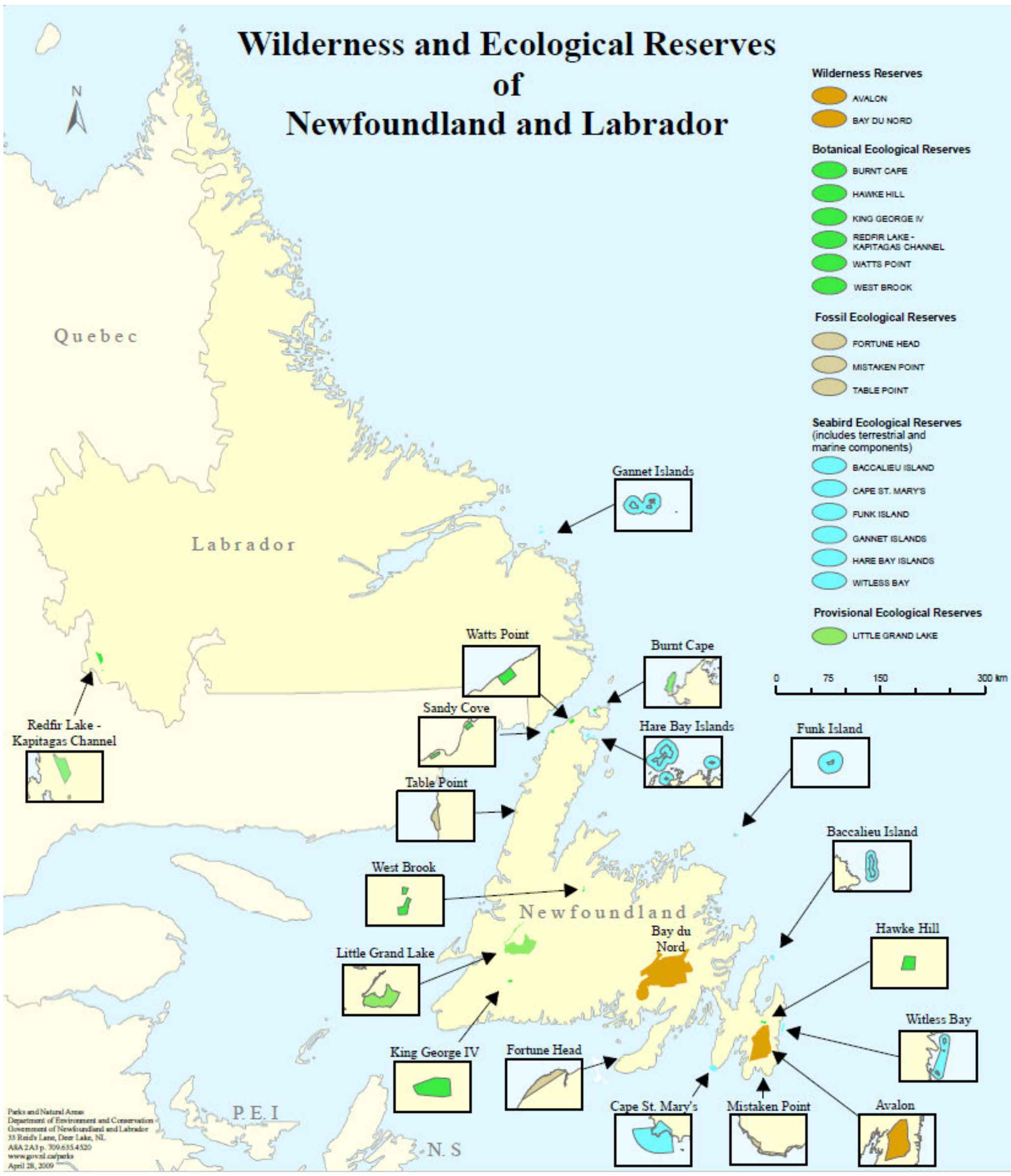
Table 1. Migratory Bird Sanctuaries in Newfoundland and Labrador.

Migratory Bird Sanctuaries			
No.	**Name**	**Year Established**	**Size in Hectares**
1	Shepherd Island	1991	18
2	Ile aux Canes	1991	162
3	Terra Nova	1967	1,178

The government of Newfoundland and Labrador has designated 18 wilderness and ecological reserves (**Fig. 6**)[7] which protect wide-ranging caribou herds, diverse seabird colonies, globally important fossil sites, and habitat for endangered or threatened plants and animals. Several protected areas are representative examples of the province's natural regions. Wilderness reserves are large, protected areas (greater than 1,000 km^2) that are designed to protect significant natural features and landscapes. There are two wilderness reserves in Newfoundland - the Avalon and the Bay du Nord and none in Labrador which were created primarily to protect the habitat and range of a caribou herd. Ecological reserves are protected areas (less than 1,000 km^2) that were created for two main purposes: a) to protect representative examples of ecosystems or ecoregions, or b) to protect unique, rare, or endangered plants, animals, or other elements of our natural heritage.

Most of the reserves in the second category are divided into three general types-botanical, fossil, and seabird ecological reserves.

Figure 6. Wilderness and Ecological Reserves of Newfoundland and Labrador.



[7] Department of Environment and Conservation. 2006. A Guide to our Wilderness and Ecological Reserves – Newfoundland and Labrador.

3.1.2 Marine Protected Areas

Marine Protected Areas (MPAs) are defined geographic areas dedicated to and managed for the long-term conservation of nature. The Department of Fisheries and Oceans (DFO) Canada establishes and manages MPAs under the Oceans Act in order to conserve numerous aspects which include, but are not limited to, commercial and non-commercial fishery resources, endangered or threatened marine species, unique habitats and other marine resources, or habitats necessary to fulfill the DFOs mandate of scientific research.

As of February 2022, there are 14 MPAs designated across Canada[8], **8 of these are in the Atlantic Ocean.**

- Anguniaqvia niqiqyuam – located in the Northwest Territories, within the Inuvialuit Settlement Region, as defined by the Western Artic Claim – Inuvialuit Final Agreement, Western Artic Bioregion.
    - To maintain the integrity of the marine environment offshore of the Cape Parry Migratory Bird Sanctuary so that it is productive and allows for higher trophic level feeding.
    - To maintain the habitat to support populations of key species (such as beluga whales, Arctic char, and ringed and bearded seals).
- **Banc-des-Américans** – located off the eastern tip of the Gaspé Peninsula, Estuary, and the Gulf of St. Lawrence bioregion.
    - Conserve and protect benthic (seabed) habitats.
    - Conserve and protect pelagic (water column) habitats and forage species (prey).
    - Promote the recovery of at-risk whales and wolffish.
- **Basin Head** – located off the eastern tip of Prince Edward Island, Estuary and Gulf of St. Lawrence Bioregion.
    - Maintain the quality of the marine environment and the physical structures of the ecosystem supporting the *Chondrus crispus* variety of Irish Moss.
    - Maintain the health (biomass and coverage) of the Basin Head *Chondrus crispus*.
    - Maintain the overall ecological integrity of the Basin Head lagoon and inner channel, including avoidance of excessive Ulva growth, maintenance of adequate oxygen levels, and diversity of indigenous flora and fauna.
- **Eastport** – located off the northeast coast of Newfoundland; Newfoundland-Labrador Shelves Bioregion.
    - Maintain a viable population of American lobster through the conservation, protection, and sustainable use of resources and habitats within the Eastport Peninsula Lobster Management Area (EPLMA); and
    - Ensure the conservation and protection of threatened or endangered species.
- Endeavour Hydrothermal Vents – located on the Juan de Fuca Ridge, British Columbia, Offshore Pacific Bioregion.
    - Conserve the biological diversity, productivity, structural habitat, and ecosystem function of the hydrothermal vents.
- **Gilbert Bay** – located off the southeast coast of Labrador; Newfoundland-Labrador Shelves Bioregion.
    - Conservation and protection of the Gilbert Bay cod and its habitats.
    - Conservation and protection of the Gilbert Bay ecosystem.
    - Facilitation of scientific research opportunities in the Gilbert Bay ecosystem.
    - Promotion of public awareness, education, and support of the Gilbert Bay MPA.
- **The Gully** – located east of Nova Scotia's Sable Island, Scotian Shelf Bioregion.
    - Minimize harmful impacts from human activities on cetacean populations and their habitats.
    - Minimize the disturbance of seafloor habitat and associated benthic communities caused by human activities.
    - Maintain and monitor the quality of water and sediments of the Gully; and
- Manage human activities to minimize impacts on other commercial and non-commercial living resources.
- Hecate Strait/Queen Charlotte Sound Glass Sponge Reefs – located north and south of the entrance to Douglas Channel, British Columbia, Northern Shelf Bioregion.
    - Conserve the biological diversity, structural habitat, and ecosystem function of the glass sponge reefs.

[8] http://www.dfo-mpo.gc.ca/oceans/mpa-zpm/index-eng.html

- **Laurentian Channel** – located off the southwest coast of Newfoundland and Labrador, Newfoundland, and Labrador Shelves Bioregion.
  - Protect corals, particularly significant concentrations of sea pens, from harm due to human activities (e.g., fishing, oil and gas exploratory drilling, submarine cable installation and anchoring) in the Laurentian Channel.
  - Protect Black Dogfish from human induced mortality (e.g., bycatch in the commercial fishery) in the Laurentian Channel.
  - Protect Smooth Skate from human induced mortality (e.g., bycatch in the commercial fishery) in the Laurentian Channel.
  - Protect Porbeagle sharks from human induced mortality (e.g., bycatch in the commercial fishery, seismic activities) in the Laurentian Channel.
  - Promote the survival and recovery of Northern Wolffish by minimizing risk of harm from human activities (e.g., bycatch in the commercial fishery) in the Laurentian Channel.
  - Promote the survival and recovery of Leatherback Sea Turtles by minimizing risk of harm from human activities (e.g., entanglement in commercial fishing gear, seismic activities) in the Laurentian Channel.
- **Musquash Estuary** – Bay of Fundy, New Brunswick; Scotian Shelf Bioregion.
  - Maintain productivity of harvested species.
  - Maintain biodiversity of individual species, communities, and populations within the different ecotypes.
  - Safeguard habitat, including the physical and chemical properties of the ecosystem, by maintaining water and sediment quality.
- SGaan Kinghlas-Bowie Seamount - located 180 kilometers offshore and to the west of Haida Gwaii (formerly known as Queen Charlotte Islands) in the northeast Pacific, off the coast of British Columbia. The seamount rises from a depth of 3,000 meters to within 24 meters of the surface.
  - Conserve and protect the unique biodiversity and biological productivity of the area's marine ecosystem, which includes the SGaan Kinghlas-Bowie, Hodgkins and Davidson seamounts and the surrounding waters, seabed, and subsoil.
- **St. Anns Bank** – located east of Cape Breton Island, Nova Scotia, Scotian Shelf Bioregion.
  - Conserve and protect all major benthic, demersal (i.e., close to the sea floor) and pelagic (i.e., in the water column) habitats within the MPA, along with their associated physical, chemical, geological, and biological properties and processes.
  - Conserve and protect marine areas of high biodiversity at the community, species, population, and genetic levels within the MPA.
  - Conserve and protect biological productivity across all trophic levels so that they can fulfill their ecological role in the ecosystems of the MPA.
- Tarium Niryutait – located in the Mackenzie River Delta and estuary in the Beaufort Sea, Western Artic Bioregion.
  - To conserve and protect beluga whales and other marine species (anadromous fish, waterfowl, and seabirds), their habitats and their supporting ecosystem.
- Tuvaijuittuq – located off the northwest coast of Ellesmere Island, Nunavut in the Arctic Ocean, encompasses areas within the Artic Basin and Arctic Archipelago Bioregions.
  - To contribute to the conservation, protection and understanding the natural diversity, productivity, and dynamism of the High Arctic Sea ice ecosystem.
    - Tuvaijuittuq is the first MPA to be designated for interim protection by ministerial order under the *Oceans Act*, limiting human activities in the area for up to five years.

3.2 Maine Natural Areas Program

Ecological Reserves are lands specifically set aside to protect and monitor the State of Maine's natural ecosystems. These lands are managed by the Bureau of Parks and Public Lands, and the Maine Natural Areas Program oversees the long-term ecological monitoring plan. As of 2013, Maine has designated more than 90,000 acres of Ecological Reserves on 17 public land units. The purposes of the Reserves are:

1. To maintain one or more natural community types or native ecosystem types in a natural condition and range of variation and contribute to the protection of Maine's biological diversity,
2. To act as a benchmark against which biological and environmental change may be measured, as a site for ongoing scientific research, long-term environmental monitoring, and education, and
3. To protect sufficient habitat for those species whose habitat needs are unlikely to be met on lands managed for other purposes.

Reserves were designated following a multi-year inventory and assessment project coordinated by the Maine Forest Biodiversity Project, with staff assistance from The Nature Conservancy, the Maine Natural Areas Program, and the Bureau of Parks and Public Lands. In total, there are 17 Maine Ecological Reserves as of July 2018 - ranging in size from 775 acres at Wassataquoik Stream to over 11,000 acres at Nahmakanta.

Factsheets on each of the reserves are available through the Maine Department of Agriculture, Conservation and Forestry website[9].

- Big Spencer Mountain
- Bigelow Preserve
- Chamberlain Lake/Lock Dam
- Cutler Preserve
- Deboullie
- Duck Lake
- Gero Island
- Great Heath
- Mahoosucs Unit
- Mt. Abraham
- Nahmakanta
- Number Five Bog
- Rocky Lake
- Salmon Brook Lake
- St. John Ponds
- Tunk Lake Area, including Donnell Pond and Spring River Lake
- Wassataquoik Stream

[9] https://www.maine.gov/dacf/mnap/reservesys/index.htm

SECTION 4 - Risk Assessment

4.1 *Atlantic Canada Aquaculture Sites and the Species at Risk Act (SARA)*

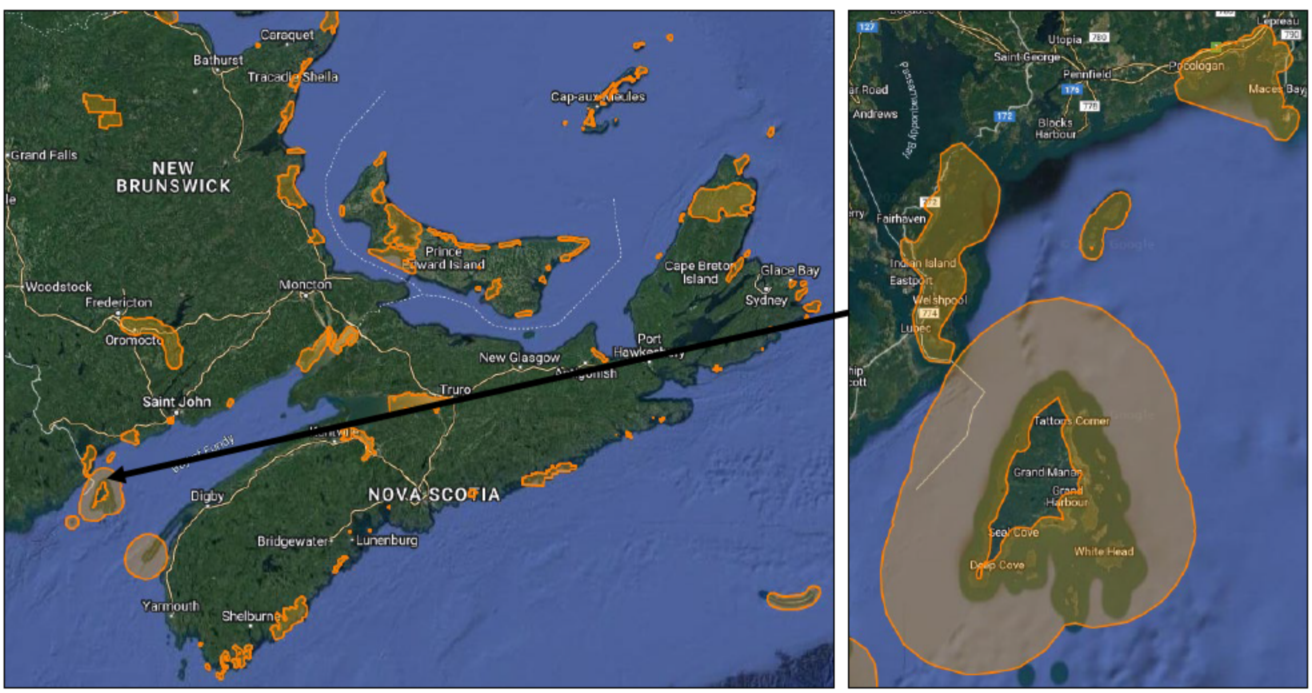
The SARA is a key federal government commitment *"to prevent wildlife species from being extirpated or becoming extinct, to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity and to manage species of special concern to prevent them from becoming endangered or threatened"*. SARA provides for the legal protection of wildlife species and the conservation of their biological diversity.

When scoping new sites or proposing boundary amendments for pre-existing farms, endangered, at risk and threatened species that have been or may be found within the proposed area must be identified. Species identified that are listed under the SARA designation must be protected and considered within the proposal. Applicants must provide mitigation plans for those species regarding how the operation will strive to not impede or otherwise cause harm. Applicants must also consider those species identified by regional conservation strategies, including Provincial Species at Risk Acts or Endangered Species Acts.

4.1.1 Important Birds and Biodiversity Areas (IBA)

Important Bird Areas (IBAs)[10] are discrete sites that support specific groups of birds: threatened birds, large groups of birds, and birds restricted by range or by habitat. When bird species occur at a site in sufficient numbers during one or more seasons (winter; migration; breeding), they become known as trigger species, and the site at which they are found is designated as an IBA. IBAs range in size from very tiny patches of habitat to large tracts of land or water. They may encompass private or public land, and they may or may not overlap partially or entirely with legally protected sites, such as EBSAs, National Wildlife Areas, Migratory Bird Sanctuaries and Wilderness and Ecological Reserves mentioned previously. While there are no IBAs located near our marine farms in Newfoundland, there are several identified within New Brunswick and Nova Scotia (**Fig. 7**).

Figure 7. IBAs in the Maritimes Region, with focus of Grand Manan Island, Passamaquoddy Bay and Maces Bay, NB.



[10] https://www.ibacanada.org/index.jsp?lang=en

4.2 Maine Aquaculture Sites and the Endangered Species Act (ESA)

The ESA aims to conserve, protect, and recover imperiled species and the ecosystems upon which they depend. The National Oceanic and Atmospheric Administration (NOAA) Fisheries is responsible for the protection, conservation, and recovery of endangered and threatened marine and anadromous species under the ESA.

Generally, NOAA Fisheries manages the marine and anadromous species including whales, corals, sea turtles, and salmon. The US Fish and Wildlife Service (USFWS) manages terrestrial and freshwater species such as polar bears, sea otters, and manatees.

The Maine Endangered Species Act (MESA) provides the Maine Department of Inland Fisheries and Wildlife (MDIFW) with a mandate to conserve all the species of fish and wildlife found in the State, as well as the ecosystems upon which they depend. Under the MESA, as stated in Maine aquaculture site Department of Marine Resources (DMR) Leases, a state agency or municipal government shall not permit, licence, fund or carry out projects occurring partly or wholly within the essential habitat, without the approval of the Commissioner of MDIFW.

Applicants are required to provide a signed statement to confirm the proposed lease either does not fall within the boundary of an essential habitat or that the applicant has contacted MDIFW, and preliminary review will grant approval for the Maine Department of Marine Resources (MDMR) to issue an aquaculture lease within part or all the boundary of a designated Essential Habitat.

SECTION 5 - Local Endangered or Threatened Species

5.1 Atlantic Canada

The following species are listed as endangered or threatened in Atlantic Canada[11] (excluding Prince Edward Island as well as terrestrial plants and animals) either under the Federal Species at Risk Act (SARA) and/or the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and may be seen in the vicinity of our marine farms:

E = Endangered under the SARA and listed by the COSEWIC
T = Threatened under the SARA and listed by the COSEWIC
s = Special Concern under the SARA and listed by the COSEWIC
c = COSEWIC Designation, no SARA Status

Birds

1. Bank Swallow (*Riparia riparia*) **T**
2. Barn Swallow (*Hirundo rustica)* **T**
3. Barrow's Goldeneye (*Bucephala islandica*) **s**
4. Bicknell's Thrush (*Catharus bicknelli*) **T**
5. Bobolink (*Dolichonyx oryzivorus*) **T**
6. Canada Warbler (*Wilsonig anadensis*) **T**
7. Chimney Swift (Chaetura pelagica) **T**
8. Common Nighthawk (*Chordeiles minor*) **T**
9. Eastern Meadowlark (*Sturnella magna*) **T**
10. Eastern Whip-poor-will (*Antrostomus vociferus*) **T**
11. Eastern Wood Pewee (*Contopus virens*) **c**
12. Eskimo Curlew (*Numenius borealis*) **E – LIKELY EXTINCT**
13. Evening Grosbeak (*Coccothraustes vespertinus*) **s**
14. Harlequin Duck (*Histrionicus histrionicus*) **s**
15. Horned Grebe – Western population (*Podiceps auratus*) **s**[12]
16. Hudsonian Godwit (*Limosa haemastica*) **c**
17. Ipswich Sparrow (*Passerculus sandwichensis princeps*) **s**
18. Ivory Gull (*Pagophila eburnean*) **E**
19. Leach's Storm-Petrel (*Oceanodroma leucorhoa*) **c**
20. Least Bittern (*Ixobrychus exilis*) **T**
21. Lesser Yellowlegs (*Tringa flavipes*) **c**
22. Olive-sided Flycatcher (*Contopus cooperi*) **T**
23. Peregrine Falcon – Anatum Subspecies (*Falco peregrinus anatum*) **s**
24. Piping Plover (*Charadrius melodus*) **E**
25. Red Crossbill percna (*Loxia curvirostra percna*) **T**
26. Red Knot Rufa (*Calidris canutus rufa*) **E**
27. Red-necked Phalarope (*Phalaropus lobatus*) **s**
28. Roseate Tern (*Sterna dougallii*) **E**
29. Ross's Gull (*Rhodostethia rosea*) **T**
30. Rusty Blackbird (*Euphagus carolinus*) **s**
31. Savannah Sparrow princeps (*Passerculus sandwichensis princeps*) **s**
32. Short-eared Owl (*Asio flammeus*) **s**
33. Wood Thrush (*Hylocichla mustelina*) **T**
34. Yellow Rail (*Coturnicops noveboracensis*) **s**

[11] https://species-registry.canada.ca/index-en.html#/species?ranges=15,9,7,8&taxonomyId=4,5,2&sortBy=commonNameSort&sortDirection=asc&pageSize=10 (Filtered by NB, NL, NS, Atlantic Ocean; Birds, Fishes (Marine), Mammals)
[12] The Western population is recognized by the Province of New Brunswick under the provincial Species at Risk Act, though the SARA Registry does not consider New Brunswick as a range of the species. Due to its listing on the provincial list, it is included here.

Fish

1 Acadian Redfish (*Sebastes fasciatus*) **c**
2 American Eel (*Anguilla rostrata*) **T**
3 American Plaice (*Hippoglossoides platessoides*) **c**
4 Atlantic Bluefin Tuna (*Thunnus thynnus*) **c**
5 Atlantic Cod – Newfoundland and Labrador, Laurentian North and South, Southern populations (*Gadus morhua*) **c**
6 Atlantic Salmon – Eastern Cape Breton, Gaspe-Southern Gulf of St. Lawrence, Outer Bay of Fundy, Nova Scotia Southern Upland, South Newfoundland populations (*Salmo salar*) **c**
7 Atlantic Salmon – Inner Bay of Fundy (*Salmo salar*) **E**
8 Atlantic Sturgeon – Maritime population (*Acipenser oxyrinchus*) **c**
9 Atlantic Whitefish (*Coregonus huntsman*) **E**
10 Atlantic Wolffish (*Anarhichas lupus*) **s**
11 Basking Shark (*Cetorhinus maximus*) **c**
12 Cusk (*Brosme brosme*) **c**
13 Lumpfish (*Cyclopterus lumpus*) **c**
14 Northern Wolffish (*Anarhichas denticulatus*) **T**
15 Porbeagle (*Lamna nasus)* **c**
16 Shortfin Mako – Atlantic population (*Isurus oxyrinchus*) **c**
17 Shortnose Sturgeon (*Acipenser brevirostrum*) **s**
18 Smooth Skate – Lauranian-Scotian population (*Malacoraja senta*) **c**
19 Spiny Dogfish (*Squalus acanthias*) **c**
20 Spotted Wolffish (*Anarhichas minor*) **T**
21 Striped Bass – Bay of Fundy, Southern Gulf of St. Lawrence Population (*Morone saxitilis*) **c**
22 Thorny Skate (*Amblyraja radiata*) **c**
23 White Shark (*Carcharodon Carcharias*) **E**
24 White Hake (*Urophycis tenuis*) **c**
25 Winter Skate – Georges Bank, Western Scotian Shelf, Bay of Fundy populations (*Leucoraja ocellate*) **c**

Mammals

26 Beluga Whale (*Delphinapterus leucas*) **c**
27 Blue Whale (*Balaenoptera musculus*) **E**
28 Fin Whale (*Balaenoptera physalus*) **s**
29 Harbour Porpoise - Northwest Atlantic Population (*Phocoena phocoena*) **c**
30 Killer Whale – Northwest Atlantic population (*Orcinus orca*) **c**
31 North Atlantic Right Whale (*Eubalaena glacialis*) **E**
32 Northern Bottlenose Whale – Scotian Shell population (*Hyperoodon ampullatus*) **E**
33 Polar Bear (*Ursus maritimus*) **s**
34 Ringed Seal (*Pusa hispida*) **c**
35 Sowerby's Beaked Whale (*Mesoplodon bidens*) **s**

Turtles

36 Leatherback Sea Turtle – Atlantic population (*Dermochelys coriacea*) **E**
29 Loggerhead Sea Turtle (*Caretta caretta*) **E**

5.1.1. New Brunswick

In addition to the Federal SARA Registry, the following species are listed under Schedule A of the New Brunswick *List of Species at Risk Regulations - Species at Risk Act*[13] and may be seen within the vicinity of our marine farms:

E = **Endangered Species**
T = **Threatened Species**
S = **Species of Special Concern**

Birds

1 Bald Eagle (*Haliaeetus leucocephalus*) **E**

Fish

2 Blue Shark – Atlantic population (*Prionace glauca*) **S**
3 Rainbow Smelt – Lake Utopia Large-Bodied, Small-Bodied populations (*Osmerus mordax*) **T**
4 Winter Skate – Southern Gulf of St. Lawrence population (*Leucoraja ocellata*) **E**

5.1.2 Newfoundland

Newfoundland and Labrador's Endangered Species Act provides special protection for plant and animal species considered to be endangered, threatened, or vulnerable in the province. The Act considers species and populations that are native to the province but does not include marine fish. The following species are additional species relevant to those listed under the Federal SARA Registry and are listed under the Newfoundland and Labrador Endangered Species Act[14]:

E = Endangered
T = Threatened
V = Vulnerable

Birds

1 Newfoundland Gray-cheeked Thrush (*Catharus minimus minimus*) **T**

5.2 Maine

Endangered and threatened marine species in the state of Maine are listed under the Marine Endangered Species Act[15]. Endangered and threatened inland fish and wildlife species in Maine are listed either under Maine's Endangered Species Act[16], the US Endangered Species Act[17], or both. The following species are listed as endangered or threatened in Maine and may be seen in the vicinity of our marine farms:

F = Federally Endangered under the U.S. Endangered Species Act
f = Federally Threatened under the U.S. Endangered Species Act
S = State Endangered under the Maine Endangered Species Act
s = State Threatened under the Maine Endangered Species Act
M = State Endangered under the Maine Marine Endangered Species Act
m = State Threatened under the Maine Marine Endangered Species Act

[13] https://laws.gnb.ca/en/showdoc/cr/2013-38
[14] https://www.gov.nl.ca/ffa/wildlife/endangeredspecies/
[15] http://www.mainelegislature.org/legis/statutes/12/title12sec6975.html
[16] https://www.maine.gov/ifw/fish-wildlife/wildlife/endangered-threatened-species/listed-species.html
[17] https://www.fisheries.noaa.gov/species-directory/threatened-endangered?title=&species_category=any&species_status=any&regions=1000001111&items_per_page=25&sort=#

Birds

1 American Pipit (*Anthus rubescens*) (Breeding population only) **S**
2 Arctic Tern (*Sterna paradisaea*) **s**
3 Atlantic Puffin (*Fratercula arctica*) **s**
4 Barrow's Goldeneye (*Buchephala islandica*) **s**
5 Black-crowned Night Heron (*Nycticorax nycticorax*) **S**
6 Black Tern (*Chlidonias niger*) **S**
7 Common Gallinule (*Gallinula chloropus*) **s**
8 Giant Manta Ray (*Manta birostris*) **f**
9 Golden Eagle (*Aquila chrysaetos*) **S**
10 Grasshopper Sparrow (*Ammodramus savannarum*) **S**
11 Great Cormorant – Breeding population (*Phalacrocorax carbo*) **s**
12 Harlequin Duck (*Histrionicus histrionicus*) **s**
13 Least Bittern (*Lxobrychus exilis*) **S**
14 Least Tern (*Sterna antillarum)* **S**
15 Peregrine Falcon – Breeding population (*Falco peregrinus*) **S**
16 Piping Plover (*Charadrius melodus*) **S f**
17 Razorbill (*Alca torda*) **s**
18 Red Knot (*Calidris canutus rufa*) **f**
19 Roseate Tern (*Sterna dougallii*) **S F**
20 Sedge Wren (*Cistothorus platensis*) **S**
21 Short-eared Owl (*Asio flammeus*) (Breeding population only) **s**
22 Upland Sandpiper (*Bartramia longicauda*) **s**

Fish

23 Atlantic Salmon (*Salmo salar*) **F**
24 Atlantic Sturgeon (*Acipenser oxyrinchus*) **f**
25 Shortnose Sturgeon (*Acipenser brevirostrum*) **F M**
26 Oceanic Whitetip Shark (*Carcharhinus longimanus*) **f**

Mammals

27 Blue Whale *(Balaenoptera musculs)* **F**
28 Fin Whale (*Balaenoptera physalus*) **F M**
29 Humpback Whale (*Megaptera novaeangliae*) **M**
30 North Atlantic Right Whale (*Eubalaena glacialis*) **F M**
31 Sei Whale (*Balaenoptera borealis*) **F M**
32 Sperm Whale (*Physeter catodon*) **F M**

Turtles

33 Atlantic (Kemp's) Ridley Turtle (*Lepidochelys kempi*) **F M**
34 Green Turtle (*Chelonia mydas*) **f**
35 Leatherback (*Dermochelys coriacea*) **F M**
36 Loggerhead (*Caretta caretta*) **f m**

SECTION 6 - Control Measures

From the careful selection of farm sites and investment in the best technology in everything from cage and net construction to feeding systems, to regular monitoring and sampling of sediment under cage sites, we ensure that all the necessary steps to safeguard the health of our salmon and of the surrounding areas are taken. Any measures taken to protect fish from predators are always carried out in a manner that considers predator welfare and does not endanger the predator population; however, if a predator cannot be deterred and is threatening human safety or the security of the containment, it may be dispatched with Saltwater Management consent AND in accordance with Provincial, State or Federal Regulations.

6.1 Passive Control Measures

The primary containment net will be protected from predators using a predator net as needed. The predator net mesh size will be consistent with that utilized in the area for controlling access by predators. Bird nets shall be present over top of each containment net when fish are present and only pulled back to allow access to the cage. During daily inspections, bird nets are checked for damage and pulled tight. 150m cages may require additional support lines to reduce sagging. In winter months, bird nets should be simmed to main nets.

6.2 Active Control Measures

Non-lethal, visual, or audible surface deterrent devices may be used on sites to discourage birds from landing on the cages. Use of audible deterrents must take into effect proximity to other users and abide by noise regulations in the respective area and as described in the operational licences and permits.

Visual active controls include the use of handheld lasers, specifically the Agrilaser® Handheld 200/500 developed by Bird Control Group. The beam produced is classified as a 3B Laser with an effective range of 2,500m. Birds see the laser beam differently than humans and see the beam as a physical danger. The goal is that after consistent use, the birds will perceive the farm as unsafe and will not return. Range of the laser is highly dependent upon weather conditions, with the longest range seen on dark or cloudy days. Sites designated to use this deterrent require specific training and must completed a Safe Use Agreement prior to being assigned a laser.

For predatory marine mammals, Acoustic Deterrent Devices (ADDs) may deployed underneath the water to deter the animals away from our cages. The use of ADDs has drastically reduced in recent years largely due in part to the advances in passive control systems, such as the use of the steel-core nets, redesign of our grid systems and other technologies. ADDs may only be used if:

- The use of an ADD has been first communicated with and approved by the respective Area and/or Production Manager to ensure that all other preventative measures have been taken.
- Other factors such as the legality to use such devices or the requirements of certification programs need to be referred to prior to deployment and your Compliance Manager (or similar) and/or Production Manager are your best resources to answer these questions.
- To ensure that non-target species are not negatively impacted, the use of any ADDs is limited during periods of high population densities. As such, the use of ADDs will NOT BE PERMITTED during the months of June through September – any ADDs must be physically removed from the water during this time.

For smaller marine predators, such as the mink. active measures to control or remove these predators is the use of traps. Traps are only permitted to be used under permit, such as the Nuisance Animal Control Permit in New Brunswick or through those who hold a valid licence, such as the Nuisance Wildlife Control Operator Licence or utilizing the services of local Wildlife Control Officers.

6.3 Lethal Control Measures

Lethal control measures for predators are prohibited unless there is a permit in place and actions are carried out according to said permit under the instructions and guidance of Senior Management. In most instances, marine mammals, primarily seals, found inside cages can be removed by lowering the net to allow the animal to remove themselves. Birds should never require the use of lethal control measures and only require intervention if entangled, entrapped or to aid, refer to *General Predator Interactions*.

6.4 Daily Inspections

Each day crews are to inspect the farm to check water quality, inspect cages and netting and to make general observations of the fish and fish activity from the surface. Any debris that could cause harm to the fish and/or damage netting should be removed from around or in the cages including garbage, large sticks, and excessive amounts of kelp or rockweed. Any garbage shall be removed from the water and placed in site garbage to be disposed properly.

Inspections on the cages and netting should include infrastructure inspections, such as:

- Checking for waterlines or handrail ties that are untied, missing, broken, or chaffed. Any lines that are untied must be retied; all others shall be replaced as soon as possible.
- Inspecting netting and the water surface inside of the cage for any entangled or entrapped wildlife. When possible, to do so without handling the wildlife, all attempts shall be made to release the wildlife without additional harm. Any species found deceased should be removed from the structure.
- Inspecting netting and cage for any damage. For larger repairs, such as broken, chaffed, or missing bridals, weight ring ropes or camera lines should be reported to the Site Manager as these types of repairs may require the use of divers, maintenance vessels, or plastic welders. Any holes discovered in the netting should immediately be repaired, if able, or reported to the Site Manager so that divers can be called in to assess and check for signs of fish escapement.

SECTION 7 - Special Requirements

7.1 Newfoundland Species at Risk; Bald Eagles and Miawpukek First Nation

Interactions between wildlife and aquaculture facilities are bound to occur from time to time. Therefore, our activities should be conducted with respect and care for the local wildlife, ensuring that harmful encounters are minimized. In cases where we do encounter entangled birds, other wildlife, and marine mammals on our sites, whether alive or dead, we are obligated to contact the following authorities for their information and action.

- Report any sightings of species listed on the Newfoundland and Labrador Species at Risk to the Department of Environment and Conservation – Endangered Species and Biodiversity, Wildlife Division at (709) 637-2026.
- Birds and other wildlife: notify the local Conservation Officer, Department of Environment and Conservation (in the Bay D'Espoir area the phone number is (709) 882-2200). If the animal in question is an eagle, we will also contact the Miawpukek First Nation Council, located in Conne River, at (709) 882-2470.
- Marine mammals and fish (tuna, etc.): contact the local Department of Fisheries and Oceans Canada Conservation and Protection Officer in your community.

In the case of wild animals that are alive, the province's Department of Environment and Conservation has a "Wildlife Care and Rehabilitation Program" at Salmonier Nature Park. The local Conservation Officer will be able to determine if the animal in question should be sent to the Salmonier Park.

If a dead animal is encountered, it should be retrieved where possible, treated respectfully, and turned over to the appropriate authority when directed to do so. In the case of deceased bald eagles, the Conservations Officer will make properly permitted arrangements to turn them over to the Miawpukek First Nation Council for respectful burial at Conne River.

7.2 Maine Coastal Islands National Wildlife Refuge Complex

Established between 1972 and 1980, the US Fish and Wildlife Service (USFWS) oversees the Maine Coastal Islands National Wildlife Refuge Complex, which were established for the protection of migratory birds, principally colonial nesting seabirds, The Complex, containing more than 73 offshore islands and 4 coastal parcels, is comprised of five individual refuges which span the coast of Maine and support an incredible diversity of habitats including coastal islands, forested headlands, estuaries, and freshwater wetlands. **Refer to APPENDIX USFWS: Maine Coastal Islands National Wildlife Refuge Complex**[18]

The Cross Island marine farm (MACH CI2), located just inside Northwest Harbour off Cross Island in Machias Bay, is positioned near the Cross Island National Wildlife Refuge. A "line of impasse" is described within the Army Corp of Engineers Permit for MACH CI2 (1989) in which the permit states that no aquaculture gear can be placed south of this line.

7.3 National (US) Bald Eagle Management Guidelines

Bald Eagles were removed from the US endangered species list in August 2007 due to sufficient population recovery, however both bald eagles and golden eagles are still protected by the Bald and Golden Eagle Protection Act (Eagle Act) and the Migratory Bird Treaty Act. The National Bald Eagle Management Guidelines[19] were developed by the USFWS to advise individuals who share public and private lands with bald eagles about when and under what circumstances the protective provisions of the Eagle Act may apply to their activities.
The Guidelines are intended to help people minimize such impacts to bald eagles, particularly where they may constitute "disturbance" which is prohibited by the Eagle Act.

[18] fws.gov/refuge/maine-coastal-islands-complex
[19] https://www.fws.gov/media/national-bald-eagle-management-guidelines-0

Due to the farms proximity to Stone Island, the Stone Island marine farm (MACH ST), located in Machias Bay, must comply with the Guidelines to minimize disturbance of nesting eagles on Stone Island. Such guidelines include sensitive periods (**Table 1**) within various ranges across the US, such as the Northern US which includes Maine.

Table 1. Chronology of typical reproductive activities of Bald Eagles for the Northern U.S., including Maine.

Sept.	Oct.	Nov.	**Dec.**	**Jan.**	**Feb.**	**March**	**April**	**May**	**June**	**July**	**Aug.**
			Nest Building - I								
					Egg Laying/Incubation - II, III						
						Hatching/Rearing Young - IV					
								Fledging Young - V			

Table 2. Nesting Bald Eagle sensitivity to human activities.

Phase	Activity	Sensitivity to Human Activity	Comments
I	Courtship and Nest Building	Most Sensitive	Most critical time period. Disturbance is manifested in nest abandonment. Bald eagles in newly established territories are more prone to abandon nest sites.
II	Egg Laying	Very Sensitive	Human activity of even limited duration may cause nest desertion and abandonment of territory for the breeding season.
III	Incubation and Early Nestling Period (up to 4 weeks)	Very Sensitive	Adults are less likely to abandon the nest near and after hatching. However, flushed adults leave eggs and young unattended; eggs are susceptible to cooling, loss of moisture, overheating, and predation; young are vulnerable to elements.
IV	Nestling period, 4 to 8 weeks	Moderately Sensitive	Likelihood of nest abandonment and vulnerability of the nestlings to elements somewhat decreases. However, nestlings may miss feedings, affecting their survival.
V	Nestlings 8 weeks through fledging	Very Sensitive	Gaining flight capacity, nestlings 8 weeks and older may flush from the nest prematurely due to disruption and die.

7.4 Coffin Island, Nova Scotia

Coffin Island is used for nesting by colonial birds, including the Roseate Tern, which are particularly vulnerable to the effects of human disturbance. The period spent at the colony prior to egg-laying is very important for seabirds, disturbance prior to egg-laying may cause birds to abandon historical colony locations. Meanwhile, disturbances during the breeding season can cause these birds to abandon their nests or young, or to use valuable energy reserves for defense, instead of incubating eggs and feeding their young. The presence of humans in close proximity to nests may prevent parent birds from returning to protect and feed their young, and expose eggs or chicks to predation, and to the lethal effects of heat, cold and rain.

The Liverpool marine farm (NS-1205) is located in close proximity to Coffin Island, which is pending designation as a 50-hectare Nature Reserve in Nova Scotia[20]. Although not officially designated under the IBAs program, the surrounding beaches and flats at East Berlin, West Berlin, Eagle Head, Beach Meadows, and Western Head all host

[20] https://novascotia.ca/parksandprotectedareas/plan/interactive-map/

small populations of migrant shorebirds as well in late summer and early fall. Given the distance from the marine farm to the surrounding beaches and flats, there is no anticipated interaction with these areas.

There is concern for potential negative interactions with sensitive species, therefore it is important that mitigation measures, such as the following, be implemented to avoid/minimize adverse effects on migratory birds in the vicinity of Coffin Island:

- Marine travel should take place at steady speeds, moving parallel to the shore, rather than approaching Coffin Island directly.
- Vessels and equipment should be well muffled, and should avoid any sharp or loud noises, should not blow horns or whistles, and should maintain constant engine noise levels.
- Radio communications should be the primary source of communication, as opposed to whistle blasts and horns.
- Marine vessels should not pursue seabirds/waterbirds swimming on the water surface and avoid concentrations of birds on the water.
- There should be no access to Coffin Island, including the intertidal zone, by employees and/or equipment. Beaches and wetlands are sensitive habitats, and these habitats shall not be used for construction, operational or decommissioning activities, with the exception of beach clean-up activities, which should be timed to not coincide with sensitive periods for breeding birds.
- Beach clean-ups should be conducted in outer Liverpool Bay (Western Head to West Berlin) but avoid the mid-March to September 30th period.
- Should equipment wash up at these sites during the courtship, nesting, and/or chick rearing seasons of colonial nesters (spring and summer), the Canadian Wildlife Service will be contacted prior to retrieval of equipment.

Farms are expected to comply with the requirements as included in the Materials, Storage Handling and Waste Disposal Plan regarding fuel and chemical storage, household, and hazardous waste as well as feed storage that may affect wildlife through contamination or through the artificial enhanced presence of avian and mammalian predators.

SECTION 8 - Reporting and Training

Farm staff have available to them a copy of this plan. All site staff, as well as management, are responsible for both implementation and compliance of this plan.

Annually all marine farm employees participate in CREW Training which is an in-house developed and delivered session that discusses the day-to-day practices and responsibilities of all employees. Topics covered include Fish Health, Waste Management, Wildlife Interactions, Spill Prevention and Reporting, Escape Prevention and Reporting. Farm staff will be trained in recognizing endangered, threatened, and protected species they may see from their farm and a system for recording and reporting such observations to farm management. A Standard Operating Procedure for Predator Interaction is also included in the Fish Health Management Plan available on each site.

An IMS Incident Record is part of the Cooke Aquaculture Integrated Management System and is to be used to report various incident types, including wildlife interactions. The form is available electronically through Pronto Forms and is also available on SharePoint and hard copy if necessary.

All records of training are recorded in Intelex.

8.1 General Predator Interactions

Due to the environment in which we operate, wildlife interactions will be unavoidable – both neutral and negative. Neutral interactions are those where no wildlife is harmed but may be sighted by employees and been seen as a positive or rewarding experience. Though there is no direct contact, some species may require management notification if the species is listed on a Species at Risk list or other similar list. Negative interactions can be further divided into two subcategories – those that affect the marine farm populations (predators) and those where the wildlife has been impacted (entangled, entrapped, death). Based on historical knowledge, negative interactions will generally identify instances of predator activity and should be noted to determine if there is an increase or decrease in activity. If a predator is persistent or there is the potential for endangerment of employees, deterrence methods may be required. Any negative interaction, including those involving non-predatory species whether intentional or accidental, in addition to those neutral interactions with at risk species, must be reported.

8.2 General Wildlife Interactions

Marine birds and mammals have the greatest likelihood for interactions with marine farms given that they share the same waters and migrate through areas where farms are located. Wildlife may become entangled, entrapped, contaminated, or oiled from gear or chemicals on an aquaculture site. The first step to preventing such emergencies is prevention. Proper installed containment and predator exclusion netting, continually checking nets for integrity and avoiding oil, gas and chemical spills is important.

8.2.1 Entanglement, Entrapment

Birds, mainly gulls, will stand atop the bird stands and bird netting, both as a form of rest and in an attempt to access feed. Occasionally other birds such as crows, herons, among other may be seen but this is generally limited to smolt entry when the fish are small. Birds interested in fish generally loose interest once the fish are larger and as long as the bird nets remain taught. Other birds may be seen as they are passing through to other destinations.

Birds may become entrapped under the bird netting if there are holes in the net or if it is not properly secured. Should a bird become entrapped, employees must roll back the bird net and allow the bird to exit. The bird net must be gathered in a manner that prevents entanglement by neither the bird nor fish while it is pulled back. Once released, the bird net must be repaired, if applicable, and/or properly secured.

Marine mammals and large fishes may enter or entangle themselves within netting or anchor lines, either through forceful entry or accidental entanglement. Should a marine mammal such as a seal enter a cage, the seal should be immediately released by lowering the net to the height of the float pipe to allow the seal to swim out. The seal should be encouraged to leave the cage from the opposite side of the cage from where the net has been dropped. Once removed, the net is to be retied and divers should immediately be contacted to perform a net inspection.

These types of interactions require the submission of a Wildlife Interaction on the IMS Incident Record.

8.2.2 Oiled Birds

If a fuel, chemical or oil spill does occur or is discovered, immediately contact the Coast Guard, and activate the Spill Prevention and Response Plan (Canada) or Spill Prevention, Control and Countermeasure Plan (Maine). If wildlife is not initially affected, efforts should be made to keep wildlife out of the affected area, if possible.

Birds that have come into contact with oil may have exhibit obvious indicators of being oiled, such as oil coating, discolored feathers, or feathers having a wet or ragged appearance. Heavily oiled birds or individuals oiled below the waterline may also appear as though they are sitting low on the water, perhaps struggling to maintain above water. As such, oiled birds are also likely to be intently focused on preening in an attempt to remove the oil, so much so that they may not exhibit a strong flight reaction upon approach. They may also stand or rest on wharves, barges, or vessels with a more solid structure than those that might usually rest on the cages or netting.

DO NOT attempt to capture the bird without first seeking advice as their handling may require the issuance of permits, depending on species. Injured and oiled birds, especially those washed ashore are extremely weak, dehydrated, and often near death. The added stress of attempted capture could cause more harm than good, perhaps even fatality. Should an oiled bird be found, alive or deceased, contact the regional Compliance Manager, or designate and complete an IMS Incident Record. If further actions are required, the regional Compliance Manager or designate will communicate any advice or recommendations provided by the appropriate authorities.

8.3 Canadian Wildlife Service Permit

Migratory birds are protected under the Migratory Birds Convention Act and some species are also protected under the Species at Risk Act (SARA); this protection can extend to the point where evening handling these species is not allowed without a Canadian Wildlife Service Permit.

Common sense must prevail in all circumstances and caution must be exercised when dealing with birds. In stressful situations, birds may react with more force to protect themselves. As well, birds can carry diseases and parasites which may be transmitted to humans. If a bird can be easily released from entrapment without handling, this may be attempted by site workers. Employees should not touch birds, regardless of the situation. If an incident cannot be resolved, employees must contact the Compliance Manager or designate and provide information regarding the incident such as the cause of the incident (entanglement, oil spill, etc.), wildlife involved and the location of the incident - good directions and/or coordinates are essential to help experts arrive in time. Canadian Wildlife Services should be contacted, (506)-364-5068 or ec.scfatlpermis-cwsatlpermits.ec@canada.ca, for further direction. A permit may become necessary to handle and transport the bird to a rehabilitation facility. If a bird must be handled, clean work gloves must be worn, and the bird handled with care.

An exception to paragraph 6(b) of the Migratory Birds Regulations is currently in place and the variance will remain in effect until August 20, 2022[21]. Normally a person is not allowed to have in their possession any migratory birds, even if found dead. Under this temporary variance, a person may possess such birds if (and only if) they are in the process of delivering them to authorities for testing. This exception was granted to allow CWS to

[21] https://www.canada.ca/en/environment-climate-change/services/migratory-birds-legal-protection/public-notice-allowing-temporary-possession.html

monitor bird viruses. Once captured, keep the bird in a dark, quiet, warm location and transport to designated location as per the Regulator. DO NOT attempt to feed or clean the bird.

If crews find a dead migratory bird, the Site Manager must be informed and the Compliance Manager or designate contacted. The Compliance Manager or designated will contact the Canadian Wildlife Health Cooperative at 1-800-567-2033.

8.4 SARA Reporting

Species identified on the Provincial Protected Wildlife factsheets are protected under SARA (Species at Risk Act) and COSEWIC (Committee on the status of Endangered Wildlife in Canada) and have been or could be found in the area of aquaculture sites in Atlantic Canada.

Should you observe wildlife around aquaculture facilities identified under SARA/COSEWIC, special care should be taken to not disturb or harm the species. If able, collect a photograph and submit the details of the sighting on the IMS Incident Record, including location of the sighting. The Compliance Manager or designate will report sighting of these listed species to the species at risk hotline at 1-866-727-3467 or emailed to sightings@speciesatrisk.ca. Should the animal be found in distress, the Compliance Manager or designate will contact the Canadian Coast Guard at 1-800-565-1633.

The IMS Incident Record can be used to report both neutral and negative interactions.

8.5 Endangered Species – Federal and State

If you see a sick, injured, stranded, or dead marine mammal or sea turtle, immediately contact Northeast Marine Mammal and Sea Turtle Stranding and Entanglement Hotline at 1-866-755-NOAA (866-755-6622), or the Maine Marine Animal Reporting Hotline at 1-800-532-9551. A stranded animal is one that is dead on the beach or in the water, one that is alive on land and unable to return to the water and/or in need of medical attention, or a live animal in the water that is unable to return to its natural habitat under its own power or without assistance.

For Federally listed species, the National Oceanic and Atmospheric Administration (NOAA) – National Marine Fisheries Service (NMFS) should be contacted through David Bean, Consultation Biologist/Atlantic Salmon Team via email david.bean@noaa.gov and/or phone 1-207-866-4172.

Allied Whale is authorized by NOAA Fisheries to respond to marine mammal emergencies and strandings, covering the area from Rockland, Maine north to the Canadian border.[22] To report a marine mammal stranding contact Allied Whale at 1-207-288-5644 (office) or 1-207-266-1326 (cell).

Endangered and threatened marine species are listed under Maine's Marine Endangered Species Act or ESA. The Maine Department of Marine Resources (MDMR) has responsibility for these species. For State listed species, the MDMR, Aquaculture Division should be contacted through Marcy Nelson, Aquaculture Program Director via phone (207) 441-4681.

[22] https://www.coa.edu/allied-whale/marine-mammal-strandings/

APPENDICES

All Included in Master or Online Version Only
Applicable Regional Documents are Included in Site Reference Binders

Agrilaser® Handheld User Manual
CAF Safe Operation Agreement: Bird Control Group Agrilaser® Handheld 200/500

Maine
USFWS: Maine Coastal Islands National Wildlife Refuge Complex

New Brunswick
NB Protected Wildlife ID Chart

Newfoundland
NL Protected Wildlife ID Chart

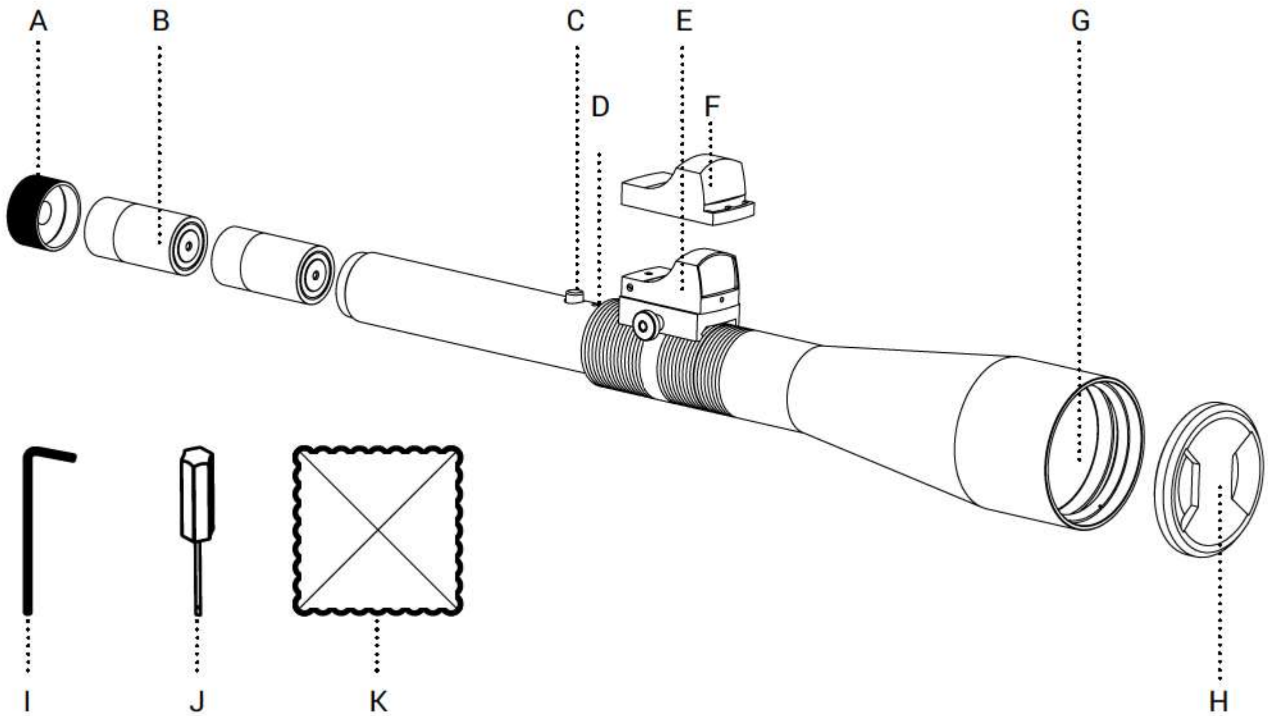
Nova Scotia
NS Protected Wildlife ID Chart

END OF DOCUMENT

Agrilaser® Handheld

User manual	EN
Mode d'emploi	FR
Benutzerhandbuch	DE
Gebruikershandleiding	NL
Manual de usuario	ES
Manual do usuário	PT
Руководство пользователя	RU

Agrilaser® Handheld V1.0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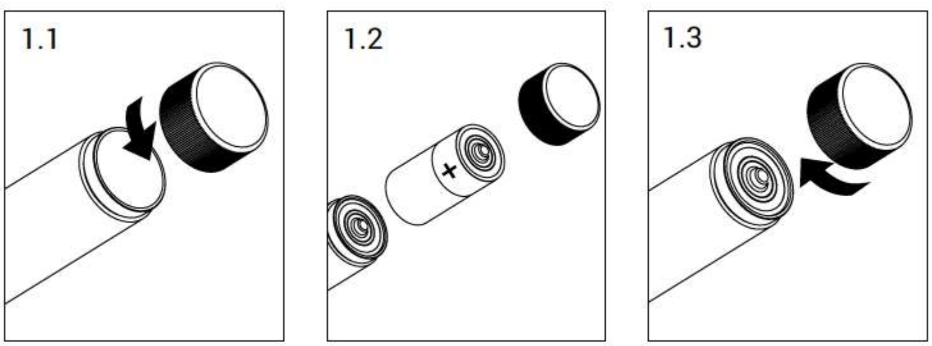
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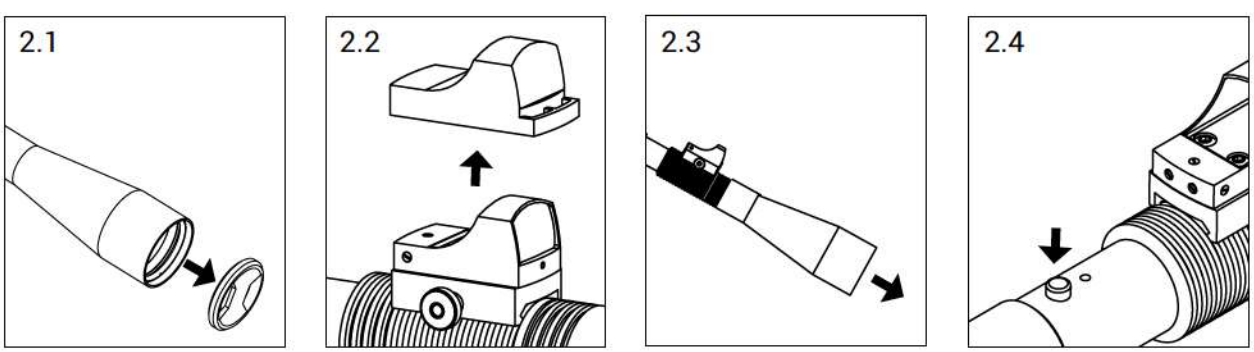
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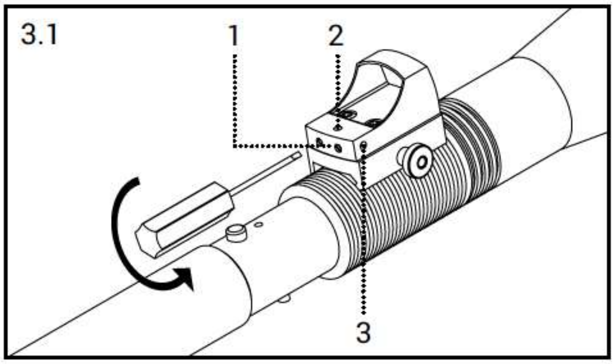
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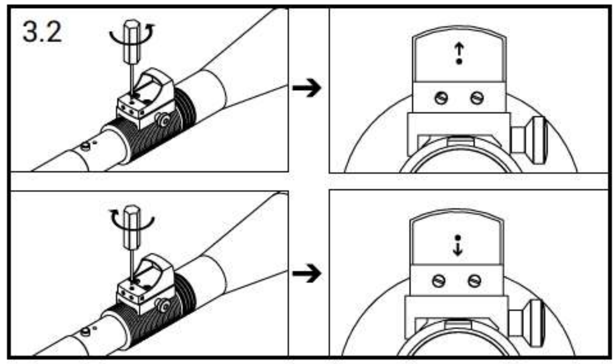
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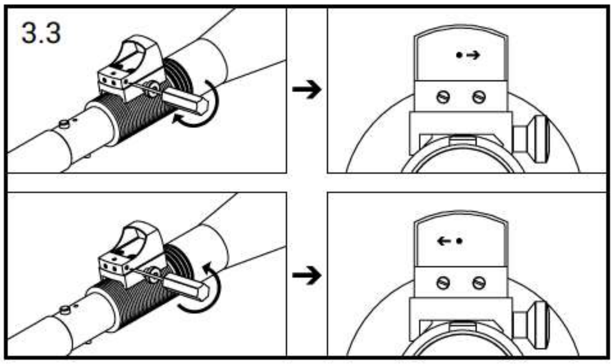
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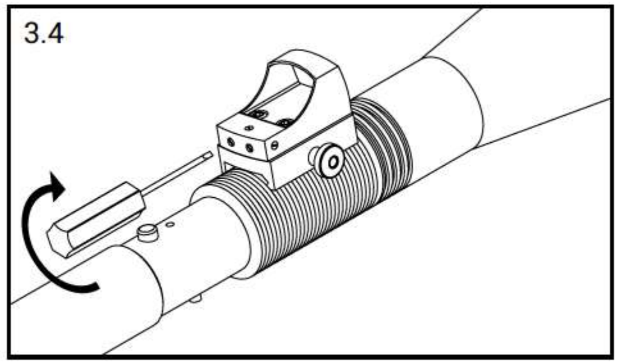
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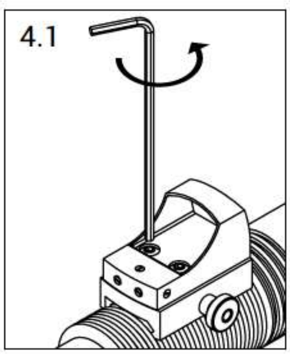
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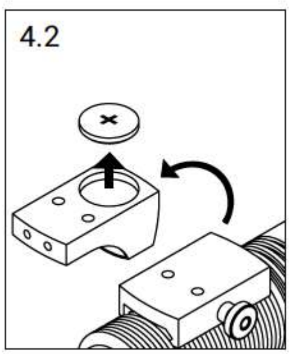
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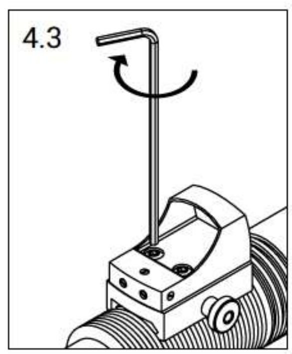
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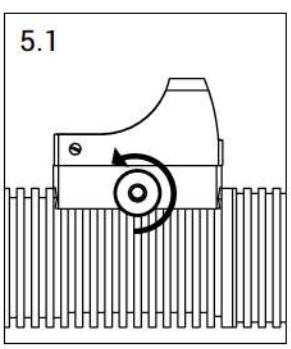
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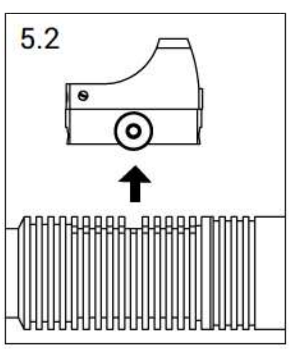
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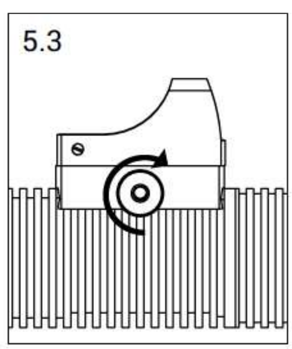
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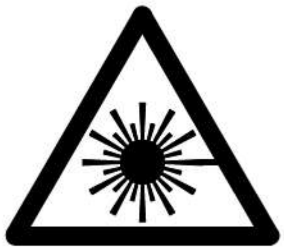


LASER RADIATION
DO NOT STARE INTO THE BEAM
OR VIEW DIRECTLY WITH
OPTICAL INSTRUMENTS
CLASS 2M LASER PRODUCT

MAXIMUM OUTPUT **< 50 mW**
WAVELENGTH **532 nM**
CLASSIFIED TO **NEN EN 60825-1:2007**

CAUTION - USE OF CONTROLS OR
ADJUSTMENTS OR PERFORMANCE OF
PROCEDURES OTHER THAN THOSE
SPECIFIED HEREIN MAY RESULT IN
HAZARDOUS RADIATION EXPOSURE

Explanation of general view

A	Screw cap	G	Laser aperture
B	C battery (LR14)	H	Lens cap
C	ON/OFF button	I	Hex key
D	Output indicator	J	Screw driver
E	Aiming sight	K	Cleaning cloth
F	Protection cap		

Table of contents

Thank you for your purchase of the Agrilaser® Handheld.

Agrilaser offers silent, effective and easy to use bird control products. Our patented optical technology is optimized for long distance bird repelling. Birds perceive the laser beam as an approaching physical danger and fly away in search for safer grounds. After consistent use birds will perceive the area as unsafe and will not return.

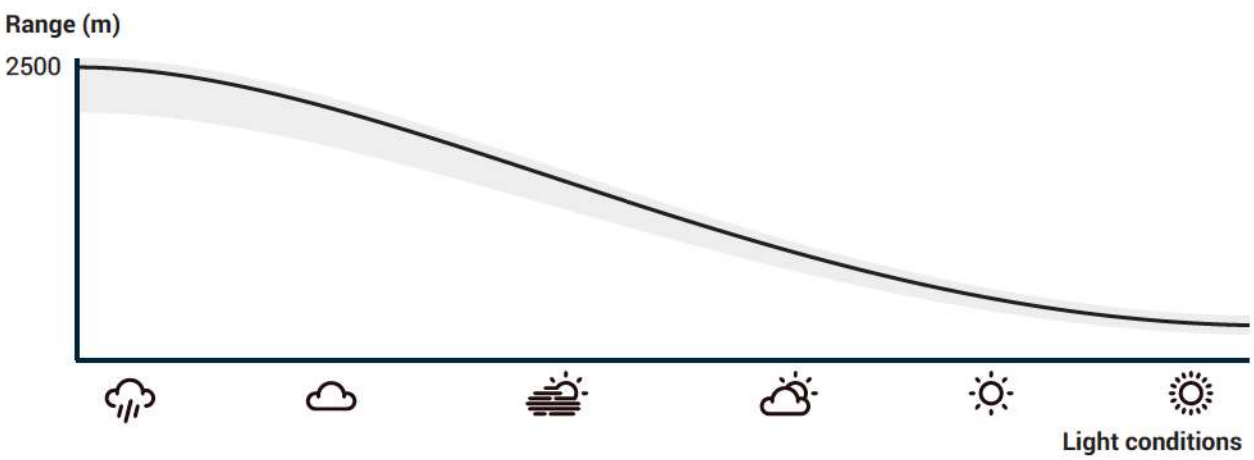
Package contents:
1x Agrilaser Handheld
1x Lens cap
2x LR14 battery
1x Aiming sight
1x Protection cap for aiming sight
1x Hex screw
1x Screw driver
1x Cleaning cloth
1x Storage case

CE The "CE" mark indicates that this product complies with the applicable European Directives which relate to health, safety, environmental and customer protection.

Technical specifications

Agrilaser® Handheld

Laser class	2M (classified according to NEN EN 60825-1:2007)
Laser beam color	Green
Service life laser source (during normal operating conditions)	5,000 h
Power source	Agrilaser Handheld: 2x C battery (LR14)
	Aiming sight: 1x CR2032 battery
Power input	3 VDC – 3.6 VDC
Energy consumption	4 W
Dimensions	424 (16.7) x 66 (2.6) x 83 (3.3) mm (in) (LxWxH)
Weight	760 g (27 oz)
Operating temperature	10 °C to 35 °C (50 °F to 95 °F)
Storage temperature	-10 °C to 50 °C (14 °F to 122 °F)



* actual range of effective bird repelling depends on environmental conditions

Safety instructions

⚠ **WARNING:** Carefully read all safety warnings and all instructions. Save all safety warnings and all instructions for future reference.

Agrilaser Handheld

⚠ **WARNING**: Staring into the beam or viewing the laser output with certain optical instruments designed for use at a distance (for example, telescopes or binoculars) may pose an eye hazard.

⚠ **WARNING**: The laser beam of the Agrilaser Handheld could cause dazzle or after images, particularly under low ambient light conditions. This may have indirect safety implications if experienced while performing safety-critical operations.

⚠ **CAUTION:**
- The Agrilaser Handheld should be used by adults only.
- The Agrilaser Handheld has no serviceable parts inside.
- To reduce risk of injury, only use the supplied batteries.
- Operate only in undamaged condition. Use of the product when damaged may result in exposure to hazardous laser radiation.

The safety labels as shown in figure 6.1 can be found on the bottom side of the Agrilaser Handheld body.

Contact your local Agrilaser dealer for any questions related to product safety.

Batteries

⚠ **CAUTION:**
- To prevent product malfunction, always insert batteries in correct orientation.
- Do not short circuit batteries.
- Misuse or abuse of batteries may result in leakage, burns, fire or explosion/disassembly causing personal injury or damage to other devices.
- Eye contact with battery contents may cause severe irritation. If battery is leaking and material contacts the eye, flush thoroughly with copious amounts of running water for 15 minutes. Seek immediate medical attention.
- Skin contact with battery contents may cause irritation. If battery is leaking and material contacts the skin, remove any contaminated clothing and flush exposed skin with copious amounts of running water. If irritation, injury or pain persists, seek medical attention.
- Inhalation of vapors or fumes released due to a large number of leaking batteries may cause respiratory and eye irritation. High concentration may cause central nervous system effects including headache, dizziness and nausea.
- Do not swallow batteries. Irritation to the internal/external mouth area, may occur following exposure to a leaking battery. If battery is leaking, contents may be irritating to respiratory passages. Move to fresh air. If irritation persists, seek medical attention.
- In case of fire, use dry chemical, alcohol foam, water or carbon dioxide as appropriate for the surrounding fire. For incipient fires, carbon dioxide extinguishers are more effective than water. Firefighters should wear positive pressure self-contained breathing apparatus and full protective clothing. Fight fire from a distance or protected area. Cool fire exposed batteries to prevent rupture. Use caution when handling fire-exposed batteries as they may explode in heat of fire.

Functional use

Preparing for use

⚠ CAUTION:
- Point the laser towards to ground when inserting batteries.

EN FR DE NL ES PT RU

- Do not drop. The product may malfunction if subjected to strong shocks or vibration.
- Avoid sudden changes in temperature: Sudden changes in temperature, such as those that occur when entering or leaving a heated building on a cold day, can cause condensation inside the device. To prevent condensation, keep the device in a storage box or plastic bag before exposing it to sudden changes in temperature.

Perform the following steps to replace the batteries of the Agrilaser Handheld:

1. Turn the end cap anti-clockwise to open the battery compartment (figure 1.1).
2. Insert the two batteries with the positive side facing the end cap (figure 1.2). Make sure the batteries are charged.
3. Turn the end cap clockwise to close the battery compartment (figure 1.3).

Only disperse birds with landowner's permission.

Never point the laser device towards aircraft, windows and vehicles.

Never point the laser device at humans.

Never point the laser device towards water or reflective surfaces such as mirrors, windows and metallic objects.

Using the Agrilaser® Handheld

⚠ **CAUTION:**

- The Agrilaser Handheld is a handheld laser device intended for bird repelling purposes only.
- When using the Agrilaser Handheld, always take into account the safety precautions as described in this document.
- The Agrilaser Handheld is not suited for continuous use. Use for short repelling actions only.

Perform the following steps to prepare the Agrilaser Handheld for active bird repelling:

1. Remove the lens cap (figure 2.1)
2. Remove the protection cap to activate the aiming sight (figure 2.2).

***Important**: To increase battery life, always replace the protection cap of the aiming sight after using the Agrilaser Handheld.*

3. Point the Agrilaser Handheld towards the ground (figure 2.3).
4. Switch on the Agrilaser Handheld by pushing the ON/OFF button (figure 2.4).
5. Project the laser dot on the ground in front of you and slowly move the dot towards the birds. Make sure no reflective objects, vehicles or people are between you and the birds. The Agrilaser Handheld should not be used like a gun, i.e. point and shoot.

Weather conditions: The Agrilaser Handheld is most effective during sunrise, sunset and overcast, rainy or foggy weather conditions. During bright weather conditions, make sure that the birds are positioned between the user and the sun. If not, bright sunlight could inhibit the repelling action.

Rain: Make sure the Agrilaser Handheld is kept out of the rain. Remove any moisture with a dry cloth.

Protected species: : Local regulations may prohibit the deterrence of certain (protected) bird species. Always consult local legislation before using the Agrilaser Handheld.

Aiming sight

Aligning the aiming sight

Applicable when the red dot is not aligned with the laser beam.

⚠ **CAUTION**: Do not stare into laser beam while aligning the aiming sight.

Step 1: Preparing for alignment

Unlock the two locking screws (number 1 on the aiming sight) at the back of the aiming sight (figure 3.1). For each locking screw, execute three full counter-clockwise rotations with the screwdriver.

Step 2: Vertical alignment.

1. Switch on the laser and project the beam on a distant object. Make sure that the green dot is visible through the aiming sight.
2. Rotate the adjustment screw (number 2 on the aiming sight) in clockwise direction to move the red dot downwards and vice versa (figure 3.2).

Continue to the horizontal alignment after the red dot is correctly aligned in vertical position.

Step 3: Horizontal alignment.

1. Project the beam on a distant object and make sure that the green dot is visible through the aiming sight.
2. Rotate the adjustment screw (number 3 on the aiming sight) in clockwise direction to move the red dot to the left and vice versa (figure 3.3).

Step 4: Securing new position

Fasten the two locking screws (number 1 on the aiming sight) in clockwise direction to secure the new alignment position (figure 3.4). Do not use excessive force.

Replacing the battery of the aiming sight

Applicable when the red dot is not visible.

1. Unscrew the two hex screws using the hex key (figure 4.1).
2. Remove the upper compartment of the aiming sight from its base to replace the CR2032 battery (figure 4.2).
3. Place the upper compartment in original position and fasten the hex screws using the hex key (figure 4.3).

Replacing the aiming sight

Applicable when the aiming sight is defective.

1. Unscrew the locknut by hand (figure 5.1).
2. Remove the aiming sight from the body of the Agrilaser Handheld (figure 5.2).
3. Place the aiming sight on the body of the Agrilaser Handheld and fasten it by hand (figure 5.3).

Maintenance

Cleaning

Body (Agrilaser Handheld and aiming sight)

Use a soft dry cloth to remove dust and dirt from the Agrilaser Handheld and the aiming sight. Do not use any liquids.

***Important**: Dust and other foreign matter inside the Agrilaser Handheld may cause damage not covered under warranty.*

Lens (Agrilaser Handheld and aiming sight)

The lenses are easily damaged. Remove dust and dirt with a soft dry cloth. To remove fingerprints and other stains, apply a small amount of lens cleaner to a soft cloth and clean with care.

Storage

When the Agrilaser Handheld is not used for an extended period, replace the lens cap and remove the batteries. To prevent mold or mildew, store the Agrilaser Handheld in a dry, well-ventilated area.

Do not store your Agrilaser Handheld in a location that is:

- poorly ventilated or subject to humidity's of over 60%.
- next to equipment that produce strong electromagnetic fields, such as televisions or radios
- exposed to temperatures above 65°C (149°F) or
- below -20°C (-4°F).

Store batteries in the original storage box together with the Agrilaser Handheld.

Disposal

Do not dispose of the Agrilaser Handheld, aiming sight or batteries together with household material. Recycle in accordance with local regulations.

Always recycle batteries.

Warranty

CAUTION: Disassembly attempts of the product voids warranty.

The Agrilaser Handheld is developed and produced according to the highest quality standards. Should you encounter any problems with your model, please carefully read this manual. If you encounter defects, please contact your local Agrilaser dealer. Should any defect arise as a result of production faults, free repair or replacement is guaranteed. The Agrilaser Handheld has a warranty period of 12 months, starting on the date of purchase. In case of replacement, the warranty period of the original product will remain valid.

Warranty conditions

The warranty is valid only if the Agrilaser Handheld is used according to the instructions as presented in the user manual. In addition, warranty only applies if a valid receipt is presented, showing the date of purchase, the name of dealer and the product name.

The warranty is invalid if:

- Water damage or damage due to falling or jolting occurred.
- The serial number has been removed.
- Any repairs have been carried out by unauthorized individuals.
- Any defects occurred as a result of misuse or use in environments that are not prescribed.
- The defect is due to wear of replaceable parts, such as batteries.

Spare parts

The following parts are available as spare parts for the Agrilaser Handheld. For requests of spare parts contact your local Agrilaser dealer.

Spare parts
Agrilaser Handheld battery (LR14 battery)
Screw cap
Lens cap
Aiming sight
Protection cap (for aiming sight)
Hex key
Screw driver
Cleaning cloth

Troubleshoot

Agrilaser Handheld

Check the following if the Agrilaser Handheld appears non-functional:

- Is the ON/OFF button activated?
- Is the lens cap removed?
- Are the batteries charged?
- Are both batteries inserted in correct orientation (as shown in figure 1.2)?

Aiming sight

Check the following if the aiming sight appears non-functional:

- Is the battery not empty?
- Is the protection cap removed?
- Are all screws sufficiently tightened?

Explication de la vue globale

A	Capuchon à vis	G	Ouverture laser
B	Pile C (LR14)	H	Capuchon d'objectif
C	Bouton Marche/Arrêt	I	Clé hexagonale
D	Voyant de sortie	J	Tournevis
E	Viseur	K	Chiffon de nettoyage
F	Capuchon de protection		

Table des matières

Merci d'avoir acheté l'Agrilaser® Handheld.

Agrilaser offre des produits de dissuasion d'oiseaux silencieux, efficaces et faciles d'utilisation. Notre technologie optique brevetée est optimisée pour la dissuasion d'oiseaux à distance. Les oiseaux perçoivent le faisceau laser comme un danger physique en approche et s'envolent pour trouver un endroit plus sûr. Après une utilisation persistante, les oiseaux considèreront cet endroit comme peu sûr et ne reviendront pas.

Contenu du colis :
1x Agrilaser Handheld
1x capuchon d'objectif
2x piles LR14
1x viseur
1x capuche de protection du viseur
1x vis hexagonale
1x tournevis
1x chiffon de nettoyage
1x boîtier de rangement

CE La marque « CE » indique que ce produit est conforme aux directives européennes en vigueur qui ont trait à la santé, la sécurité, l'environnement et la protection des clients.

Thank You

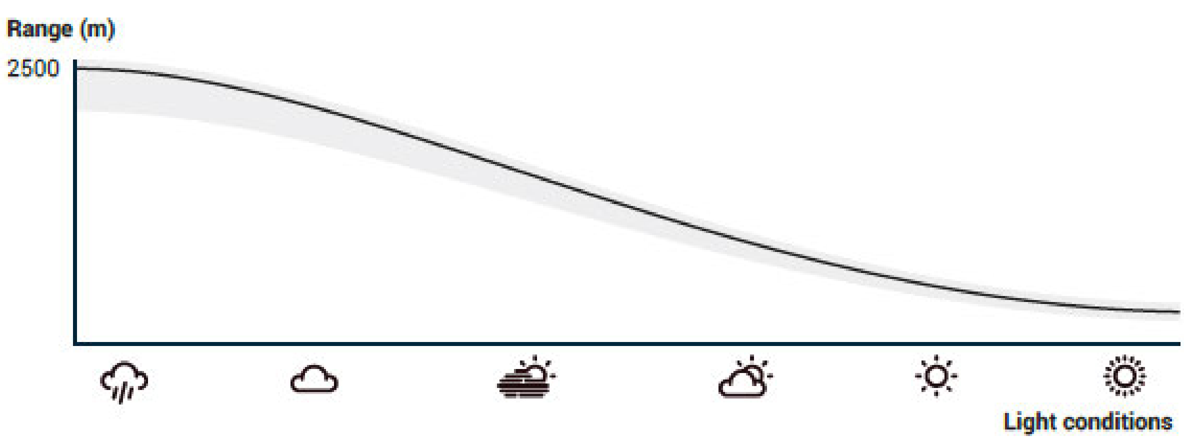
Agrilaser® Handheld

Safe Operation Agreement: Bird Control Group Agrilaser® Handheld 200/500

Background

The Agrilaser® Handheld 200 and Handheld 500 are products developed by the Bird Control Group used as an active control measure to discourage birds from landing on our cages. This product requires responsible safe handling.

The beam produced from the Agrilaser® Handheld 200/500 is classified as a 3B Laser with an effective range of 2,500m. Birds see the laser beam differently than humans and see the beam as a physical danger. The goal is that after consistent use, the birds will perceive the farm as unsafe and will not return. Range of the laser is highly dependent upon weather conditions, with the longest range seen on dark or cloudy days.



Source: Bird Control Group Agrilaser® Handheld Manual)_EN V.1.0

Safe Operations

This product is only to be used as a visual deterrent to discourage birds from landing on cages and nets. Prior to use, ensure that you have read and understood the user manual, are familiar with the local regulations and be aware of your surroundings. This product is classed as a Class 3B Laser and as such is subject to the following non-permissible actions, warnings and cautions:

Non-Permissible Actions:

- **Never** project the laser device towards **Aircraft**, **Vessels**, or **Vehicles.**
- **Never** project the laser device at **Humans.**
- **Never** project the laser device into the **"Infinite Sky"/Horizon.**
- **Never** project this laser device towards reflective surfaces such as **Mirrors**, **Windows**, or **Metallic Objects**.

Warning:

- Avoid Direct Eye exposure to the laser beam. Direct eye exposure or exposure to direct reflections can result in serious eye damage. Diffuse reflections are considered safe.
- Viewing the laser output with optical instruments designed for use at a distance (For example, telescopes, or binoculars) may pose an eye hazard.
- This Laser product is only to be used by trained personnel in a **controlled environment.**
- The Laser Beam of the handheld could cause dazzle or after images, particularly under low ambient light conditions. This may have indirect safety implications if experienced while performing safety-critical operations.
- Only operate this product in undamaged condition. Use of this product when damaged may result in in exposure to **hazardous laser radiation.**

Caution:

- To operate this laser safety training is required.
- The handheld should be used by responsible adults only.
- The handheld should be used for bird repelling only.
- The handheld has no serviceable parts inside.
- To reduce the risk of injury, use only the supplied battery.

Acknowledgement

By signing below, I acknowledge that I have read and understand this Safe Operation Agreement in its entirety. I further agree to read and understand the user manual of the Handheld 200/500 prior to its use at my site(s).

Please Print Full Name	**Inventory Control Verification**
Signature	Date Unit Given
Date Agreement Signed	Date Returned

Maine Coastal Islands National Wildlife Refuges
P.O. Box 279 (Water Street)
Milbridge, ME 04658
207/546 2124

P.O. Box 1735 (9 Water Street)
Rockland, ME 04841
207/594 0600

Hearing-impaired visitors may call the Maine Relay Center:
1 800/457 1220 (voice) or 1 800/437 1220 (TDD)

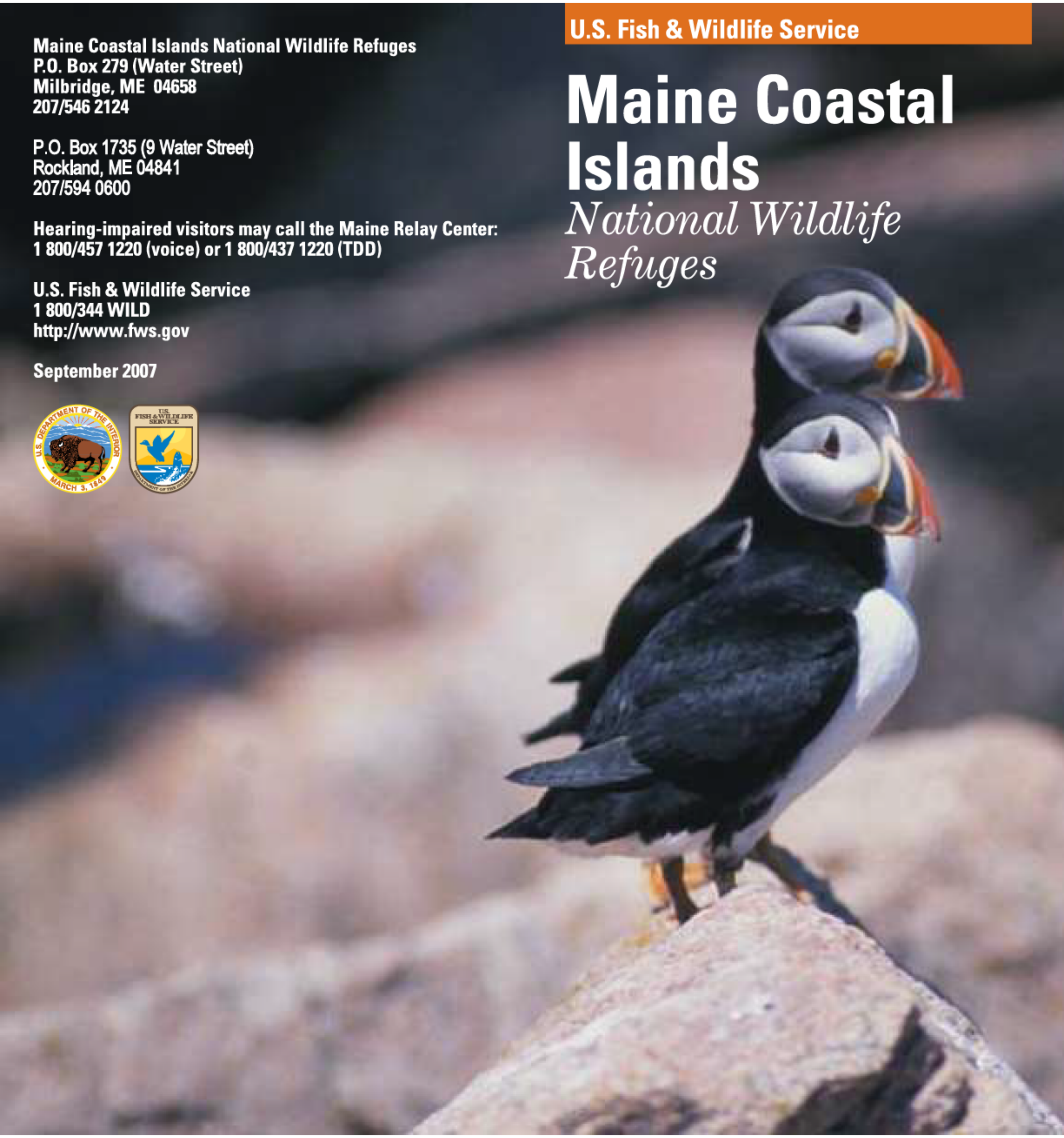
U.S. Fish & Wildlife Service
1 800/344 WILD
http://www.fws.gov

September 2007

U.S. Fish & Wildlife Service

Maine Coastal Islands

National Wildlife Refuges



Conserving the Nature of the Coast

This blue goose, designed by J.N. "Ding" Darling, has become a symbol of the National Wildlife Refuge System.

The Maine Coastal Islands National Wildlife Refuges span over 200 miles of Maine coastline and contain 49 offshore islands and four coastal parcels, totaling more than 8,000 acres. The refuge complex includes five national wildlife refuges — Petit Manan, Cross Island, Franklin Island, Seal Island, and Pond Island. The U.S. Fish and Wildlife Service manages the refuge complex as part of the National Wildlife Refuge System.

The Service's primary focus at Maine Coastal Islands is colonial seabird restoration and management. Refuge islands provide nesting habitat for common, Arctic, and endangered roseate terns, Atlantic puffins, razorbills, black guillemots, Leach's storm-petrels, laughing gulls, and common eiders. Over the last 25 years, the Service has worked to reverse the decline in these birds' populations. As a result, many species have returned to islands where they nested historically.

In addition to seabirds, wading birds and bald eagles nest on refuge islands. The mainland divisions provide habitat for songbirds, shorebirds, and waterfowl, as well as opportunities for bird watching and hiking.

Bald eagle

cover and facing photo: Bill Silliker, Jr.©

photo: Maine Dept. of Inland Fisheries & Wildlife

Seabird Struggles

James C. Leupold

Black guillemots

Seabirds have always relied on Maine's offshore islands as havens for raising their young. Small, unforested, rocky islands provide a setting free of mammalian predators such as foxes, coyotes, and raccoons. Flying distance from the mainland discourages avian predators such as great horned owls. The cold waters surrounding the islands hold an abundant supply of fish for adults and young alike.

Native Americans have used the coast's natural resources for more than 4,000 years. The Red Paint people camped on offshore islands in the summer and fished the deep ocean waters. Although they hunted seabirds and their eggs, they used sustainable methods, limiting harvest to certain islands and hunting any one colony once every three years.

Europeans began settling the islands in the 1600s, farming and raising sheep and hogs. The livestock disturbed nesting seabirds and trampled their habitat. The people hunted the birds and collected their eggs. In the late 1800s, the fashion industry posed an additional threat to the birds' existence. Women's hats were decorated with feathers. Egrets, herons, and terns were especially popular and, therefore, most harmed by the trend. At the start of the 20th Century, most seabirds in the Gulf of Maine were on the brink of extinction.

Concern for the future of all birds led to passage of the Migratory Bird Treaty Act in 1918. The Act protects migratory birds, their nests, and their eggs. At about the same time, trains and automobiles replaced boats as preferred forms of transportation. People relocated to the mainland, easing pressure on seabird habitat. Common and Arctic tern populations rebounded, reaching a high of almost 16,000 pairs along the Maine coast in 1940.

The recovery was short-lived, however. During the mid-1900s, the spread of open landfills along the coast and an increase in fishery waste provided easy pickings for herring and great black-backed gulls. These birds nest earlier than terns, claiming prime habitat and relegating terns to inferior nest sites. Some gulls also prey on tern eggs and chicks. The artificial food sources led to an explosion in gull populations. By 1977, the tern population in the Gulf of Maine had declined to roughly 5,000 nesting pairs.

Burton Glendenning

Common terns

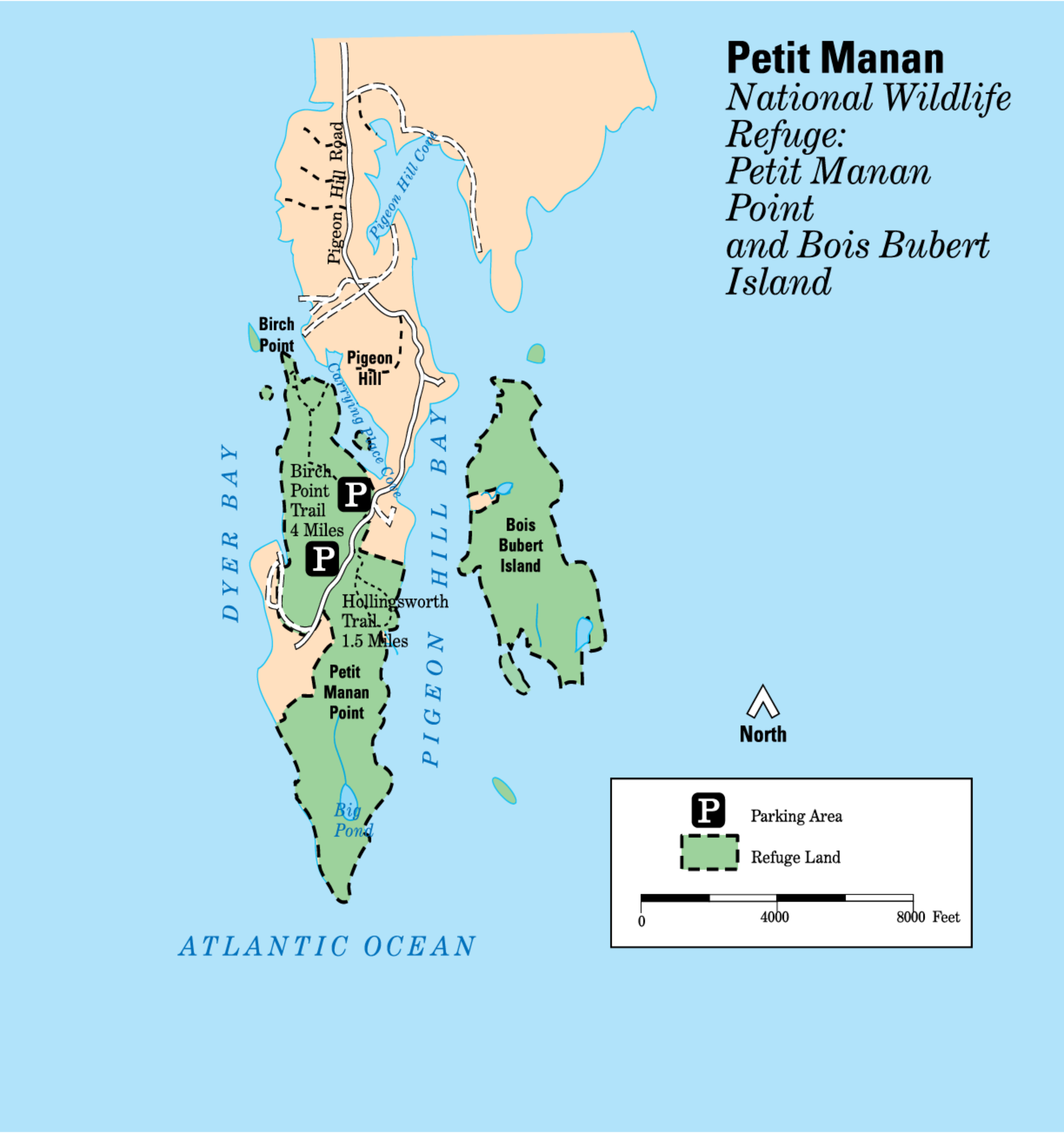
Seabird Restoration

Between 1972 and 1980, the refuges in the Maine Coastal Islands National Wildlife Refuge were established for the protection of migratory birds, principally colonial nesting seabirds. The Service has focused on restoring terns because their populations were particularly low. The roseate tern, a federally endangered species, prefers large colonies of common or Arctic terns in which to nest. Therefore, saving this species requires assisting the other two.

To restore terns to an island, it must first be made suitable for the birds again. This requires discouragement of herring and great black-backed gulls. In some cases, human presence on the island during the start of the gull nesting season is enough. Small populations of gulls can be controlled


Maine Coastal Islands
National Wildlife Refuges
North
0
50 Kms
0
50 Miles
MAINE
CANADA
U.S.
NEW HAMPSHIRE
MAINE
Maine Turnpike
Bangor
Calais
Machias
Cutler
Ellsworth
Belfast
Bar Harbor
Rockland
Brunswick
Portland
Portsmouth
Petit Manan NWR Headquarters
Petit Manan NWR Office
Mainland Divisions
Schoppee Island
Brothers Island (E)
Halifax Island
Little Libby Island
Nash Island
Inner Sand Island
Scotch Island
Mink Island
Double Headshot Islands
Cross Island
Old Man Island
Machias Seal Island
Abbott Island
Bois Bubert Island
Sally Island
Petit Manan Island
Egg Rock
Jordan's Delight
South Twinnie Island
Little Spoon Island
Little Marshall Island
John's Island
Little Marshall Island
Ship Island
Barge Islands
Bar Island
Trumpet Island
Roberts Islands
Seal Island
Matinicus Rock
Two Bush Island
Two Bush Island
Hart Island
Metinic Island
Franklin Island
Crane Island
Outer White Island
Little Thrumcap Island
Inner White Island
Lower Mark Island
Outer Heron Island
Pond Island
Ram Island
Upper Flag Island
Duck Island
Smuttynose Island
Malaga Island
ATLANTIC OCEAN
95
1

Petit Manan
National Wildlife Refuge: Mainland Divisions
Milbridge
Steuben
East Steuben
Gouldsboro
Prospect Harbor
Wyman
Lookout Mtn
Sawyer's Marsh Division
Gouldsboro Bay Division
Williams Point
Corea Heath Division
Petit Manan Point Division
Petit Manan Point
Bois Bubert Island
Little Bois Bubert Island
Dyer Neck
Eagle Hill
Parker Head
Pigeon Hill
Stanley Point
Dyer Point
Cranberry Point
Green Island
Petit Manan Island
Foster Island
Ripley Neck
Dyer Island
Trafton Island
Flint Island
Pond Island
Douglas Island Harbor
NARRAGUAGUS RIVER
NARRAGUAGUS BAY
JOY BAY
WEST BAY
GOULDSBORO BAY
DYER BAY
PIGEON HILL BAY
PROSPECT HARBOR
Dyer Harbor
Pinkham Bay
Pigeon Hill Cove
Carrying Place Cove
Yeaton Cove
Over Cove
Stanley Cove
Big Pond
Forbes Pond
Fickett Pt. Road
Wyman Road
Smithville Road
Pigeon Hill Road
Chicken Mill Pond Rd.
Rogers Point Road
Dyer Bay Road
Morgador Road
Rocky Gulch Rd.
Shores Rd.
Dyer Neck Road
Petit Manan Point Road
1
186
195
North
MAINE
Mainland Divisions
Other Refuge Lands
Lighthouse


Petit Manan
National Wildlife Refuge:
Petit Manan Point
and Bois Bubert Island
Pigeon Hill Road
Pigeon Hill Cove
Birch Point
Pigeon Hill
Carrying Place Cove
DYER BAY
PIGEON HILL BAY
Birch Point Trail 4 Miles
Hollingsworth Trail 1.5 Miles
Petit Manan Point
Bois Bubert Island
Big Pond
ATLANTIC OCEAN
North
Parking Area
Refuge Land
0
4000
8000 Feet

through egg and nest destruction and noise-makers. If a gull colony has grown too large, these techniques may be ineffective. Lethal means, including limited shooting and the use of an avicide, may be necessary.

If terns have recently abandoned an island, they may return rapidly once the gulls are gone. However, in many cases, it has been decades since terns nested on an island. To entice them back, the Service uses sound systems playing recordings of a tern colony and tern decoys scattered in suitable nesting habitat. This method has been highly effective on several islands within the Gulf of Maine.


Bill Silliker, Jr.©

Roseate tern

Tern restoration began in 1984 on Seal and Petit Manan islands, which now support large colonies of common and Arctic terns. Roseates have returned to Petit Manan. More recent restorations have occurred on Pond, Metinic, and Eastern Brothers islands. The goal is to establish tern colonies on numerous refuge islands. This will ensure that a singular catastrophic event such as disease, an oil spill, or a hurricane, will not wipe out a species.

Other colonial nesting seabirds have benefited from tern restoration efforts. Atlantic puffins, black guillemots, laughing gulls, Leach's storm-petrels, and common eiders have recolonized some islands. Petit Manan Island now hosts all of these species during the nesting season. Razorbills, a relative of the extinct great auk, are at the southern end of their range along the Maine coast and nest on three refuge islands: Seal, Matinicus Rock, and Old Man. Herring and great black-backed gulls and double-crested cormorants breed on some refuge islands.

A "Bed and Breakfast" for the Birds

In addition to seabirds, refuge islands provide habitat for raptors, wading birds, shorebirds, and songbirds. Some of the forested islands, including Outer Heron, Sally, Bois Bubert, and Mink, have active bald eagle nests. Outer White Island supports a black-crowned night heron rookery. Migrating peregrine falcons stop on Seal Island to hunt and rest. Warblers such as the bay-breasted and blackpoll, and shorebirds, including ruddy turnstones and semipalmated plovers, rely on the islands as stepping stones on their long trips north and south.

Tern decoys


USFWS

Points of Light

Eight refuge islands possess historic light houses. For more than a century, light keepers operated beacons on Petit Manan, Franklin, Pond, Nash, Two Bush, and Libby islands and Matinicus and Egg rocks to ensure safe travel for passing vessels. With the advent of underwater electric cables and solar power, automation of the lights became possible. The islands were transferred to the Service from the Coast Guard. The Coast Guard maintains all of the lights except Nash Island Light, which no longer functions. All are on the National Register of Historic Places, with the exception of Two Bush Island Light.

USFWS

Petit Manan Island Light

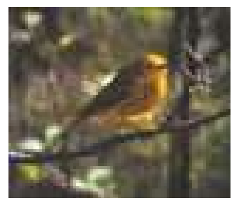
Meanwhile, On the Mainland

The refuge's four mainland properties are located in Hancock and Washington counties. Upland areas are characterized by spruce-fir forests with some mixed hardwoods. The 2,195-acre Petit Manan Point Division, in Steuben, also includes jack pine stands, coastal raised heath peatlands, blueberry barrens, old hayfields, freshwater and saltwater marshes, cedar swamps, granite shores, and cobble beaches. The Gouldsboro Bay Division, in Gouldsboro, protects 623 acres, including a large tidal saltmarsh and mudflat. The 1028-acre Sawyer's Marsh Division lies at the head of a broad saltmarsh in Milbridge, just north of Petit Manan Point.

The Corea Heath Division is a 431-acre raised coastal peatland situated on the Corea peninsula in Gouldsboro.

A Seasonal Home

Neotropical migratory songbirds thrive in the forests of the mainland divisions. These birds breed in North America and winter in the Caribbean, Mexico, and Central and South America. Recently, populations of species such as the American redstart, Swainson's thrush, and song sparrow, have declined due to habitat loss throughout their migratory routes.



Sid Bahrt

Yellow warbler

The Service monitors songbird populations by conducting surveys at the height of the breeding season each year. Experts walk designated routes, stopping at set intervals to identify and count birds by sight and song. Other studies use banding to identify individuals and track their survival and productivity.

The saltmarshes and mudflats of the mainland divisions attract waterfowl, wading birds, and shorebirds. Black ducks, great blue herons, and American bitterns ply the waters of the saltmarshes. Semipalmated sandpipers, short-billed dowitchers, greater and lesser yellowlegs, and dunlins probe the mudflats for invertebrates.

During fall migration, the 80-acre Cranberry Flowage on Petit Manan Point is filled with over 4,000 ducks. Black ducks, green-winged teal, and mallards rest and feed on wild rice in preparation for the long flight south. Long-tailed duck, surf, black, and white-winged scoters, common goldeneyes, and common eiders winter in coastal waters.

The former pastures and blueberry fields on Petit Manan Point provide nesting habitat for grassland birds such as bobolinks and savannah sparrows. In the spring, American woodcock use the clearings for their unique courtship displays. Whimbrels stop off here during their fall migration from the Arctic tundra to the southern United States. The Service maintains open areas through periodic mowing and controlled burning.

Some species call the refuge's mainland "home" year-round. Resident wildlife include ruffed and spruce grouse, white-tailed deer, bobcats, snowshoe hares, porcupines, coyotes, and raccoons.

A Group Effort

Partnerships between the Service and other public and private organizations are key to the success of seabird restoration efforts at the refuge. Since 1984, refuge staff have worked closely with representatives from

Razorbill

Linda Welch/USFWS

Linda Welch/USFWS

Atlantic Puffin

the Maine Department of Inland Fisheries and Wildlife, College of the Atlantic, National Audubon Society, Maine Audubon Society, and Canadian Wildlife Service in the Gulf of Maine Seabird Working Group. The Group guides restoration efforts on Maine's offshore islands, including those in the refuge.

Since the early 1980s, the National Audubon Society has worked with the Service to restore seabirds to Seal Island, located 21 miles southeast of Rockland, Maine. Through its Project Puffin, the Society successfully re-introduced Atlantic puffins to the island by transporting chicks from Newfoundland, Canada, and hand-raising them. Puffins now nest on the island, after a 150-year absence. Seal Island also supports the largest tern colony in the Gulf of Maine, with 2,000 pairs. National Audubon is working with the Service to manage and restore seabirds on Matinicus Rock and Pond Island.

Tom Goettel/USFWS

Old Man Island

The Service works with private organizations at the local, state, and national levels to add land to the refuge. These groups serve a vital function by purchasing property from willing sellers and protecting it until it can be acquired by the Service. Through conservation easements, refuge staff help landowners manage their properties for wildlife.

Where You Come In

Wildlife comes first on national wildlife refuges. All human activities must be compatible with the needs of wildlife. Six priority public uses are encouraged when they do not interfere with the individual refuge's mission. These are: hunting, fishing, wildlife observation and photography, environmental education, and interpretation.

The refuge offers excellent opportunities for bird watching and hiking. Foot trails wind through a variety of habitats, from spruce-fir woodlands to grasslands to freshwater and saltwater marshes to mudflats. On Petit Manan Point, the Hollingsworth Trail is a 1.5-mile

USFWS

Hollingsworth Trail - Petit Manan Point

loop with views of heaths and cobble beaches. Interpretive signs offer insight into refuge wildlife, habitats, and management. The Birch Point Trail (four miles round trip) begins in a blueberry field and leads to the saltmarshes of Dyer Bay, passing through a mixed-wood forest. A hiking trail on the Gouldsboro Bay Division is under development.

Cross, Scotch, Halifax, and Bois Bubert islands are open to visitors all year. Seal Island and Duck Island are closed at all times. The remaining refuge islands are open from September 1 through March 31 and closed during the seabird nesting season, April 1 - August 31. Commercial tour boats provide views of nesting seabirds on Petit Manan and Machias Seal islands.

USFWS

Parts of the refuge are open to hunting. Contact the refuge office for a list of open areas and current regulations.

To reach the Petit Manan Point Division, take Pigeon Hill Road off U.S. Route 1 in Steuben. The parking area for the Birch Point Trail is 5.8 miles from Route 1, and the parking area for the Hollingsworth Trail is 6.2 miles. The Gouldsboro Bay, Corea Heath and Sawyer's Marsh divisions have no public use facilities at present.

Your Cooperation is Appreciated....

To protect the refuge's wildlife and habitats, please comply with the following:

The refuge is open during daylight hours only.

Dogs are allowed on mainland divisions only and must be on hand-held leashes no longer than 10 feet.

All-terrain vehicles and open fires are not allowed.

Blueberries may be hand-picked; raking is not allowed.

New Brunswick's Protected Wildlife

The following species are protected under SARA (Species at Risk Act) and/or COSEWIC (Committee on the status of Endangered Wildlife in Canada). Of the protected species found in New Brunswick and the Atlantic Ocean, these either have (recently) been observed in the area of southwestern NB's aquaculture sites or they are likely to be found in the area of the aquaculture sites due to their environmental preferences. If any of these animals are found in distress around the aquaculture sites, Canadian Coast Guard should be contacted at **1-800-565-1633**. If any of these animals are observed, care should be exercised to avoid causing them any harm.

Atlantic Cod *(Gadus morhua)*, Southern population

Habitat: Shoreline to continental shelf in Northeast Atlantic
Description: Brown to green or grey with spots on dorsal surface, pale underside. Distinctive chin barbell.
3 dorsal fins and 2 anal fins.
Max. size: 2 m, 96 kg

Atlantic Salmon (*Salmo salar*), iBoF population

Habitat: Fresh water streams in winter then migrates out to Bay
Description: Sides and belly are silvery,
back varies from shades of brown to green and blue.
Adult size: 60 cm, 3 kg
Season of Concern: Spring, summer and fall

Atlantic Bluefin Tina (*Thunnus thynnus*)

Habitat: Mostly pelagic species but can dive to depths of 500 to 100 m. Tolerates a wide thermal range (3 to 30°C).
Description: Fusiform body, conical head, pointed snout; blue-black dorsal surface, lighter blue sides, and silvery-grey underside; 2 dorsal fins.
Adult size: 400 kg, 270 cm FL
Season of Concern: Summer to late fall

Fin Whale *(Balaenoptera physalus)*

Habitat: Temperate, cool waters. Found in shallow and uneven depths of the Bay of Fundy.
Description: Baleen whale with a long and slender, streamline body; dark grey, white underneath. Narrow, V-shaped head, pointed snout, paired blowholes.
Adult Size: 20-27 m, 70,000 kg
Season of concern: Summer

Harbour Porpoise *(Phocoena phocoena)*

Habitat: Temperate and subarctic waters (<16 °C). Inhabit marine and fresh waters, depths of < 650 m.
Description: Black back, grayish-white sides fading to white underneath
Max. size: 1.7 m, 65 kg

Thorny Skate *(Amblyraja radiata)*

Habitat: Ocean bottoms at depths of 18-1400 m, at temperatures of 0-10°C.
Description: Dark colored upper body, white under side. A row of 11-19 large thorns runs down the middle of its back and along the tail.
Adult Size: 110 cm, 12.5 kg

Porbeagle *(Lamna nasus)*

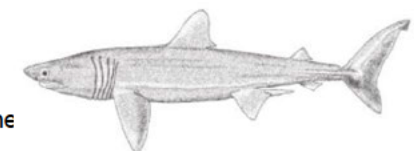
Habitat: Found at depths of 1 m to 700 m though more often on continental shelves. Prefers temperatures 5 – 10°C.
Description: Large shark with a powerful streamlined body. Grey-bluish black body with a white patch on the back of dorsal fin, white underside. Head is stout, snout is pointed.
Max. size: 3.5 m, 135 kg

Leatherback Sea Turtle (*Dermochelys coriacea*)

Habitat: Offshore and coastal waters, at depth of 2 to 5033 m.
Description: Largest living sea turtle. Lacks a bony shell, instead its carapace is covered by bluish black skin.
Max.size: 2.4 m in length, 3.6 m wide, up to 725 kg
Season of Concern: April to December

Atlantic Wolffish *(Anarhichas lupus)*

Habitat: Bottom dweller, found in cold, deep waters. Prefers rock or hard-clay sediment.
Description: Rounded profile, heavy head, blunt snout, lacking pelvic fins. Body color ranges from slate blue to dull green to purplish brown with vertical, dark brown bars along the sides. Extensive teeth structure
Max. size: 150 cm, 20 kg



Basking Shark *(Cetorhinus maximum)*

Habitat: Prefers shallow coastal waters
Description: Blackish to grey-brown coloring, pointed snout, crescent-shaped caudal fin, elongated gill slits, large mouth with small teeth
Max. size: 15.2 m
Season of Concern: Summer

North Atlantic Right Whale *(Eubalaena glacialis)*

Habitat: Temperate northern waters (in summer)
Description: Large black baleen whale distinguished by the callosities (thick, hard, white bumps) on its head. Broad back, lacks a dorsal fin.
Adult Size: 16-17 m, 63,500 kg
Season of Concern: Summer and fall

American Eel *(Anguilla rostrata)*

Habitat: Found in all freshwater, estuarine, and marine waters that are connected to the Atlantic Ocean.
Description: Elongate and serpentine body with scales. Adults are grey with a white belly, juveniles have a dark back and a yellow, green, or olive-brown belly. A single fin extends from its back around the tail to its belly.
Adult size: 1 m (females), 0.4 m (males)

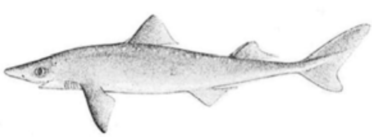
Harlequin Duck *(Histrionicus histrionicus)*
Habitat: Offshore islands, rocky coastline where surf breaks against rock and ice build-up is minimal.
Description: Small sea duck. Males have slate-blue plumage, chestnut sides, and streaks of white, chestnut and black on head. Females are plain, brownish-grey with patches of white
Adult size: 45cm
Season of Concern: Winter

Red Knot rufa *(Calidrius canutus rufa),*
Tierra del Fuego/Patagonia wintering population
Habitat: (migration) coastal areas with sandflats
Description: Medium size shorebird with sandpiper profile. Non-breeding plumage is plain with white underparts and pale grey back.
Adult size: 23- 25 cm, 135 g
Season of Concern: May/June and July/August

Red-necked Phalarope (*Phalaropus lobatus*)
Habitat: near water surface where there are prey aggregations
Description: (non-breeding plumage) white along the head, throat, breast and underparts with dark upper parts, eye stripe, and crown
Adult size: 18 cm
Season of Concern: April – May and August - October

Peregrine Falcon anatum/tundrius (*Falco peregrinus*)
Habitat: cliffs or buildings for nesting, open landscapes for foraging, with nearby waterbodies
Description: (adults) bluish-grey/darker upper parts and pale under parts with dark spotting and barring; (immatures) pale to slate or chocolate brown upper parts, under parts are buffy with blackish streaks
Adult size: (males) 36-49 cm long, 650 g; (females) 45-58 cm long, 950 g

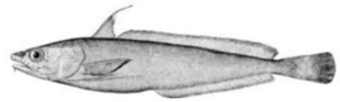
Lesser Yellowlegs (*Tringa flavipes*)
Habitat: uses freshwater and marine shorelines during migration
Description: small, slender shorebird with greyish plumage, a long neck, straight black bill, and long yellow legs
Adult size: 23 – 25 cm, 67-94 g
Season of Concern: Fall and spring



Spiny Dogfish (*Squalus acanthis*)
Habitat: Occurs world-wide from the intertidal to the continental shelf slope, most common at 10-100 m depth. Usually found at temperatures of 5-15˚C.
Description: Small shark, grey-brown on the upper body and whitish on the under side.
Max. size: 112 cm TL (female), 94 cm TL (male)

Leach's Storm-Petrel *(Oceanodroma leucorhoa)*
Habitat: Forages in open ocean waters, breeds on vegetated islands, nests on island with other seabirds.
Description: A small, tube-nosed seabird, dark blackish-brown plumage, long wings, forked tail.
Adult size: 45 g

Killer Whale *(Oricinus orca)*
Habitat: Occur in all oceans; tolerate a wide range of salinity, temperature, and turbidity
Description: Distinctive black and white coloration, tall triangular dorsal fin.
Adult size: 9 m, 6600 kg (males); 7.7 m, 4700 kg (females)



White Hake *(Urophycis tenuis)*
Habitat: Groundfish, prefers depths of 144-358 m and temperatures between 4 and 8˚C.
Description: Elongated body, small barbel at the tip of the lower jaw, 2 dorsal fins. Color ranges from muddy or purple brown on the dorsal side, bronze or golden sides, white or yellow-white belly with small dots.
Max. size: 133-135 cm, 21.5 – 22.3 kg

White Shark (*Carcharodon carcharias*),
Atlantic population
Habitat: Inshore and offshore waters; just below surface to 1100 m depth; off sandy beaches, rocky shores; enters bays, harbours.
Description: Heavy, torpedo-shaped body, grey/black back and white underside, pointed dorsal fin, cone-shaped snout
Adult size: 2 – 6 m length

Lumpfish (*Cyclopterus lumpus*)
Habitat: found in benthic and pelagic environments; seem to prefer temperatures of 5˚C
Description: thick, ball-shaped fish with a sucker on the underside, rounded snout
Max. size: 55 cm

Shortfin Mako (*Isurus oxyrinchus*)
Habitat: Prefers temperatures of 17-22˚C thus likely doesn't reside extensively in Canadian waters.
Description: Dark colored dorsal surface, white underside. Pointed snout, small eyes, U-shaped mouth. First dorsal fin height greater than base length.
Max. size: 4.5 m TL

Newfoundland and Labrador Protected Wildlife

The following species are protected under SARA (*Species at Risk Act*) and / or COSEWIC (Committee on the status of Endangered Wildlife in Canada) and/or the *Newfoundland and Labrador Endangered Species Act* and have been or could be found near aquaculture sites on the south coast of Newfoundland. If any animals shown below are found in distress around aquaculture sites, Canadian Coast Guard should be contacted at 1.800.565.1633. They will provide assistance in how to proceed. Care should always be exercised around wildlife to avoid causing any harm to human or wildlife. Where species specific contact information is provided below, sightings should be reported.

Acadian Redfish (*Sebastes fasciatus*)
Habitat: Smaller fishes live in shallow waters and adults are found in deeper waters.
Description: Spiny-rayed with distinctive flame-red colouring and fan of bony spines.
Adult size: 60 cm in length.

American Eel (*Anguilla rostrata*)
Habitat: Uses all salinities during life stage, found in all freshwaters that are accessible to the Atlantic Ocean.
Description: Elongated, grey with cream colour belly.
Adult size: Male: 0.4 m; Female: 1.0 m.
Contact: Provincial Biologist – 1.709.637.2043

American Plaice (*Hippoglossoides platessoides*)
Habitat: Juveniles prefer finer sediment to partially or fully bury themselves while adults are less stringent.
Description: Laterally flattened. The eyed side is typically red to grayish brown and the blind side is white. Small head with a relatively large mouth.
Adult size: 61 cm in length.

Atlantic Bluefin Tuna (*Thunnus thynnus*)
Habitat: Seasonal migrants and occurs in the area during its summer feeding migration.
Description: Large, stout but fusiform body. Dorsal surface is dark blue to black, shading to lighter blue on the sides and silvery grey below.
Adult size: 270 cm fork length and 400 kg or more.

Atlantic Cod – Laurentian North (*Gadus morhua*)
Habitat: Migrates inshore to their feeding grounds.
Description: Brown to green or grey with spots on dorsal surface, pale underside. Distinctive chin barbell, 3 dorsal and 2 anal fins.
Adult Size: 2 m and 96 kg

Atlantic Salmon – South NL (*Salmo salar*)
Habitat: Requires rivers or streams that are generally clear, cool, and well-oxygenated, but undertakes lengthy feeding migrations in the North Atlantic Ocean as older juveniles and adults
Description: Fusiform body shape.
Adult size: 100 + cm in length.

Atlantic Wolffish (*Anarhichas lupus*)
Habitat: Bottom dwellers, prefer rock or hard clay.
Description: Rounded profile, heavy head, blunt snout. Colour ranges from slate blue to dull green to purplish brown with vertical, dark brown bars along the sides. Extensive teeth structure.
Adult size: 150 cm in length and 20 kg.

Blue Whale (*Balaenoptera musculus*)
Habitat: Off the south coast of Newfoundland.
Description: Largest animal on earth, coloured dark and light grey, smallish dorsal fin and pointed pectoral flippers.
Adult size: 30 m in length and 181 MT.
Contact: Whale Release and Strandings group 1.888.895.3003

Fin Whale (*Balaenoptera physalus*)
Habitat: Temperate, deep, cool waters.
Description: Long, slender body, V-shaped head, paired blowholes, asymmetrical colouring.
Adult size: 20 to 27 m in length and 70 MT.
Contact: Whale Release and Strandings group 1.888.895.3003

Leatherback Sea Turtle (*Dermochelys coriacea*)
Habitat: Can be found close to shore and at times in relatively shallow waters to feed on jellyfish aggregations in late summer.
Description: Largest living sea turtle. Lacks a bony shell, its carapace is covered in bluish black skin.
Adult size: 2.4 m in length, 3.6 m wide, 725 kg.
Contact: Whale Release and Strandings group 1.888.895.3003

North Atlantic Right Whale (*Eubalaena glacialis*)
Habitat: Temperate northern waters in summer.
Description: Large black baleen whale distinguished by the callosities (thick, hard, white bumps) on its head.
Adult size: 16 to 17 m in length, 64 MT.
Contact: Whale Release and Strandings group 1.888.895.3003

Northern Wolffish (*Anarhichas denticulatus*)
Habitat: Inhabits cold waters usually between 2- 5°C and mainly at depths of 400-1000 metres. Prefers rocky or muddy sea floor.
Description: Thick and heavy set, with a large head, small sharp teeth with grey to dark chocolate colour appearance.
Adult size: 1.4 m in length and 20 kg.

Porbeagle (*Lamna nasus*)
Habitat: Pelagic, epipelagic, or littoral, found far from land in ocean basins and close inshore.
Description: Streamlined body, dark grey - bluish black back and white underneath. Stout head and large eyes.
Adult size: 3 m in length.
Contact: NL shark sightings DFO -1.844.400.7870

Thorny Skate (*Amblyraja radiata*)
Habitat: Found on sand, gravel, mud and broken shells.
Description: Disk spade to heart-shaped, corners rounded, rounded snout, tail 1.0-1.1 times its body length, and a single dominant mid-dorsal row of 11-19 large thorns.
Adult size: 110 cm in length.

White Shark (*Carcharodon carcharias*)
Habitat: Breakers off sandy beaches, rocky shores, and readily enters enclosed bays and estuaries.
Description: Heavy spindle-shaped body with sharp coloured contrast between its backside and underside
Adult size: 3.8 to 6 m in length.
Contact: NL shark sightings DFO -1.844.400.7870

Spotted Wolffish (*Anarhicas minor*)
Habitat: Arctic and Atlantic Ocean, 200-750 m on the continental shelf or deep trenches.
Description: Large head and rounded snout, yellow, grey, or brown with dark spots.
Adult size: Max. size 150 cm weighing up to 22 kg.

Lumpfish *(Cyclopterus lumpus)*
Habitat: Prefer hard rocky bottom with lots of vegetation in cold water.
Description: Short, stubby, with a small mouth and slightly rounded tail.
Adult size: Max. size: 60 cm, weighing up to 10kg.

Harbour Porpoise (*Phocoena phocoena*)
Habitat: Found primarily over continental shelves, and occasionally in deeper waters
Description: Robust body, dark grey fins and flipper, light grey sides, and whiter underside.
Adults size: 1.9 m in length and 76 kg.
Contact: Local DFO Office – 1-709-885-2520

Loggerhead Sea Turtle (*Caretta caretta*)
Habitat: Atlantic, Pacific, and Indian Oceans
Description: head and carapace are reddish-brown, flippers are chestnut brown, the bridge, plastron, underside of throat, flippers and tail are yellow
Adult size: 200 to 350 pounds
Contact: Whale Release and Strandings group – 1.888.895.3003

Harlequin Duck (*Histrionicus histrionicus*)
Habitat: Turbulent mountain streams in summer, rocky coastal waters in winter.
Description: Males have slate-blue plumage, chestnut sides, streaks of white, chestnut, and black on head. Females are plain, brownish grey with patches of white.
Adult size: 45 cm in length.
Contact: Provincial Biologist – 1.709.637.2026

Piping Plover (*Charadrius melodus melodus*)
Habitat: Nests and forages for on ocean beaches, sand spits, or barrier beaches.
Description: Small, thrush-sized shorebird primarily the colour of dry sand with distinctive black markings, a white rump, and bright orange legs.
Adult size: 18 cm in length.
Contact: Provincial Biologist – 1.709.637.2026

Red Knot (*Calidris canutus rufa*)
Habitat: Use coastal mudflats, salt marshes, sandy estuaries, and sand flats during their fall migration
Description: Medium-sized shorebird. Long bill, long legs, long tapered wings with elongated body.
Adult size: 25 cm in length.
Contact: Provincial Biologist – 1.709.637.2026

Nova Scotia Protected Wildlife

The following species are protected under SARA (Species at Risk Act) and/or COSEWIC (Committee on the status of Endangered Wildlife in Canada). Of the protected species found in Nova Scotia and the Atlantic Ocean, these either have (recently) been observed in the area of NS's aquaculture sites or they are likely to be found in the area of the aquaculture sites due to their environmental preferences. If any of these animals are found in distress around the aquaculture sites, Canadian Coast Guard should be contacted at **1-800-565-1633**. If any of these animals are observed, care should be exercised to avoid causing them any harm.

American Eel (*Anguilla rostrata*)
Habitat: Uses all salinities during life stage, found in all freshwaters that are accessible to the Atlantic Ocean.
Description: Elongated, grey with cream colour belly.
Max Size: Male: 0.4 m; Female: 1.0 m

Atlantic Cod (*Gadus morhua*)
Habitat: Shoreline to continental shelf in Northeast Atlantic
Description: Brown to green or grey with spots on dorsal surface, pale underside. Distinctive chin barb. 3 dorsal fins and 2 anal fins
Max Size: 2 m; 96 kg

Atlantic Wolffish (*Anarhichas lupus*)
Habitat: All around Nova Scotia. Deep, rocky continental shelf. Periodically found on sandy or muddy bottom.
Description: Rounded profile, heavy head, blunt snout, lacking pelvic fins. Colour ranges from slate blue to dull green to purplish brown with vertical, dark brown bars along the sides. Extensive teeth structure
Max Size: 150 cm, 20 kg

Blue Whale (*Balaenoptera musculus*)
Habitat: North shore of the Gulf of St Lawrence and off Eastern Nova Scotia during spring, summer, and fall.
Description: Tapered, elongated body, pleated grooves in the skin of the neck, small dorsal fin, mottled dark blue and grey.
Max Size: 30 m, 181 MT

Atlantic Bluefin Tuna (*Thunnus thynnus*)
Habitat: Seasonal migrant and occurs in the area during its summer feeding migration.
Description: Large, stout but fusiform body. Dorsal surface is dark blue to black, shading to lighter blue on the sides and silvery grey below.
Max Size: 270 cm fork length and 400 kg or more

Atlantic Salmon – NS (*Salmo salar*)
Habitat: Throughout the inner Bay of Fundy following anadromous migration
Description: Sides and belly are silvery, back varies from shades of brown to green and blue
Max Size: 60 cm, 3 kg

Basking Shark (*Cetorhinus maximus*)
Habitat: Prefers temperatures of 8 to 14.5 °C and is often seen close to land and near surface as it slowly feed on plankton.
Description: Cavernous jaw and obvious gill slits. Colours range from dark brown to black or blue dorsally and fade to a dull white on the underside.
Max Size: 15+ m

Fin Whale (*Balaenoptera physalus*)
Habitat: Temperate, deep, cool waters.
Description: Long, slender body, V-shaped head, paired blowholes, asymmetrical colouring.
Max Size: 20 to 27 m in length and 70 MT.

Harbour Porpoise (*Phocoena phocoena*)
Habitat: Found primarily over continental shelves, and occasionally in deeper waters
Description: Robust body, dark grey fins and flipper, grey sides, and whiter underside.
Max Size: 1.9 m in length and 76 kg.

Lumpfish *(Cyclopterus lumpus)*
Habitat: Prefer hard rocky bottom with lots of vegetation in cold water.
Description: Short, stubby, with a small mouth and slightly rounded tail.
Max Size: 60 cm, weighing up to 10kg.

Porbeagle (*Lamna nasus*)
Habitat: Pelagic, epipelagic, or littoral, found far from land in ocean basins and close inshore.
Description: Streamlined body, dark grey - bluish black back and white underneath. Stout head and large eyes.
Max Size: 3 m in length

Striped Bass (*Morone saxatilis*)
Habitat: Anadramous species spawns in freshwater, moves to coastal brackish or salt water to feed and mature. Found along the Atlantic Coast.
Description: Dark olive green back with pale silver striped sides and white belly
Max Size: 1.8 m

Barrow's Goldeneye (*Buscephala islandica*)
Habitat: Coastal waters throughout Atlantic Ocean
Description: Medium sized sea duck. High, rounded head is black with white patch under eye. Males are black and white; females are greyish brown and white.
Max Size: 53 cm, 1 kg

Leatherback Sea Turtle (*Dermochelys coriacea*)
Habitat: Can be found close to shore and at times in relatively shallow waters to feed on jellyfish aggregations in late summer.
Description: Largest living sea turtle. Lacks a bony shell, its carapace is covered in bluish black skin.
Max Size: 2.4 m in length, 3.6 m wide, 725 kg.

North Atlantic Right Whale (*Eubalaena glacialis*)
Habitat: Temperate northern waters in summer.
Description: Large black baleen whale distinguished by the callosities (thick, hard, white bumps) on its head.
Max size: 16 to 17 m in length, 64 MT.

Shortfin Mako *(Isurus oxyrinchus)*
Habitat: Prefers water temperatures between 17-22°C so it is unlikely to be found outside of summer in Canadian waters.
Description: Cylindrical shape with a vertically elongated tail. Metallic blue coloration dorsally and white on its underside.
Max Size: 4 m in length

White Shark (*Carcharodon carcharias*)
Habitat: Breakers off sandy beaches, rocky shores, and readily enters enclosed bays and estuaries.
Description: Heavy spindle-shaped body with sharp colour contrast between its backside and underside.
Max Size: 3.8 to 6 m in length

Harlequin Duck (*Histrionicus histrionicus*)
Habitat: Turbulent mountain streams in summer, rocky coastal waters in winter.
Description: Males have slate-blue plumage, chestnut sides, streaks of white, chestnut, and black on head. Females are plain, brownish grey with patches of white.
Max size: 45 cm in length.

Red Knot (*Calidris canutus rufa*)
Habitat: Migrate from Canadian Arctic to South America in July and August. Migration stops can include tidal sandflats and mudflats along the gulf of St Lawrence and Bay of Fundy.
Description: Shorebird with long straight bill, small head, and long legs. Brownish red face, neck, chest, and underparts. White stripe on upper part of wings.
Max Size: 26 cm in length.

Roseate Tern (*Sterna dougallii*)
Habitat: Occurs in large colonies on coasts and islands.
Description: Medium sized seabird with long forked tail. White with black head cap and bill.
Max Size: 40 cm, 130 g

Leach's Storm-petrel (*Oceanodroma leucorhoa*)
Habitat: Forages over the continental shelf during the breeding season, moving into open oceanic waters to feed on small fish and crustacea.
Description: Tube nosed with blackish-brown plumage, long wings angled at the carpal joint, and forked tail. Distinctive white rump
Max Size: 21 cm in length, 48 cm wingspan

Lesser Yellowlegs (*Tringa flavipes*)
Habitat: Utilizes intertidal habitat during migration south.
Description: Medium sized shorebird with yellow legs. Bill is short, slim, straight, and dark. Breast is streaked and flanks are finely marked with short bars.
Max size: 27 cm in length, 64 cm wingspan

Piping Plover (*Charadrius melodus melodus*)
Habitat: Nest and feed primarily on coastal sand or gravel beaches and sand flats. Found all along the southern shore of Nova Scotia
Description: Grey/brown sides and back, white under. Black spots around neck, on forehead, and at beak tip.
Max Size: 19 cm, 48 g

Red-necked Phalarope (*Phalaropus labatus*)
Habitat: Spends much of its nonbreeding season at sea.
Description: Small shorebird with red and orange on sides and base of its neck during breeding season. Non breeding plumage is white along the head, throat, breast and underparts, with dark upper parts, eye stripe, and crown.
Max Size: 20 cm in length

Short-eared Owl (*Asio flammeus*)
Habitat: Tundra, coastal barrens, sand dunes, field, and bog areas.
Description: Medium-sized, puffy white and brown owl with short ear tufts and yellow eyes.
Adult size: 43 cm, 475 g.

Thorny Skate *(Amblyraja radiata)*
Habitat: Ocean bottoms at depths of 18-1200 m, at temperatures of 0-10˚C.
Description: Dark colored upper body, white under side. A row of 11-19 large thorns runs down the middle of its back and along the tail.
Adult Size: 110 cm, 12.5 kg

Peregrine Falcon anatum/tundrius (*Falco peregrinus*)
Habitat: cliffs or buildings for nesting, open landscapes for foraging, with nearby waterbodies
Description: (adults) bluish-grey/darker upper parts and pale under parts with dark spotting and barring; (immatures) pale to slate or chocolate brown upper parts, under parts are buffy with blackish streaks
Adult size: (males) 36-49 cm long, 650 g; (females) 45-58 cm long, 950 g

Spiny Dogfish (*Squalus acanthis*)
Habitat: Occurs world-wide from the intertidal to the continenta shelf slope, most common at 10-100 m depth. Usually found a temperatures of 5-15˚C.
Description: Small shark, grey-brown on the upper body and whitish on the under side.
Max. size: 112 cm TL (female), 94 cm TL (male)

APPENDIX D
Notice of Works

Transport Canada / Transports Canada

PROTECTED A (WHEN COMPLETED)

NAVIGATION PROTECTION ACT
NOTICE OF WORKS FORM

TC file number (if known): 8200-95-3029

Are you the riparian property owner? ○ Yes ◉ No

GENERAL INFORMATION

Official and/or local name(s) of the body of water (Required) Victoria Beach, Annapolis Basin	Is the body of water listed on the schedule to the NPA? ◉ Yes ○ No ○ Unknown
Are you also requesting an Approval, if required? ◉ Yes ○ No	Is this an Opt-in request? ○ Yes ◉ No
Are you representing an Aboriginal group? ○ Yes ◉ No	Is the work near/on First Nations reserve or land claim? ○ Yes ◉ No ○ Unknown
Does this project involve throwing or depositing materials in water? ○ Yes ◉ No	Does this project involve dewatering a body of water? ○ Yes ◉ No

OWNER CONTACT INFORMATION[1]

Individual or company name (Required) Kelly Cove Salmon Ltd.		Contact name (Required) Jeff Nickerson	
Mailing address (Required) P.O. Box 33			
City/Town (Required) Bridgewater		Province/Territory (Required) Nova Scotia	Postal code (Required) B4V 2W6
Primary telephone number (Required) 902-275-7493	Other telephone number	E-mail jnickerson@cookeaqua.com	

Owner's agent/mandatary (contractor/consultant/representative/co-proponent, if any)

Company name Sweeney International Marine Corp.		Contact name [redacted]	
Mailing address 46 Milltown Boulevard			
City/Town St. Stephen		Province/Territory New Brunswick	Postal code E3L 1G3
Primary telephone number 506-467-9014	Other telephone number	E-mail [redacted]	

WORK SITE INFORMATION

Nearest municipality/county/district (Required) Digby	Province/Territory (Required) Nova Scotia

Site location such as lot, concession, section, township, range, meridian, 911 address, property identification, etc. (Required)

Victoria Beach aquaculture site #1040 is located in Annapolis Basin, approximately 5.5 kilometers north-northeast of the town of Digby. Site #1040 is situated on the northern shore of Annapolis Basin, east of the Digby Gut channel.

Site position Latitude North (Required) Degrees 44 Minutes 40 Seconds 06.1	Site position Longitude West (Required) Degrees 65 Minutes 43 Seconds 18.2
Hydro chart number: 4396	Topo map number:

Body of water details, such as characteristics, bank/bottom features, biological components, flow/tides, etc.

Site #1040 is located on the north-eastern side of Annapolis Basin, occupies a 31.433-ha parcel, and is located over waters ranging from 5-34 m in depth. The sediment composition of the seafloor is composed primarily of hard-packed mud and sand. The northern area of the lease also has some pebbles and boulders closer to shore. Shell debris is very common

Potential obstructions, such as natural/man-made, other works, navigation aids, etc.

This site consists of plastic circular cages. Tag lines and anchor buoys are also located throughout the lease area. The outside corners of the lease are marked with a 0.6 m buoy equipped with a light and radar reflectors. Annapolis Basin also has a marked navigation channel.

Land use/Ownership, such as past/current, private/government, rural/suburban, coastal, environmental, etc.

Aquaculture site #1040 is owned by Kelly Cove Salmon Ltd.

BODY OF WATER USE INFORMATION

Navigation types (check all that apply): ☑ Commercial ☑ Recreational	Maximum vessel size: Length ____ Width ____ Draft ____
Traffic direction: ○ One-way ◉ Two-way	Manoeuvrability (check all that apply): ☐ Poor ☑ Good ☐ Excellent
Day/Night: ○ Day ○ Night ◉ Both — Volume: ○ Low ○ Med ◉ High	Navigation season(s) (check all that apply): ☑ Winter ☑ Spring ☑ Summer ☑ Fall

Other uses such as cottagers, special events, fishing, etc

Annapolis Basin is used by Bay Ferries Ltd. to dock the Fundy Rose 3 km west of site #1040 as it makes its run to and from Digby, Nova Scotia, and Saint John, New Brunswick. Fishing vessels also use the basin as passage between the port of Digby and the Bay of Fundy. Commercial fishing also takes place in the area. Recreational vessels also frequent the area.

PROJECT INFORMATION

Name of work such as bridge, dam, marina, etc. (Required): Aquaculture site	Type of work (check all that apply) (Required): ☐ Construct ☐ Place ☑ Alter ☐ Repair ☐ Decommission ☐ Rebuild ☑ Permanent ☐ Temporary ☐ Remove

Brief project description (or attach) such as status, structures, operation, etc. (Required)

The aquaculture site consists of two strings of 8 circular 100 m circumference cages. Cages are present on site year round.

Method of construction such as temporary works activities, etc. (Required)

Aquaculture sites consists of anchored cage systems (see attached plans). Crews visit the site daily to feed and maintain the cage systems.

Anticipated impacts such as source, severity, mitigation, marking, waste/debris management, use, cumulative, etc.

Expected start date (dd-mm-yyyy) (Required)	Expected completion date (dd-mm-yyyy) (Required)
Immediately	Ongoing

ENVIRONMENTAL REVIEW INFORMATION

Is the work located on Federal lands? ○ Yes ◉ No ○ Unknown	Is the project a designated project under the *Regulations Designating Physical Activities* under the *Canadian Environmental Assessment Act, 2012*? ○ Yes ◉ No ○ Unknown
Is the project subject to Northern Environmental Assessment (EA) Regime(s)? ○ Yes ◉ No ○ Unknown	If yes, identify the northern EA regime(s) that apply ☐ Inuvialuit Final Agreement (IFA) ☐ *Mackenzie Valley Resource Management Act* (MVRMA) ☐ Nunavut Land Claims Agreement (NLCA) ☐ *Yukon Environmental and Socio-economic Assessment Act* (YESAA)

Other Federal Organizations involved

☑ Canadian Environmental Assessment Agency (CEAA)	☐ Environment Canada (EC)
☑ Fisheries and Oceans Canada (DFO)	☐ Natural Resources Canada (NRCan)
☐ Major Projects Management Office (MPMO)	☐ Northern Projects Management Office (NPMO)
☐ Aboriginal Affairs and Northern Development Canada (AANDC)	☐ Other:

OWNER AUTHORIZATION[2]

I hereby certify that the information contained herein and in any of the supporting documents is complete, true and accurate to the best of my knowledge and belief, and that I am authorized, as the owner, to submit this Notice to the Minister.

[redacted]
Signature (Required)

4-5-2022.
Date (dd-mm-yyyy) (Required)

Jeff Nickerson
Print Name (Required)

FOR OFFICE USE ONLY

	Date stamped (dd-mm-yyyy)

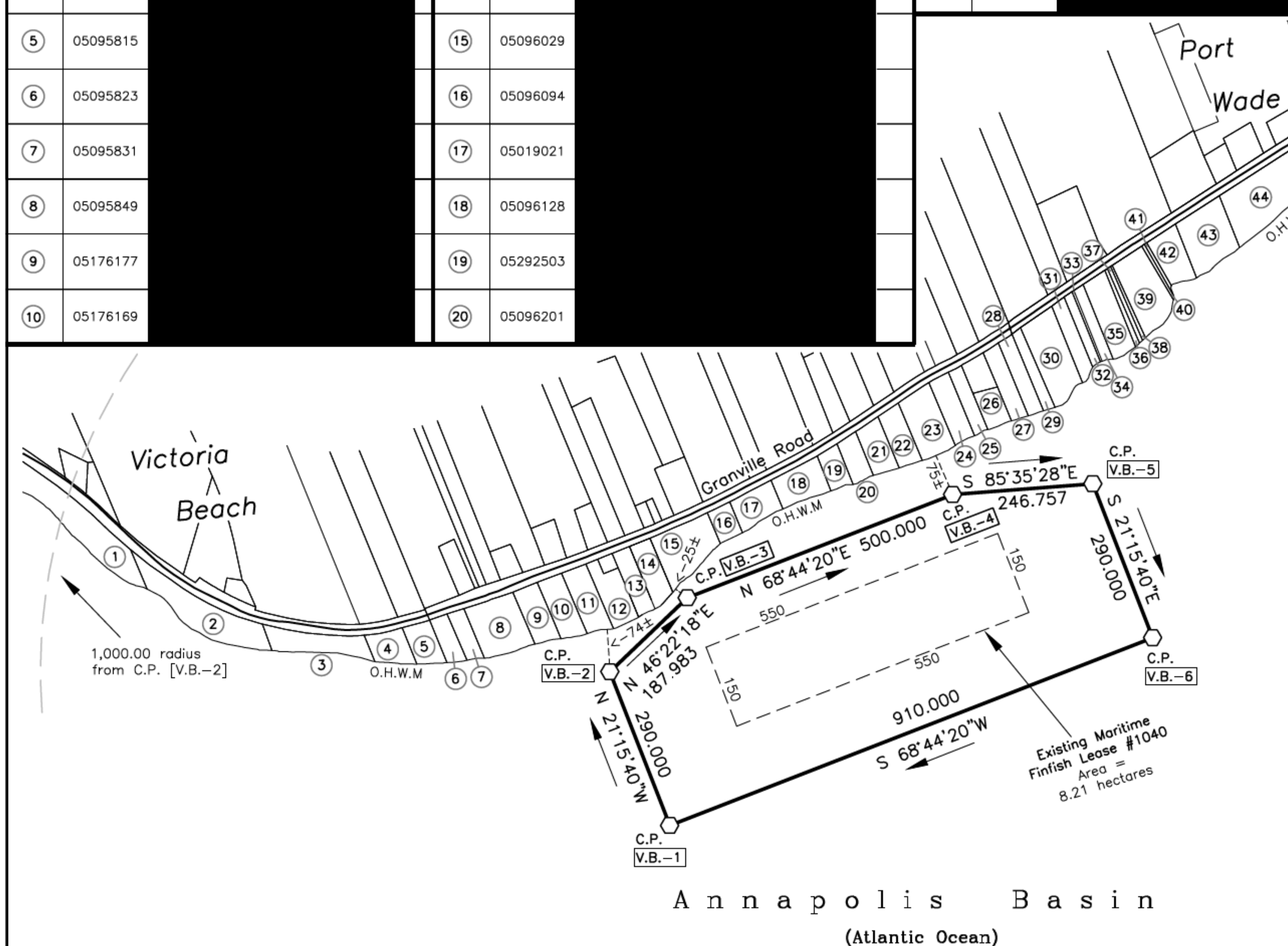
[2] "Owner", in relation to a work, means the actual or reputed owner of the work or that owner's agent or mandatary. It includes a person who is in possession or claiming ownership of the work and a person who is authorizing or otherwise responsible for the construction, placement, alteration, repair, rebuilding, removal, decommissioning, maintenance, operation, safety or use of the work. It also includes a person who proposes to construct or place a work.

The personal information provided on this Notice to the Minister is collected under the authority of the ***Navigation Protection Act***, sections 4, 5, 6, 9, 21, 22, 23 and 24. This information is required for the purpose of processing applications made under the above-noted sections for proposed, commenced or existing works that are or will be constructed, placed, altered, repaired, rebuilt, removed or decommissioned in, on, over, under, through or across any navigable water in Canada. The personal information collected is described in a personal information bank entitled ***Navigation Protection Program*** (bank number TC PPU 086). Under the provisions of the ***Privacy Act***, individuals have the right of access to, correction of and protection of their personal information. Instructions for obtaining personal information are provided in Info Source, a copy of which is available in major public and academic libraries or online at http:// ww.infosource.gc.ca

#	P.I.D. #	OWNER / ADDRESS
1	05306683	[redacted]
2	05186374	[redacted]
3	05095757	[redacted]
4	05295720	[redacted]
5	05095815	[redacted]
6	05095823	[redacted]
7	05095831	[redacted]
8	05095849	[redacted]
9	05176177	[redacted]
10	05176169	[redacted]

#	P.I.D. #	OWNER / ADDRESS
11	05095930	[redacted]
12	05095989	[redacted]
13	05298989	[redacted]
14	05096011	[redacted]
15	05096029	[redacted]
16	05096094	[redacted]
17	05019021	[redacted]
18	05096128	[redacted]
19	05292503	[redacted]
20	05096201	[redacted]

#	P.I.D. #	OWNER / ADDRESS
21	05096177	[redacted]
22	05096185	[redacted]
23	05096227	[redacted]
24	05096235	[redacted]



NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
UTM Zone 20N

Point	Northing	Easting
V.B.–1	4,949,398.771	283,938.374
V.B.–2	4,949,669.033	283,833.215
V.B.–3	4,949,798.737	283,969.283
V.B.–4	4,949,980.046	284,435.252
V.B.–5	4,949,999.015	284,681.279
V.B.–6	4,949,728.752	284,786.438

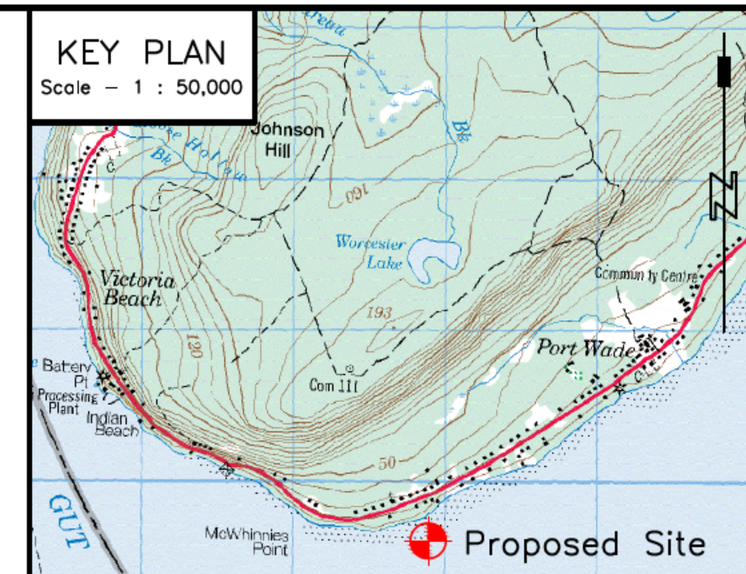
NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
Geodetic Co-ordinates

Point	Latitude (N)	Longitude (W)
V.B.–1	44°39'55.5433"	65°43'31.9370"
V.B.–2	44°40'04.1783"	65°43'37.1176"
V.B.–3	44°40'08.5245"	65°43'31.1420"
V.B.–4	44°40'14.8982"	65°43'10.2783"
V.B.–5	44°40'15.7781"	65°42'59.1457"
V.B.–6	44°40'07.1425"	65°42'53.9663"

Proposed Marine Aquaculture Site

Victoria Beach Aquaculture Site
Kelly Cove Salmon Ltd.
Area = 31.433 hectares

KEY PLAN
Scale – 1 : 50,000



Legend:

CALCULATED POINT	C.P.
CALCULATED	(c.)
N.S. PROPERTY IDENTIFICATION NUMBER	P.I.D. #00000000
NORTHING / EASTING	N. / E.
LOCAL REGISTRY NUMBER	Book: / Page:
ORDINARY HIGH WATER MARK	O.H.W.M.
BOUNDARY DEALT WITH BY THIS PLAN	
OTHER BOUNDARY	
TIE LINES	
NOT TO SCALE	
MAJOR CONTOURS	
MINOR CONTOURS	
DEPTH SOUNDINGS	+ 00.0
CONCRETE MOORING	
ANCHOR	

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING

PROPOSED BOUNDARY AMENDMENT TO LEASE #1040

KELLY COVE SALMON LTD. / VICTORIA BEACH

LOCATED AT:

VICTORIA BEACH, ANNAPOLIS BASIN (ATLANTIC OCEAN), ANNAPOLIS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 21st day of May, 2021.

[redacted]

Jeff Nickerso[redacted]

A&D JOB #300–18–1040

SHEET 1 OF 7 DATE: May 21, 2021

NOTES:

(1.) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
(2.) THIS PLAN IS A COMPILATION OF THIRD PARTY DATA. DATA WAS PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. ACKER & DOUCETTE SURVEYING INC. HAS COMPLETED THIS PLAN IN ACCORDANCE WITH THE "GUIDE TO MARINE FINFISH AQUACULTURE SITE REQUIREMENTS", DATED NOVEMBER 2007.
(3.) ALL DEPTHS ARE REFERENCED TO CHART DATUM (LOWER LOW WATER, LARGE TIDE).
(4.) DEPTH CONTOUR DATA IS BASED ON GARMIN MARINE MAPSOURCE DATA AND BATHYMETRIC SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP.
(5.) SPOT SOUNDINGS ARE BASED ON SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. SAID SOUNDINGS WERE CORRECTED TO CHART DATUM FROM G.N.S.S. OBSERVATIONS.
(6.) NATURAL FEATURES WERE DETERMINED BY NOVA SCOTIA PROPERTY ONLINE MAPPING AND GEONOVA DATA LOCATOR GEOGRAPHIC INFORMATION.
(7.) ONSHORE PROPERTY DATA IS BASED ON NOVA SCOTIA PROPERTY ONLINE MAPPING.
(8.) ALL BEARINGS SHOWN HEREON ARE GRID BEARINGS AND ARE BASED ON THE NORTH AMERICAN DATUM OF 1983 (NAD83 CSRS), EPOCH 2010.0, USING THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION, ZONE 20 NORTH (UTM Z20N).

KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S.
639
MEMBER

PURPOSE OF PLAN (SHEET 1 OF 7)

THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE THE EXTENTS OF THE PROPOSED MARINE AQUACULTURE SITE AND AS WELL AS ADJACENT PARCELS OF LAND. FOR ADDITIONAL SITE INFORMATION, REFER TO SHEETS 2–7.

200 0 200 400 600

SCALE – 1 : 10,000 (METRIC)

Acker & Doucette Surveying Inc.
Nova Scotia Land Surveyors & Professional Engineers

4083 Highway #308, P.O. Box 64
Tusket, Yarmouth County
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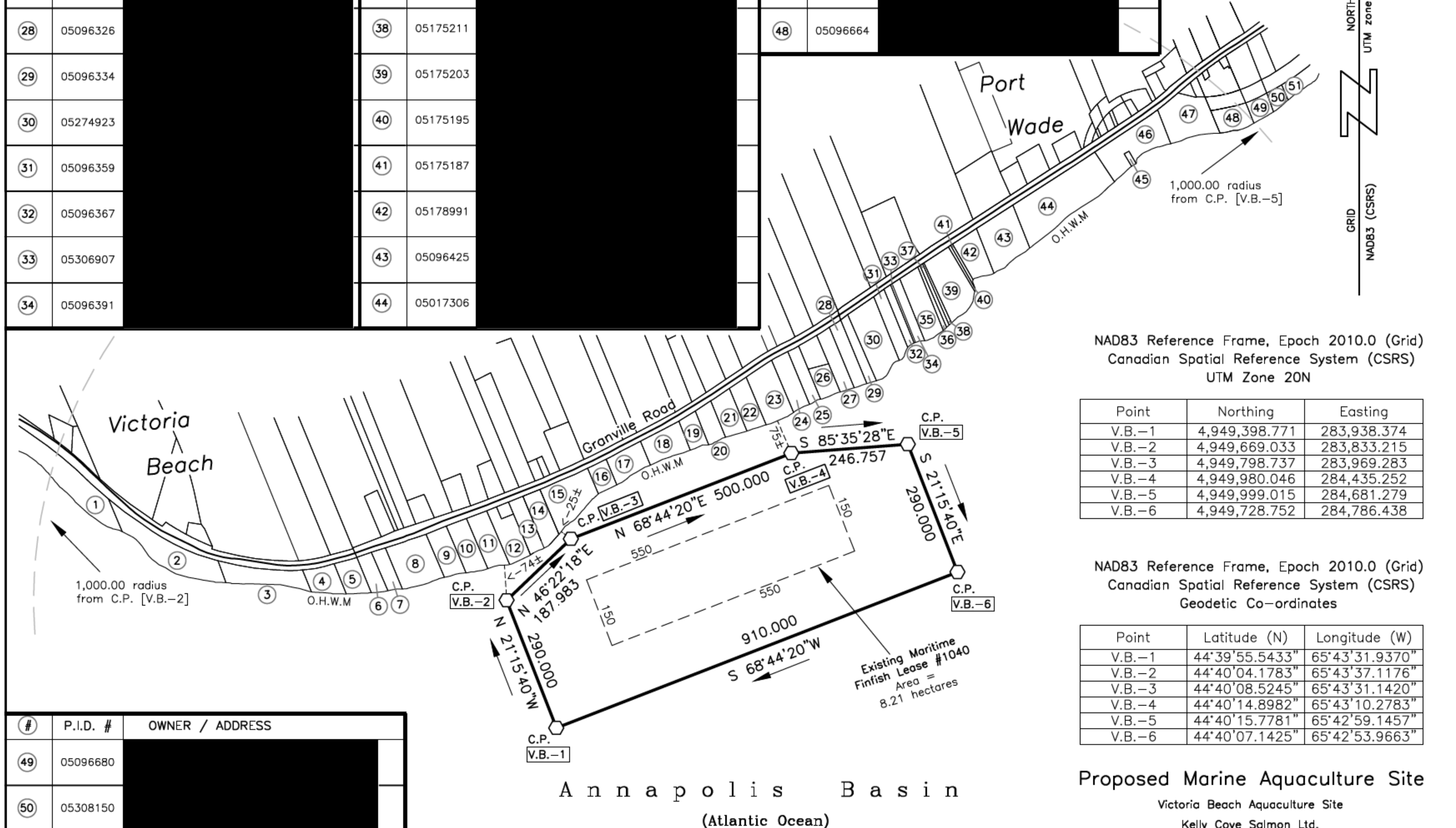
B0W 3M0
Phone: (902) 648–2186
www.adsurveying.ca

808 Ohio Road, P.O. Box 367
Shelburne, Shelburne County
Nova Scotia, Canada
B0T 1W0
Phone: (902) 875–2110
info@adsurveying.ca

#	P.I.D. #	OWNER / ADDRESS
25	05096268	[redacted]
26	05096292	
27	05096318	
28	05096326	
29	05096334	
30	05274923	
31	05096359	
32	05096367	
33	05306907	
34	05096391	

#	P.I.D. #	OWNER / ADDRESS
35	05096409	[redacted]
36	05175237	
37	05175229	
38	05175211	
39	05175203	
40	05175195	
41	05175187	
42	05178991	
43	05096425	
44	05017306	

#	P.I.D. #	OWNER / ADDRESS
45	05096540	[redacted]
46	05096557	
47	05208905	
48	05096664	



#	P.I.D. #	OWNER / ADDRESS
49	05096680	[redacted]
50	05308150	
51	05294632	

Annapolis Basin

(Atlantic Ocean)

NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
UTM Zone 20N

Point	Northing	Easting
V.B.–1	4,949,398.771	283,938.374
V.B.–2	4,949,669.033	283,833.215
V.B.–3	4,949,798.737	283,969.283
V.B.–4	4,949,980.046	284,435.252
V.B.–5	4,949,999.015	284,681.279
V.B.–6	4,949,728.752	284,786.438

NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
Geodetic Co-ordinates

Point	Latitude (N)	Longitude (W)
V.B.–1	44°39'55.5433"	65°43'31.9370"
V.B.–2	44°40'04.1783"	65°43'37.1176"
V.B.–3	44°40'08.5245"	65°43'31.1420"
V.B.–4	44°40'14.8982"	65°43'10.2783"
V.B.–5	44°40'15.7781"	65°42'59.1457"
V.B.–6	44°40'07.1425"	65°42'53.9663"

Proposed Marine Aquaculture Site

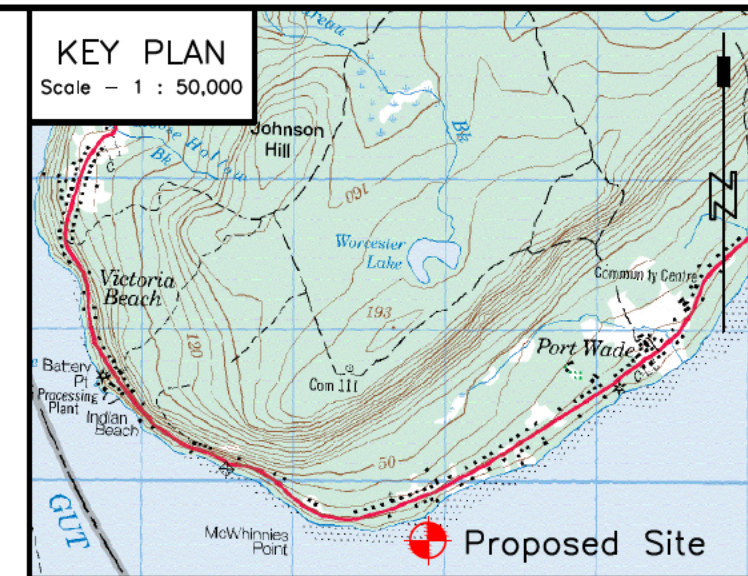
Victoria Beach Aquaculture Site

Kelly Cove Salmon Ltd.

Area = 31.433 hectares

KEY PLAN

Scale – 1 : 50,000



Legend:

CALCULATED POINT	C.P.
CALCULATED	(c.)
N.S. PROPERTY IDENTIFICATION NUMBER	P.I.D. #00000000
NORTHING / EASTING	N. / E.
LOCAL REGISTRY NUMBER	Book: / Page:
ORDINARY HIGH WATER MARK	O.H.W.M.
BOUNDARY DEALT WITH BY THIS PLAN	
OTHER BOUNDARY	
TIE LINES	
NOT TO SCALE	
MAJOR CONTOURS	
MINOR CONTOURS	
DEPTH SOUNDINGS	+ 00.0
CONCRETE MOORING	
ANCHOR	

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING

PROPOSED BOUNDARY AMENDMENT TO LEASE #1040

KELLY COVE SALMON LTD. / VICTORIA BEACH

LOCATED AT:

VICTORIA BEACH, ANNAPOLIS BASIN (ATLANTIC OCEAN), ANNAPOLIS COUNTY, NOVA SCOTIA

Client's Statement

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Dated this 21st day of May, 2021.

[redacted]

Jeff Nickerson

A&D JOB #300–18–1040

SHEET 2 OF 7 | DATE: May 21, 2021

NOTES:

(1.) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
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KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S.
639
MEMBER

PURPOSE OF PLAN (SHEET 2 OF 7)

THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE THE EXTENTS OF THE PROPOSED MARINE AQUACULTURE SITE AND AS WELL AS ADJACENT PARCELS OF LAND. FOR ADDITIONAL SITE INFORMATION, REFER TO SHEETS 1, 3–7.

200 0 200 400 600

SCALE – 1 : 10,000 (METRIC)

Acker & Doucette Surveying Inc.
Nova Scotia Land Surveyors & Professional Engineers

4083 Highway #308, P.O. Box 64
Tusket, Yarmouth County
Nova Scotia, Canada
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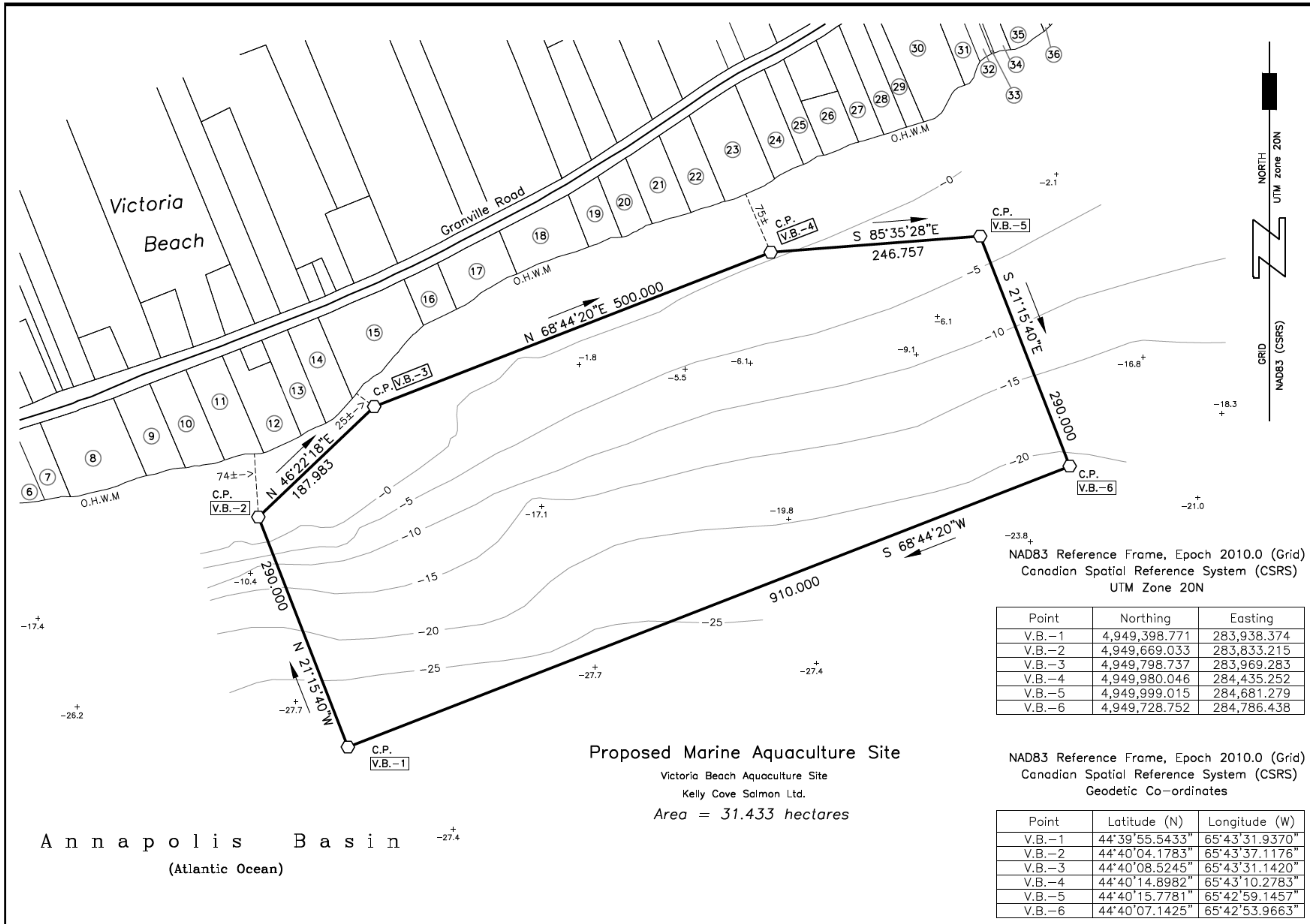

NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
UTM Zone 20N

Point	Northing	Easting
V.B.–1	4,949,398.771	283,938.374
V.B.–2	4,949,669.033	283,833.215
V.B.–3	4,949,798.737	283,969.283
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V.B.–6	4,949,728.752	284,786.438

NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
Geodetic Co–ordinates

Point	Latitude (N)	Longitude (W)
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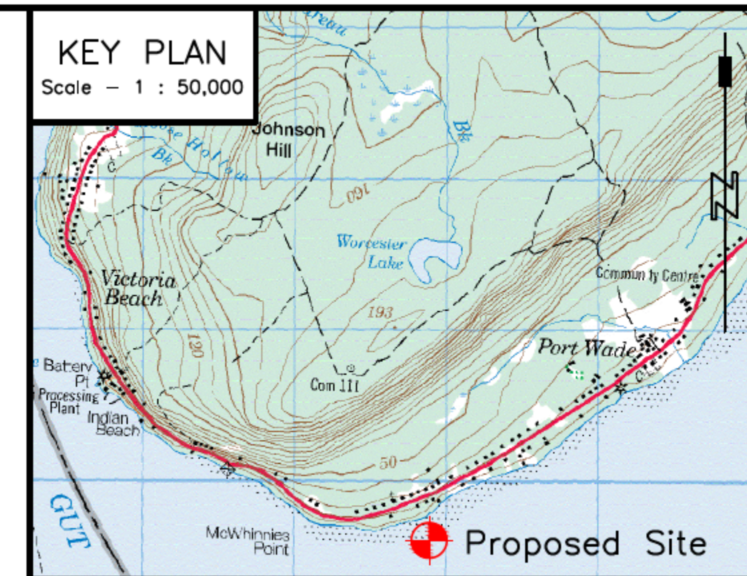
V.B.–6	44°40'07.1425"	65°42'53.9663"

KEY PLAN

Scale – 1 : 50,000



Legend:

CALCULATED POINT	C.P.
CALCULATED	(c.)
N.S. PROPERTY IDENTIFICATION NUMBER	P.I.D. #00000000
NORTHING / EASTING	N. / E.
LOCAL REGISTRY NUMBER	Book: / Page:
ORDINARY HIGH WATER MARK	O.H.W.M.
BOUNDARY DEALT WITH BY THIS PLAN	
OTHER BOUNDARY	
TIE LINES	
NOT TO SCALE	
MAJOR CONTOURS	
MINOR CONTOURS	
DEPTH SOUNDINGS	+ 00.0
CONCRETE MOORING	
ANCHOR	

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING

BASIC SEAFLOOR TOPOGRAPHY

KELLY COVE SALMON LTD. / VICTORIA BEACH

LOCATED AT:

VICTORIA BEACH, ANNAPOLIS BASIN (ATLANTIC OCEAN),
ANNAPOLIS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 21st day of May, 2021.

Jeff Nickerson [redacted]

A&D JOB #300–18–1040

SHEET 3 OF 7 | DATE: May 21, 2021

NOTES:

(1.) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
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KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S.
639
MEMBER

PURPOSE OF PLAN (SHEET 3 OF 7)

THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE THE EXTENTS OF THE PROPOSED MARINE AQUACULTURE SITE AND BASIC SEAFLOOR TOPOGRAPHY. FOR ADDITIONAL ADDITIONAL SITE INFORMATION, REFER TO SHEETS 1–2 & 4–7.

100 0 100 200 300

SCALE – 1 : 5,000 (METRIC)

Acker & Doucette Surveying Inc.
Nova Scotia Land Surveyors & Professional Engineers

4083 Highway #308, P.O. Box 64
Tusket, Yarmouth County
Nova Scotia, Canada
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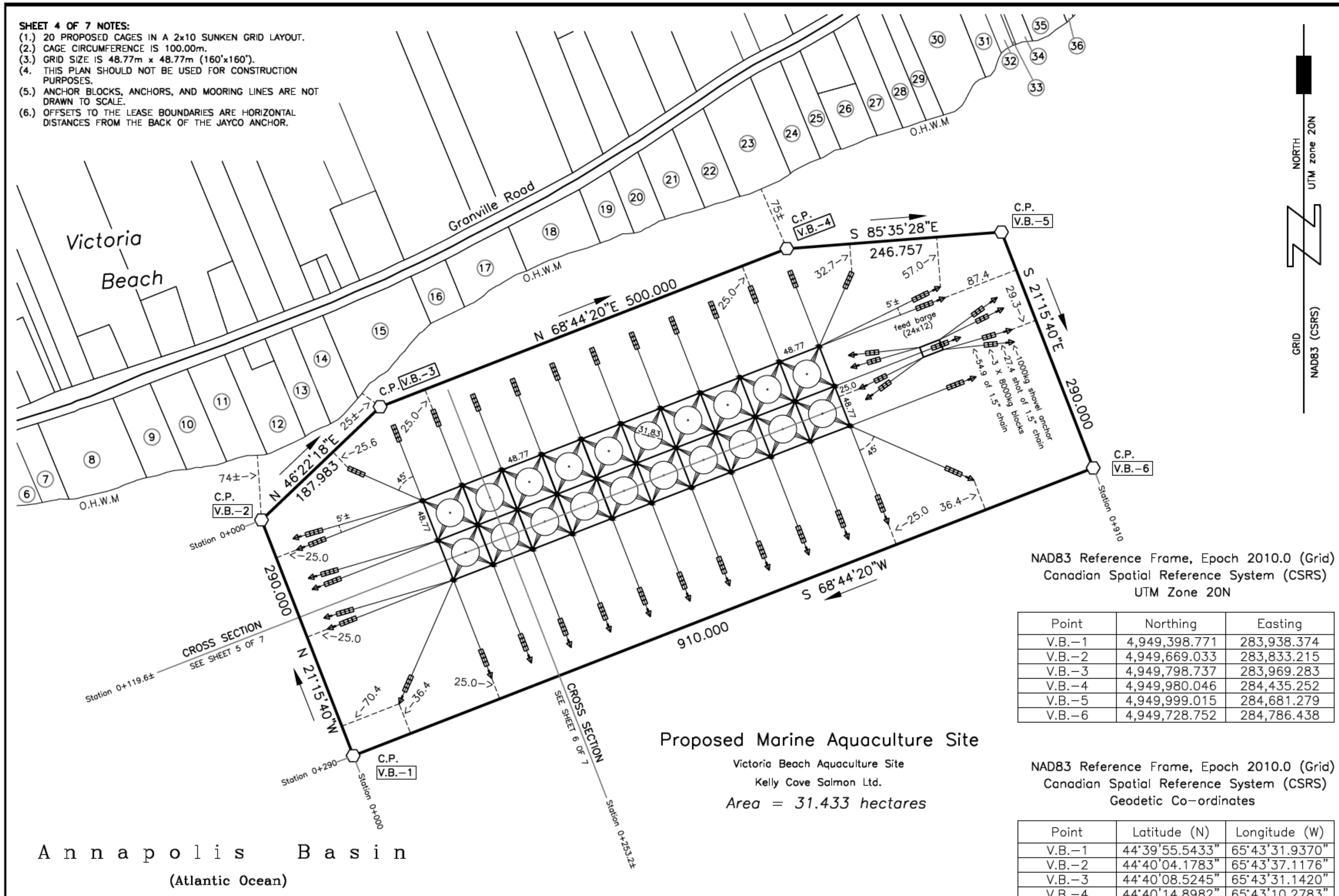
Shelburne, Shelburne County
Nova Scotia, Canada
B0T 1W0

Phone: (902) 648–2186
www.adsurveying.ca

Phone: (902) 875–2110
info@adsurveying.ca

SHEET 4 OF 7 NOTES:
(1.) 20 PROPOSED CAGES IN A 2x10 SUNKEN GRID LAYOUT.
(2.) CAGE CIRCUMFERENCE IS 100.00m.
(3.) GRID SIZE IS 48.77m x 48.77m (160'x160').
(4.) THIS PLAN SHOULD NOT BE USED FOR CONSTRUCTION PURPOSES.
(5.) ANCHOR BLOCKS, ANCHORS, AND MOORING LINES ARE NOT DRAWN TO SCALE.
(6.) OFFSETS TO THE LEASE BOUNDARIES ARE HORIZONTAL DISTANCES FROM THE BACK OF THE JAYCO ANCHOR.



Proposed Marine Aquaculture Site

Victoria Beach Aquaculture Site

Kelly Cove Salmon Ltd.

Area = 31.433 hectares

NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
UTM Zone 20N

Point	Northing	Easting
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Canadian Spatial Reference System (CSRS)
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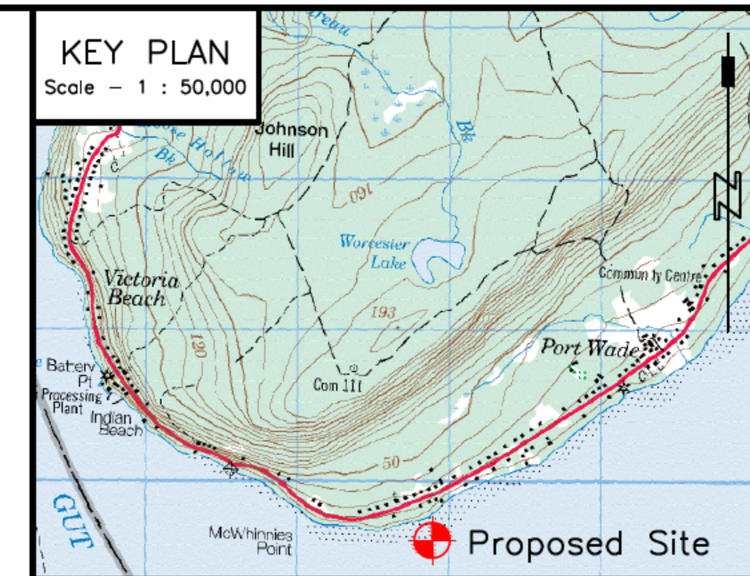
V.B.-5	44°40'15.7781"	65°42'59.1457"
V.B.-6	44°40'07.1425"	65°42'53.9663"

NORTH UTM zone 20N
GRID NAD83 (CSRS)

KEY PLAN
Scale – 1 : 50,000



Legend:

CALCULATED POINT	C.P. ○
CALCULATED	(c.)
N.S. PROPERTY IDENTIFICATION NUMBER	P.I.D. #00000000
NORTHING / EASTING	N. / E.
LOCAL REGISTRY NUMBER	Book: / Page:
ORDINARY HIGH WATER MARK	O.H.W.M.
BOUNDARY DEALT WITH BY THIS PLAN	
OTHER BOUNDARY	
TIE LINES	
NOT TO SCALE	
MAJOR CONTOURS	
MINOR CONTOURS	
DEPTH SOUNDINGS	+ 00.0
CONCRETE MOORING	□
ANCHOR	

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING

AQUACULTURE CAGE CONFIGURATION

KELLY COVE SALMON LTD. / VICTORIA BEACH

LOCATED AT:

VICTORIA BEACH, ANNAPOLIS BASIN (ATLANTIC OCEAN), ANNAPOLIS COUNTY, NOVA SCOTIA

Client's Statement

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Dated this 21st day of May, 2021.

[redacted]

Jeff Nickerso[redacted]

A&D JOB #300-18

SHEET 4 OF 7 DATE: May 21, 2021

NOTES:
(1.) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
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KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S.
639
MEMBER

PURPOSE OF PLAN (SHEET 4 OF 7)
THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE THE LOCATIONS OF ALL ANCHORS, CAGES, AND THE GRID/MOORING CONFIGURATION RELATIVE TO THE LEASE BOUNDARIES.

100 0 100 200 300

SCALE – 1 : 5,000 (METRIC)

Acker & Doucette Surveying Inc.
Nova Scotia Land Surveyors & Professional Engineers

4083 Highway #308, P.O. Box 64
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B0T 1W0

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Phone: (902) 875-2110
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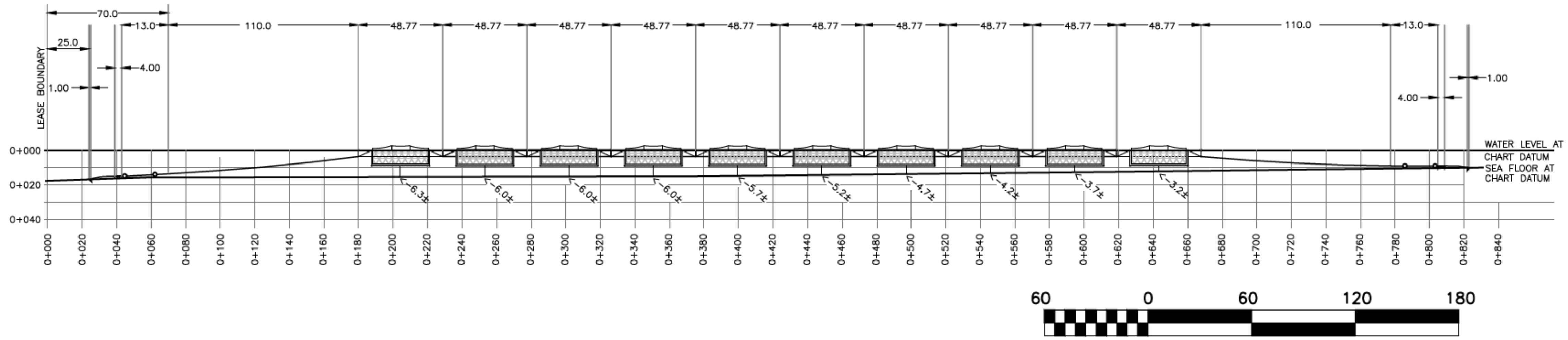
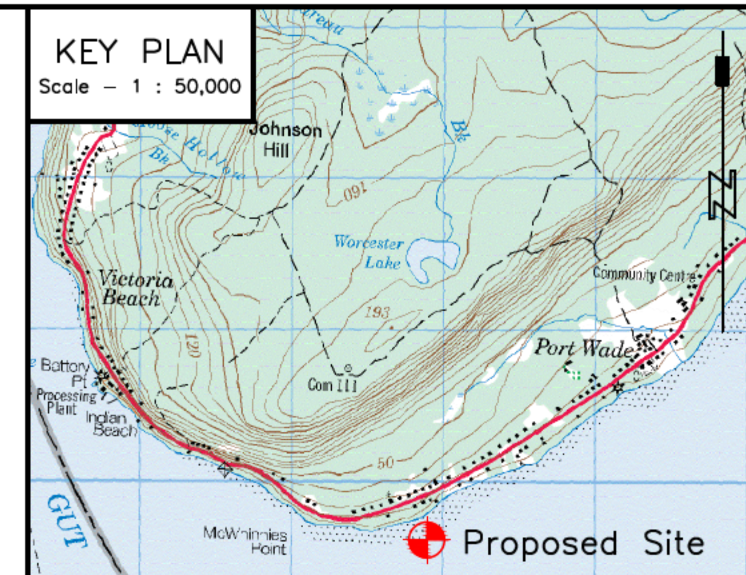
CROSS SECTION AT STATION 0+119.6
HORIZONTAL SCALE – 1 : 3,000 (METRIC)
VERTICAL SCALE – 1 : 3,000 (METRIC)



SCALE – 1 : 3,000 (METRIC)

KEY PLAN
Scale – 1 : 50,000

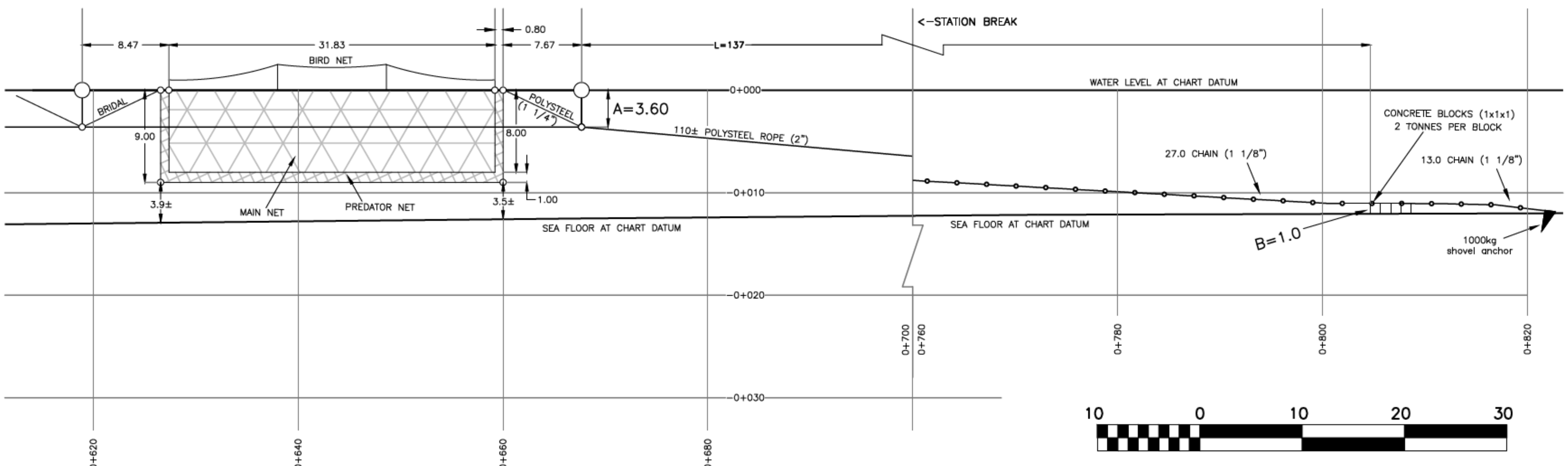


Legend:

CALCULATED POINT	C.P.
CALCULATED	(c.)
N.S. PROPERTY IDENTIFICATION NUMBER	P.I.D. #00000000
NORTHING / EASTING	N. / E.
LOCAL REGISTRY NUMBER	Book: / Page:
ORDINARY HIGH WATER MARK	O.H.W.M.
BOUNDARY DEALT WITH BY THIS PLAN	
OTHER BOUNDARY	
TIE LINES	
NOT TO SCALE	
MAJOR CONTOURS	
MINOR CONTOURS	
DEPTH SOUNDINGS	+ 00.0
CONCRETE MOORING	
ANCHOR	

DETAILED CROSS SECTION
HORIZONTAL SCALE – 1 : 500 (METRIC)
VERTICAL SCALE – 1 : 500 (METRIC)

5:1 Mooring Scope Calculation
L = [(max depth + max tide range) – A – B] x 5
L = [(25± + 9.4±) – 3.6 – 1.0] x 5
L = 149.0 (calculated)
L = 137± (as by client design)



SCALE – 1 : 500 (METRIC)

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING
LATERAL CROSS–SECTION
KELLY COVE SALMON LTD. / VICTORIA BEACH
LOCATED AT:
VICTORIA BEACH, ANNAPOLIS BASIN (ATLANTIC OCEAN), ANNAPOLIS COUNTY, NOVA SCOTIA

Client's Statement

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Dated this 21st day of May, 2021

Jeff Nickerson [redacted]

A&D JOB #300–18–1040

SHEET 5 OF 7 | DATE: May 21, 2021

NOTES:
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KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S.
639
MEMBER

PURPOSE OF PLAN (SHEET 5 OF 7)
THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE A LATERAL CROSS SECTION AS SHOWN ON SHEET 3 OF 6, TO DEMONSTRATE DETAILS ASSOCIATED WITH THE CAGE INFRASTRUCTURE, ANCHOR AND MOORING LINES, AND SEAFLOOR PROFILE.

CROSS SECTION NOTES:
(1.) THIS PLAN IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.
(2.) FOR HORIZONTAL LOCATION OF EACH CROSS SECTION SEE SHEET 4 OF 7.
(3.) DISTANCES FROM SEA FLOOR MAY VARY DEPENDING ON TIDE AND CURRENT.
(4.) DISTANCES FROM SEA FLOOR ARE APPROXIMATE ONLY.
(5.) DEPTHS ARE REFERENCED TO CHART DATUM (LOWER LOW WATER, LARGE TIDE).

Acker & Doucette Surveying Inc.
Nova Scotia Land Surveyors & Professional Engineers

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Tusket, Yarmouth County
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B0W 3M0
Phone: (902) 648-2186
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808 Ohio Road, P.O. Box 367
Shelburne, Shelburne County
Nova Scotia, Canada
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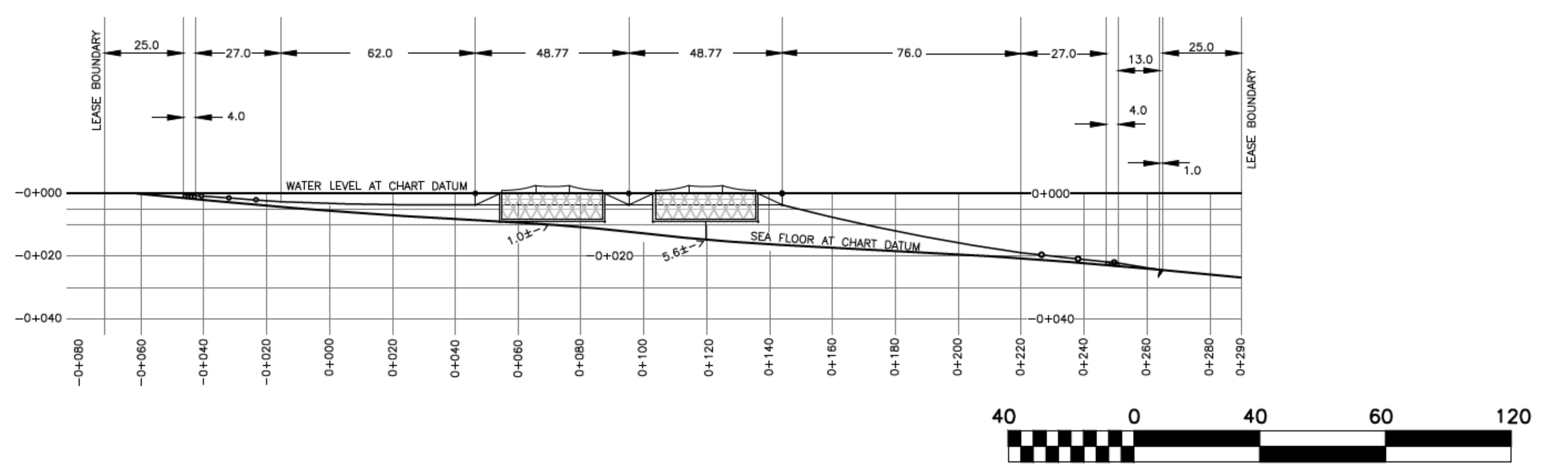
Phone: (902) 875-2110
info@adsurveying.ca

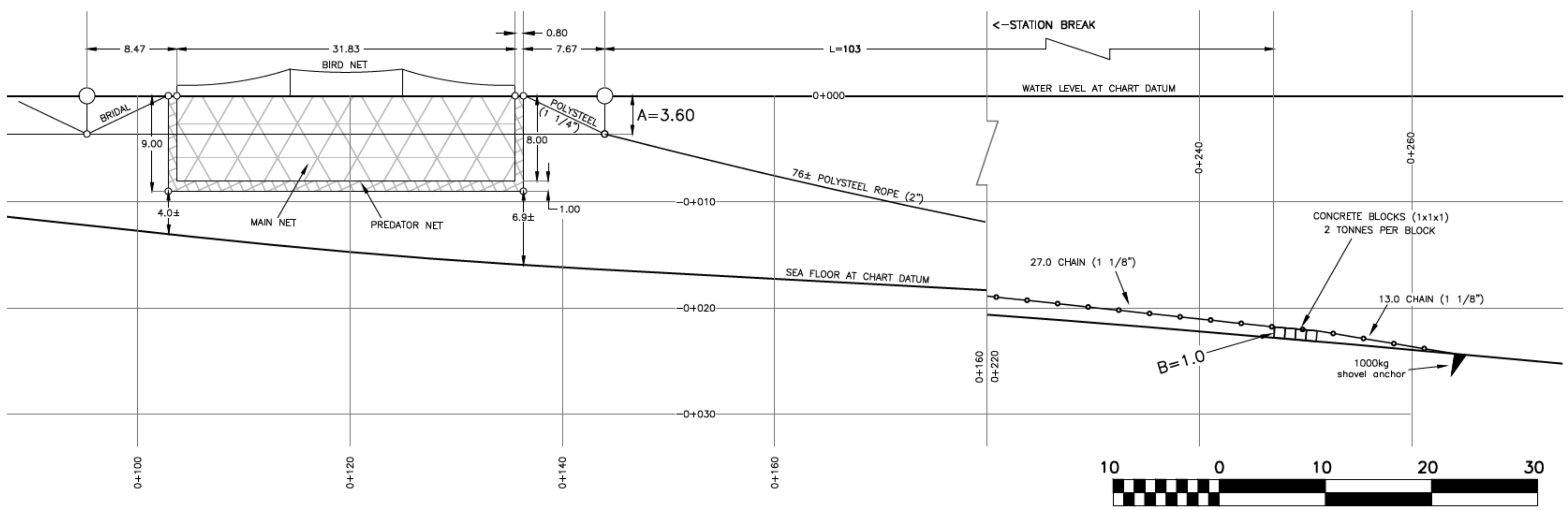
CROSS SECTION AT STATION 0+253.2
HORIZONTAL SCALE – 1 : 2,000 (METRIC)
VERTICAL SCALE – 1 : 2,000 (METRIC)



SCALE – 1 : 2,000 (METRIC)

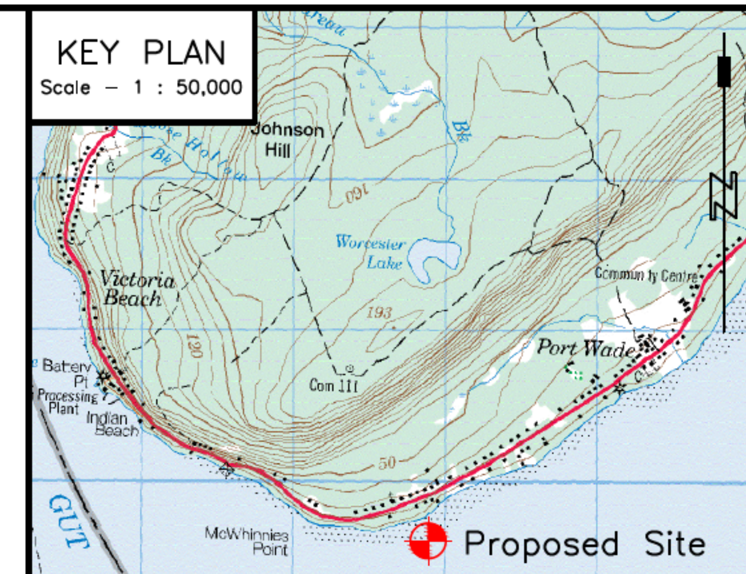
DETAILED CROSS SECTION
HORIZONTAL SCALE – 1 : 500 (METRIC)
VERTICAL SCALE – 1 : 500 (METRIC)

5:1 Mooring Scope Calculation
L = [(max depth + max tide range) – A – B] x 5
L = [(25± + 9.4±) – 3.6 – 1.0] x 5
L = 149.0 (calculated)
L = 103± (as by client design)



SCALE – 1 : 500 (METRIC)

KEY PLAN
Scale – 1 : 50,000



Legend:

CALCULATED POINT	C.P.
CALCULATED	(c.)
N.S. PROPERTY IDENTIFICATION NUMBER	P.I.D. #00000000
NORTHING / EASTING	N. / E.
LOCAL REGISTRY NUMBER	Book: / Page:
ORDINARY HIGH WATER MARK	O.H.W.M.
BOUNDARY DEALT WITH BY THIS PLAN	
OTHER BOUNDARY	
TIE LINES	
NOT TO SCALE	
MAJOR CONTOURS	
MINOR CONTOURS	
DEPTH SOUNDINGS	+ 00.0
CONCRETE MOORING	
ANCHOR	

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING

LONGITUDINAL CROSS–SECTION

KELLY COVE SALMON LTD. / VICTORIA BEACH

LOCATED AT:

VICTORIA BEACH, ANNAPOLIS BASIN (ATLANTIC OCEAN), ANNAPOLIS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 21st day of May, 2021.

Jeff Nickerson [redacted]

A&D JOB #300–18–1040

SHEET 6 OF 7 DATE: May 21, 2021

NOTES:
(1.) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
(2.) THIS PLAN IS A COMPILATION OF THIRD PARTY DATA. DATA WAS PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. ACKER & DOUCETTE SURVEYING INC. HAS COMPLETED THIS PLAN IN ACCORDANCE WITH THE "GUIDE TO MARINE FINFISH AQUACULTURE SITE REQUIREMENTS", DATED NOVEMBER 2007.
(3.) ALL DEPTHS ARE REFERENCED TO CHART DATUM (LOWER LOW WATER, LARGE TIDE).
(4.) DEPTH CONTOUR DATA IS BASED ON GARMIN MARINE MAPSOURCE DATA AND BATHYMETRIC SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP.
(5.) SPOT SOUNDINGS ARE BASED ON SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. SAID SOUNDINGS WERE CORRECTED TO CHART DATUM FROM G.N.S.S. OBSERVATIONS.
(6.) NATURAL FEATURES WERE DETERMINED BY NOVA SCOTIA PROPERTY ONLINE MAPPING AND GEONOVA DATA LOCATOR GEOGRAPHIC INFORMATION.
(7.) ONSHORE PROPERTY DATA IS BASED ON NOVA SCOTIA PROPERTY ONLINE MAPPING.
(8.) ALL BEARINGS SHOWN HEREON ARE GRID BEARINGS AND ARE BASED ON THE NORTH AMERICAN DATUM OF 1983 (NAD83 CSRS), EPOCH 2010.0, USING THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION, ZONE 20 NORTH (UTM Z20N).

KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S.
639
MEMBER

PURPOSE OF PLAN (SHEET 6 OF 7)
THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE A LONGITUDINAL CROSS SECTION AS SHOWN ON SHEET 4 OF 7, TO DEMONSTRATE DETAILS ASSOCIATED WITH THE CAGE INFRASTRUCTURE, ANCHOR AND MOORING LINES, AND SEAFLOOR PROFILE.

CROSS SECTION NOTES:
(1.) THIS PLAN IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.
(2.) FOR HORIZONTAL LOCATION OF EACH CROSS SECTION SEE SHEET 4 OF 6.
(3.) DISTANCES FROM SEA FLOOR MAY VARY DEPENDING ON TIDE AND CURRENT.
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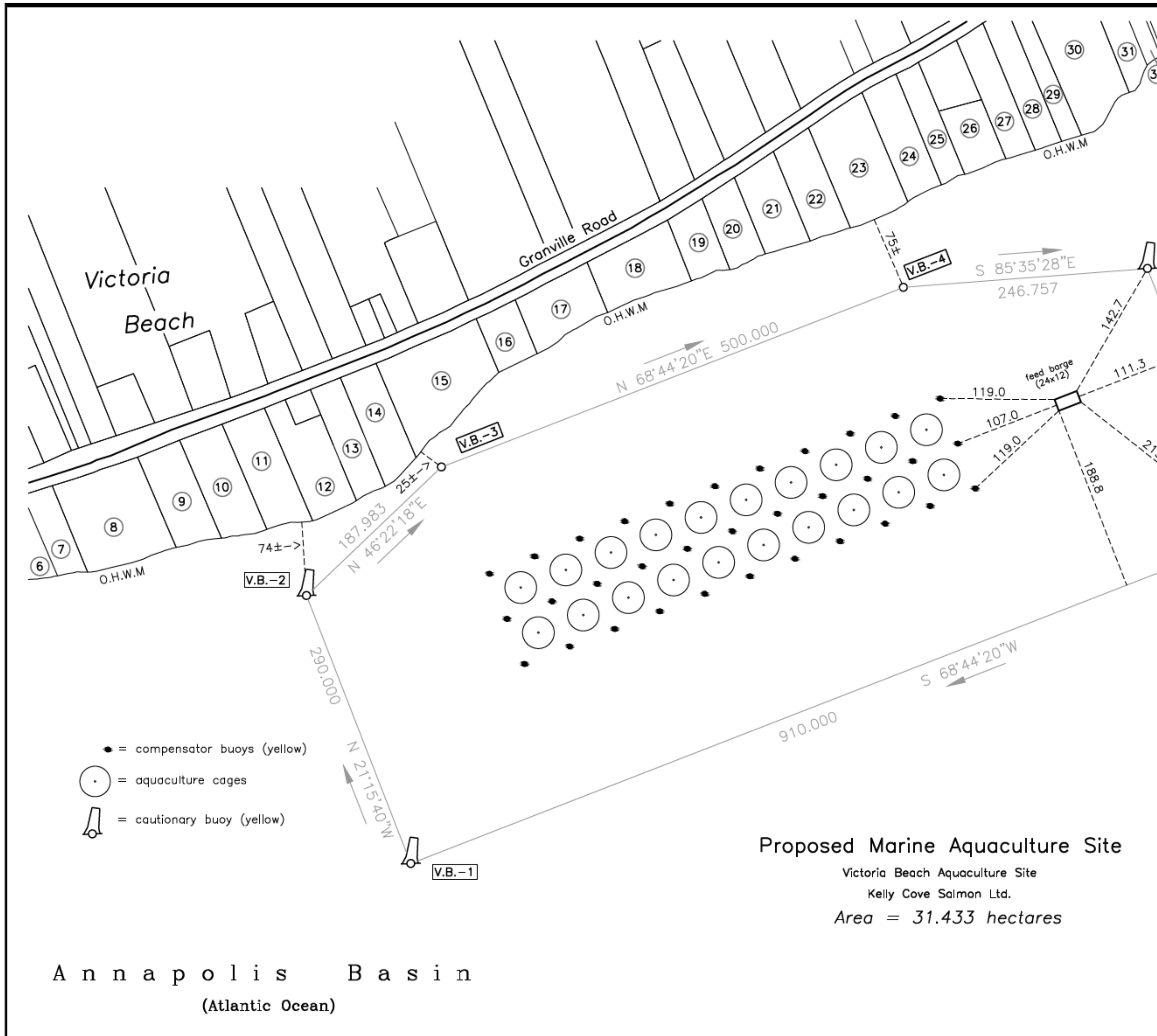


Proposed Marine Aquaculture Site

Victoria Beach Aquaculture Site

Kelly Cove Salmon Ltd.

Area = 31.433 hectares

NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
UTM Zone 20N

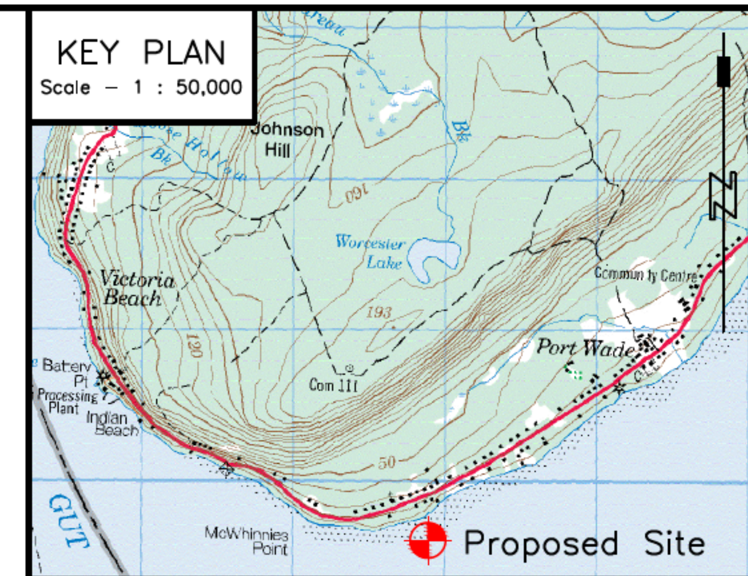
Point	Northing	Easting
V.B.–1	4,949,398.771	283,938.374
V.B.–2	4,949,669.033	283,833.215
V.B.–3	4,949,798.737	283,969.283
V.B.–4	4,949,980.046	284,435.252
V.B.–5	4,949,999.015	284,681.279
V.B.–6	4,949,728.752	284,786.438

NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
Geodetic Co–ordinates

Point	Latitude (N)	Longitude (W)
V.B.–1	44°39'55.5433"	65°43'31.9370"
V.B.–2	44°40'04.1783"	65°43'37.1176"
V.B.–3	44°40'08.5245"	65°43'31.1420"
V.B.–4	44°40'14.8982"	65°43'10.2783"
V.B.–5	44°40'15.7781"	65°42'59.1457"
V.B.–6	44°40'07.1425"	65°42'53.9663"

GRID NORTH NAD83 (CSRS) UTM zone 20N

KEY PLAN
Scale – 1 : 50,000



Legend:

CALCULATED POINT	C.P. ○
CALCULATED	(c.)
N.S. PROPERTY IDENTIFICATION NUMBER	P.I.D. #00000000
NORTHING / EASTING	N. / E.
LOCAL REGISTRY NUMBER	Book: / Page:
ORDINARY HIGH WATER MARK	O.H.W.M.
BOUNDARY DEALT WITH BY THIS PLAN	
OTHER BOUNDARY	
TIE LINES	
NOT TO SCALE	
MAJOR CONTOURS	
MINOR CONTOURS	
DEPTH SOUNDINGS	+ 00.0
CONCRETE MOORING	□
ANCHOR	

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING

PROPOSED NAVIGATIONAL AIDS MARKING PLAN

KELLY COVE SALMON LTD. / VICTORIA BEACH

LOCATED AT:

VICTORIA BEACH, ANNAPOLIS BASIN (ATLANTIC OCEAN),
ANNAPOLIS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 21st day of May, 2021.

[redacted]

Jeff Nickerson

A&D JOB #300–18–1040

SHEET 7 OF 7 | DATE: May 21, 2021

NOTES:

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KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S.
639
MEMBER

PURPOSE OF PLAN (SHEET 7 OF 7)

THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE THE LOCATION AND TYPES OF ALL NAVIGATIONAL AIDS RELATIVE TO THE PROPOSED LEASE BOUNDARIES.

100 0 100 200 300

SCALE – 1 : 5,000 (METRIC)

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St. Stephen, NB
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SIMCorp Environmental Sciences Lab
120 Milltown Blvd.
St. Stephen, NB
E3L 1G6