NOVA SCOTIA
Fisheries and Aquaculture

Office Use Only

Received
30 OCT. 2016
Fisheries and Aquaculture
Shelburne, NS

Aquaculture Amendment Application

Licence/Lease No.: 1006

Name of licence/lease holder:

Applicant: Kelly Cove Salmon Ltd. Business Registration Number: 89709 4850

Contact Person [redacted] NS Production Manager

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

Fax No. (902) 755-1492 Email Address [redacted]

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

Civic Address: 80B Ohio Road
Shelburne, NS
Postal Code BOT 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 in response to the need to reconfigure the cage array to ensure long term environmental sustainability.

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

[redacted]
Nova Scotia Department of Fisheries and Aquaculture Designate

October 30, 2016
Date

NS1006 Saddle Island – Boundary Amendment

Finfish Marine Aquaculture Development Plan for Site #1006 Saddle Island
County of Lunenburg
Province of Nova Scotia

May 13, 2024

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

Prepared by:
Sweeney International Marine Corp.
46 Milltown Blvd.
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EP EMPLOYER

SIMCorp File #SW2016-061

New Brunswick Newfoundland Nova Scotia

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May 13, 2024

SIMCorp File # SW2016-061

[redacted]
Kelly Cove Salmon Ltd.
P.O. Box 33
Bridgewater, NS
B4V 2W6

Dear Mr. Nickerson:

Reference: **Application for boundary amendment of aquaculture site #1006, Saddle Island, Nova Scotia**

Please find enclosed the supporting materials for the above-mentioned boundary amendment at marine aquaculture site #1006, in Aspotogan Harbour, NS.

If you have any questions or comments on the above-noted report, please do not hesitate to contact me at 902-969-4179 or Shaun Allain at 902-830-2676.

Sincerely,

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

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

EXECUTIVE SUMMARY

Project: Application for a boundary amendment of aquaculture site #1006 in Aspotogan Harbour, Nova Scotia

Marine aquaculture site #1006, called Saddle Island, is in Aspotogan Harbour, Lunenburg County, Nova Scotia. Kelly Cove Salmon Ltd. (KCS) has been farming the Saddle Island site since circa 2002. KCS has methodically examined the oceanographic conditions of the area around Saddle Island to determine the best positioning for the lease. Expertise from academics and consultants combined with the practical knowledge of operating the site over the last 20 years has identified a depositional area to the east of the original lease where algal debris collects. KCS has applied to amend the boundaries of the lease, resulting in a move away from the depositional area. The Saddle Island site has most recently been operated with six 150-m cages housing up to 440,000 Atlantic salmon, though the historic maximum number of fish reared on site was 600,000.

Aspotogan Harbour is positioned between St. Margaret's Bay and Mahone Bay. These areas are notable for their small, fishing and tourist-related communities. The harbour provides several different resources for humans and animals (Fig. 43). Fishing, specifically lobster, is an important activity contributing to the economic wellbeing of many of the small communities along the peninsula. In addition, this area is habitat for migratory birds, which are supported by the presence of unique microenvironments such as salt marshes, bogs, and fens. The peninsula is limited in terms of tourist destinations. One of the more notable spots, however, is the Bayswater Beach Provincial Park and picnic area where people can enjoy the sandy beaches and the view of the harbour. KCS has implemented policies and procedures to manage their farms and protect wildlife.

The Saddle Island marine aquaculture site is in salmon fishing area (SFA) 21 within the range of the Nova Scotia Southern Upland designated unit of Atlantic salmon. This designated unit has experienced drastic declines in population over recent decades. The closest river with a known remnant population of salmon is the Gold, which is approximately 21 km from the Saddle Island aquaculture site. 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. 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 and/or compiled by Sweeney International Marine Corp. (SIMCorp) for Kelly Cove Salmon Ltd. (KCS) in support of a boundary amendment of #1006 to include six cages of 150-m circumference housed in 76-m grid cells in a 1 x 6 configuration. The lease dimensions being applied for are 844 x 358 m, resulting in a lease area of 30.22 ha. Plans are to construct and stock the site with 440,000 Atlantic salmon in twenty cages for spring 2024.

SIMCorp is assisting KCS in this application for a boundary amendment of site #1006 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*
CAI	– Cooke Aquaculture Inc.
COHFT	– Certificate Of Health For Transfer
COSEWIC	– Committee On the Status of Endangered Wildlife In Canada
DFO	– Department of Fisheries and Oceans Canada
ECCC	– Environment and Climate Change Canada
EMP	– Environmental Monitoring Program
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
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	Global Chief Sustainability Officer
[redacted]	KCS	Corporate Support	Business Development Manager
Jennifer Hewitt	KCS	Corporate Support	Compliance Manager
[redacted]	SIMCorp	Sr. Project Manager	Company Owner
[redacted]	SIMCorp	Senior Marine Environmental Biologist, Atlantic Region	MSc
[redacted]	SIMCorp	Senior Marine Environmental Biologist, Nova Scotia	BSc, EP
[redacted]	Acker & Doucette Surveying Inc.	Survey Plan Preparation	NSLS

CONTACT INFORMATION

<u>Proponent:</u>

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

Project Management:

Company Name:	Sweeney International Marine Corp.
Principal Contact:	[redacted]
Mailing Address:	46 Milltown Blvd. St. Stephen, New Brunswick, E3L 1G3
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Cellular:	[redacted]
E-mail:	[redacted]

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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 the Saddle Island aquaculture site (#1006) since circa 2002. The lease and licence for Site #1006 was first issued in the early 1990s to the Eskasoni First Nations. It was purchased by KCS in the early 2000s. Upon obtaining the site, KCS implemented a single-yearclass stocking regime and instituted fallow periods. After the new Nova Scotia aquaculture regulations were brought into force, KCS applied for a boundary amendment in 2015 to make the site compliant. Several iterations of the boundary amendment package have been prepared over the years in efforts to meet changing provincial priorities and incorporate new knowledge. Throughout the process, KCS has methodically examined the oceanographic conditions of the area around Saddle Island to determine the best positioning for the lease. Expertise from academics and consultants combined with the practical knowledge of operating the site over the last 20 years has identified a depositional area to the east of the original lease where algal debris collects. KCS has applied to amend the boundaries of the lease, resulting in a move away from the depositional area.

The proposed marine farm consists of six, 76-m grid cells in a 1 x 6 configuration. The proposed lease incorporates all aquaculture-related gear, above and below the water line, and would have lease dimensions of 844 x 358 m, resulting in a farm with an area of 30.22 ha. KCS relies on the production of the Saddle Island site as a major contributor to its Nova Scotian operations. The Saddle Island site directly employs 7 to 9 site workers, indirectly supports several other positions within KCS, and contributes to the provincial GDP and federal, provincial, and municipal taxes. KCS is not requesting an increase in production over the historical maximum (i.e., ~600,000) but intends to maintain production at the current level of 440,000.

The general area of site #1006 appears on Canadian Hydrographic Service (CHS) Nautical chart #4386 (St. Margaret's Bay) and National Topographic Systems Map Sector 021A09 (Chester, Nova Scotia). The coordinates of the corners of the proposed lease area are presented in Table 1.

Site #1006 is in Aspotogan Harbour, between the Aspotogan Peninsula and the north side of Saddle Island, Lunenburg County, Nova Scotia (Fig. 1). The site is approximately 15 km southeast of the community of Chester and 14.5 km south of the community of Hubbards. Aspotogan Harbour is positioned between St. Margaret's Bay and Mahone Bay. These areas are notable for their small fishing and tourist-related communities. The harbour provides several different resources for humans and animals (Fig. 43). Fishing, specifically lobster, is an important activity contributing to the economic wellbeing of many of the small communities along the peninsula. In addition, this area is habitat for migratory birds, which are supported by the presence of unique microenvironments such as salt marshes, bogs, and fens. The peninsula is limited in terms of tourist destinations. One of the more notable spots, however, is the Bayswater Beach Provincial Park and picnic area where people can enjoy the sandy beaches and the view of the harbour. KCS has implemented policies and procedures to manage their farms and protect wildlife.

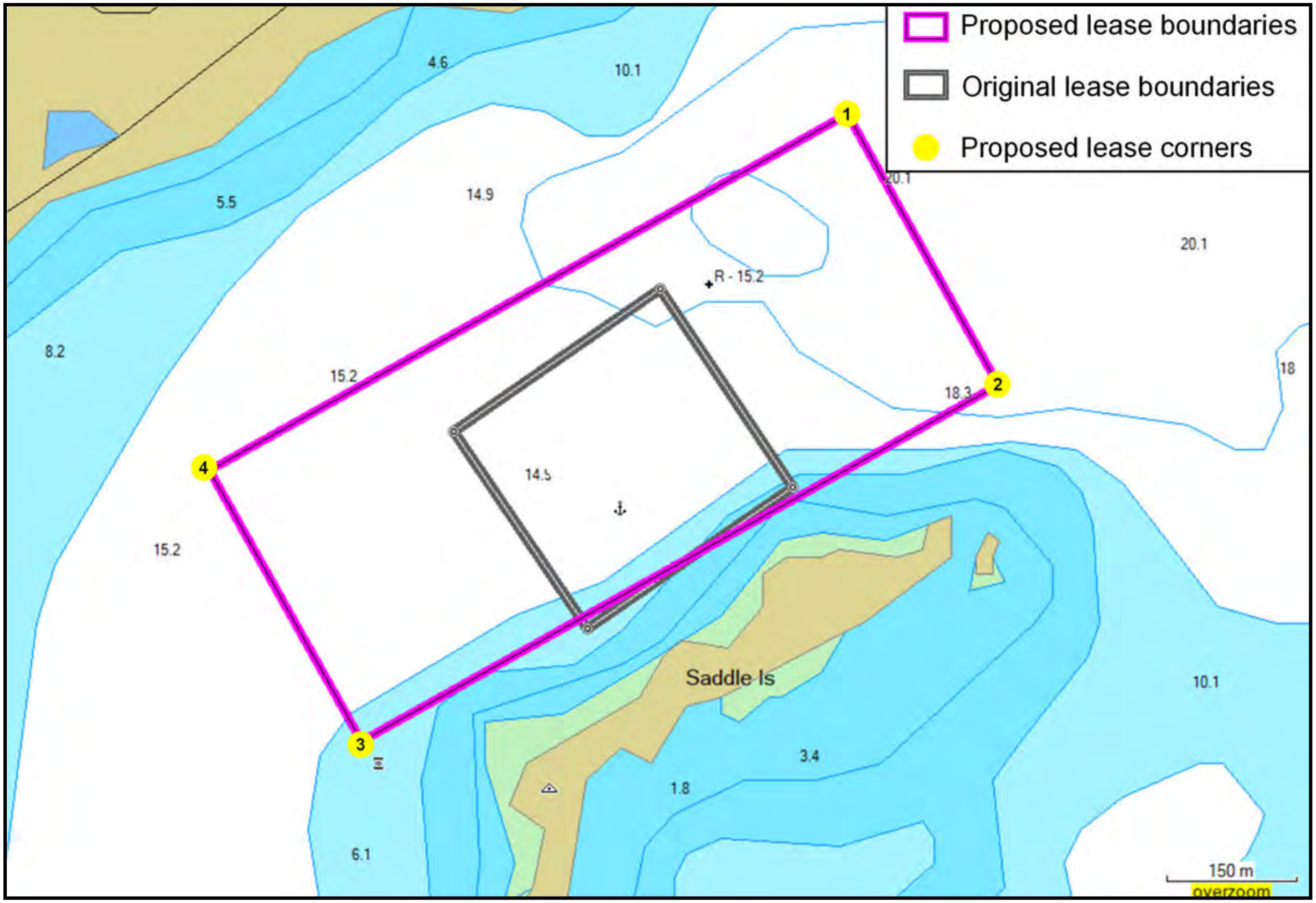
Aquaculture in the Aspotogan area has been able to successfully co-exist with other resources, providing increased employment and industry diversity for over 20 years. KCS is Cooke Aquaculture's farming division, and Cooke employs 302 people in Nova Scotia through its various divisions. Saddle Island 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 throughout 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 Saddle Island 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 Aspotogan Harbour

APPROXIMATE SITE CO-ORDINATES (NAD 83)		
Corner	**Latitude**	**Longitude**
1	44° 30' 28.4661"	64° 02' 44.2932"
2	44° 30' 18.3430"	64° 02' 36.3731"
3	44° 30' 04.9800"	64° 03' 09.7200"
4	44° 30' 15.1024"	64° 03' 17.6412"
Approximate Site Center	44° 30' 16.7"	64° 02' 57.0"

Figure 1. Proposed Boundary Location for Saddle Island #1006 in Aspotogan Harbour



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

2.1 Production Plan

The total number of fish expected to be introduced to Saddle Island (#1006) is 440,000 with an anticipated grow out period of 24 months (Table 2). The expected fallow period is 13 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	6	150	Predator	10	440,000	200	24 months	22.5	2,178,000	2596 (MT)	5.5
		HDPE		Rearing	9							

*Projected maximum values for production cycle is assuming a mortality of 10% and a FCR of 1.2:1.

Table 3. Harvest Plan Details

End Date	Date of Re-entry	Expected Fallow Period
April 30, 2026	May 2027	~12 months

2.2 Infrastructure

All active finfish farms in Nova Scotia are required to have 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.

Saddle Island is an existing, approved site that currently has infrastructure to support the operations already in place, including six (6) 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 to 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 Saddle Island 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. (CAI) 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 reviews and approves the FMP for each site prior to stocking. 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 Saddle Island 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 only wharf used by this operation is a private wharf owned by [redacted] located in Backman's Cove, Aspotogan. Only [redacted] and KCS have access to this wharf and this wharf will not be used to access other aquaculture farms. Refer to section **5.3.2.1 Right to Navigation** and section **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 include divers, mechanics, boat repair facilities, hardware providers, welders, heavy-equipment operators, crane operators, marine supplies, 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

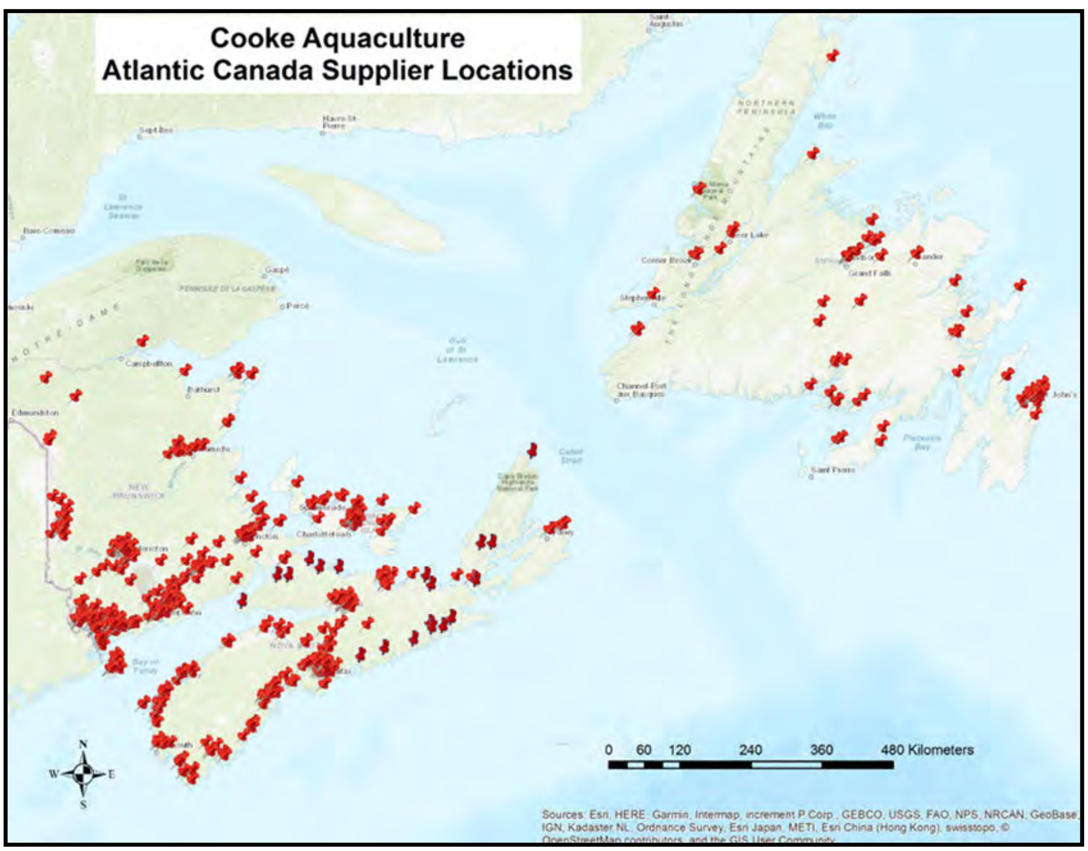
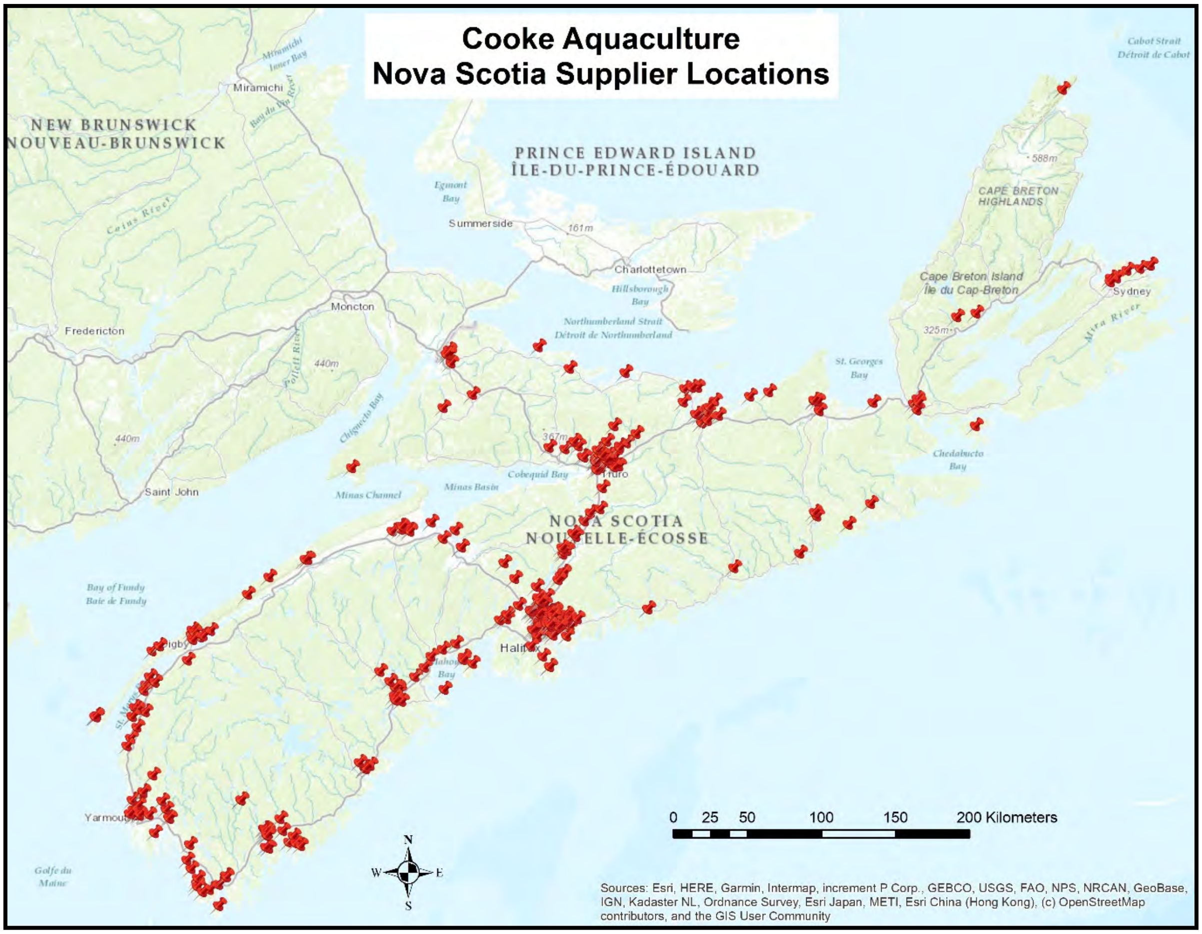


Figure 3. Cooke Aquaculture Nova Scotia Supplier Locations



2.4 Employment

KCS is Cooke Aquaculture's farming division, and Saddle Island is an important component of KCS' success in Nova Scotia. Cooke Aquaculture employs approximately 2153 people in Atlantic Canada, with 302 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. Most 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.

2.5 Other Economic Contributions to the Local Community and Province

KCS contributes to the local economy in Blandford, Hubbards, Chester, Lunenburg, Bridgewater, 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 Saddle Island aquaculture site contributes 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 ~30 years the farm has been in operation, the Saddle Island site 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 2021, the top five groundfish and pelagic species landed included herring, haddock, redfish spp., hake, and halibut (Table 4; Fisheries and Oceans Canada 2022a). The Saddle Island (#1006) aquaculture site borders on Maritimes statistical districts 23 and 25.

Table 4. Atlantic Coast Commercial Landings for 2021
Note: sourced from Fisheries and Oceans Canada (2022a)

2021 ATLANTIC COAST COMMERCIAL LANDINGS BY PROVINCE (metric tonnes, live weight)						
	Nova Scotia	**New Brunswick**	**PEI**	**Quebec**	**NL**	**Atlantic Total**
Groundfish						
Atlantic Cod	1,125	3	4	370	12,170	13,673
Haddock	11,289	x	0	x	57	11,346
Redfish spp.	10,363	x	0	x	4,202	14,798
Halibut (Atlantic)	5,102	141	80	813	922	7,058
Flatfishes	666	5	0	431	15,860	16,962
Greenland turbot	x	x	0	1,085	8,452	9,557
Pollock	3,088	x	0	x	81	3,169
Hake	5,172	x	0	x	558	5,747
Cusk	x	x	0	0	x	143
Catfish	0	0	0	x	0	x
Skate	185	0	0	x	x	754
Dogfish	11	0	0	x	x	x
Other	1,028	0	0	37	26	1,091
Total	**38,192**	**276**	**85**	**2,860**	**42,895**	**84,308**
Pelagic & other finfish						
Herring	38,430	19,210	2,163	2,124	6,728	68,656
Mackerel	1,472	397	1,187	859	602	4,517
Swordfish	x	0	0	0	x	1,434
Tuna	773	x	187	x	38	1,035
Alewife	732	976	79	0	0	1,787
Eel	12	60	55	x	x	167
Salmon (Atlantic)	0	0	0	0	0	0
Smelt	0	x	x	0	0	31
Silversides	x	0	x	0	0	158

Shark	0	x	0	2	x	3
Capelin	0	0	0	1,712	22,332	24,045
Other	17	x	0	x	16	43
Total	**42,649**	**20,664**	**3,830**	**4,731**	**30,001**	**101,875**

X: Suppressed to meet confidentiality requirements

Groundfish

There are several commercially harvested species of groundfish off the shores of Nova Scotia. The most common traditional fisheries include cod, haddock, and pollock, with halibut being the most valuable in 2021. Fisheries for cod, haddock, and pollock 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). The haddock stock in 4X5Y has exhibited a declining trend in weight- and length-at-age since the early 1990s, with the observed minimum having occurred in recent years (DFO 2022a). For decades, Scotian Shelf haddock have shown declines in maturation timing and mature fish length-at-age (DFO 2022a). Neuheimer and Taggart (2010) offered the combination of high fishing mortality and sustained harvesting of large fish as the simplest explanation for these declines. Cod in 4X demonstrate poor juvenile recruitment and low biomass levels (DFO 2019a). Spawning stock biomass has been critically low since 2008 (Fisheries and Oceans Canada 2021a). The western-component pollock fishery exhibited a declining trend in biomass in the 1990s, an increasing trend in the 2000s, and a decline in 2010, after which the stock has remained at fairly low levels (DFO 2021a). 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 length indices have been observed (DFO 2020a). American-plaice catches were generally small during research surveys in 2019 (DFO 2020a), and COSEWIC considers the Maritime population to be threatened (COSEWIC 2009a). O’Boyle (2012) had considered silver-hake stock status to be critical; however, recent biomass estimates showed increases from 2008 to 2014 but with further declines since 2014 (DFO 2020b). Halibut stocks appear to be improving (DFO 2019b, DFO 2020a), and the biological information for this species continues to develop.

The Saddle Island site is in Maritimes Statistical District 25, which incorporates all the landings from the Halifax County Line to Oakland and the eastern side of Mahone Bay. An adjacent district, District 23, encompasses Black Point, Shad Bay to the Lunenburg County Line. Between 2015 and 2022, key species landed within District 23 included cod, cusk, haddock, halibut, monkfish, pollock, redfish, sculpin, white hake, winter flounder, Atlantic wolfish, and silver hake. Key species landed within District 25 included cod, cusk, haddock, halibut, monkfish, pollock, redfish, winter flounder, white/silver hake, and sculpin. In 2015, 48,987 kg were landed in District 23 at a value of $234,269. In 2017, cod and white hake were two of the top five species landed with a combined landing quantity of 18,717 kg. The combined fisheries of mackerel, snow crab, pollock, and white hake landed 106,883 kg in District 25 for the year 2017. The data was combined by DFO to protect participant confidentiality (A. Campbell, pers. com.). The 2018 and 2019 data provided by DFO was further protected for participant confidentiality and all species other than lobster in District 23 and District 25 were combined. In 2018, 468,000 kg of non-lobster species were landed in District 23 at a value of $782,000 while District 25 had 132,000 kg of non-lobster species landed at a value of $3,070,000. In 2019, 179,000 kg of non-lobster species were landed in District 23 at a value of $734,000 while District 25 had 57,000 kg of non-lobster species landed at a value of $3,322,000 (A. Campbell, pers. com.). The 2021 and 2022 landings data for District 23 indicated halibut was the main groundfish species landed followed by cod (D. Eberhard, pers. com.). For District 25, halibut was the top species of 2021 followed by redfish. In 2022, halibut was again the top groundfish species landed but was followed by sculpin (D. Eberhard, pers. com.).

Figures 4 - 8 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 halibut (*Hippoglossus hippoglossus*)
- Atlantic cod (*Gadus morhua*)
- Haddock (*Melanogrammus aeglefinus*)
- Redfish (*Sebastes* sp.)
- Atlantic pollock (*Pollachius virens*)
- American plaice (*Hippoglossoides platessoides*)
- Winter, yellowtail, and witch flounder (*Pseudopleuronectes americanus, Limanda ferruginea* and *Glyptocephalus cynoglossus*)
- Monkfish (*Lophius americanus*)
- Silver hake (*Merluccius bilinearis*)
- White hake (*Urophycis tenuis*), restricted to by-catch only
- Cusk (*Brosme brosme*), restricted to by-catch only
- Striped wolffish (*Anarhichas lupus*), by-catch
- Sculpin, by-catch

Figure 4. Commercial Groundfish Landings (2014 – 2018)

Note: sourced from Rozalska and Coffen-Smout (2020)

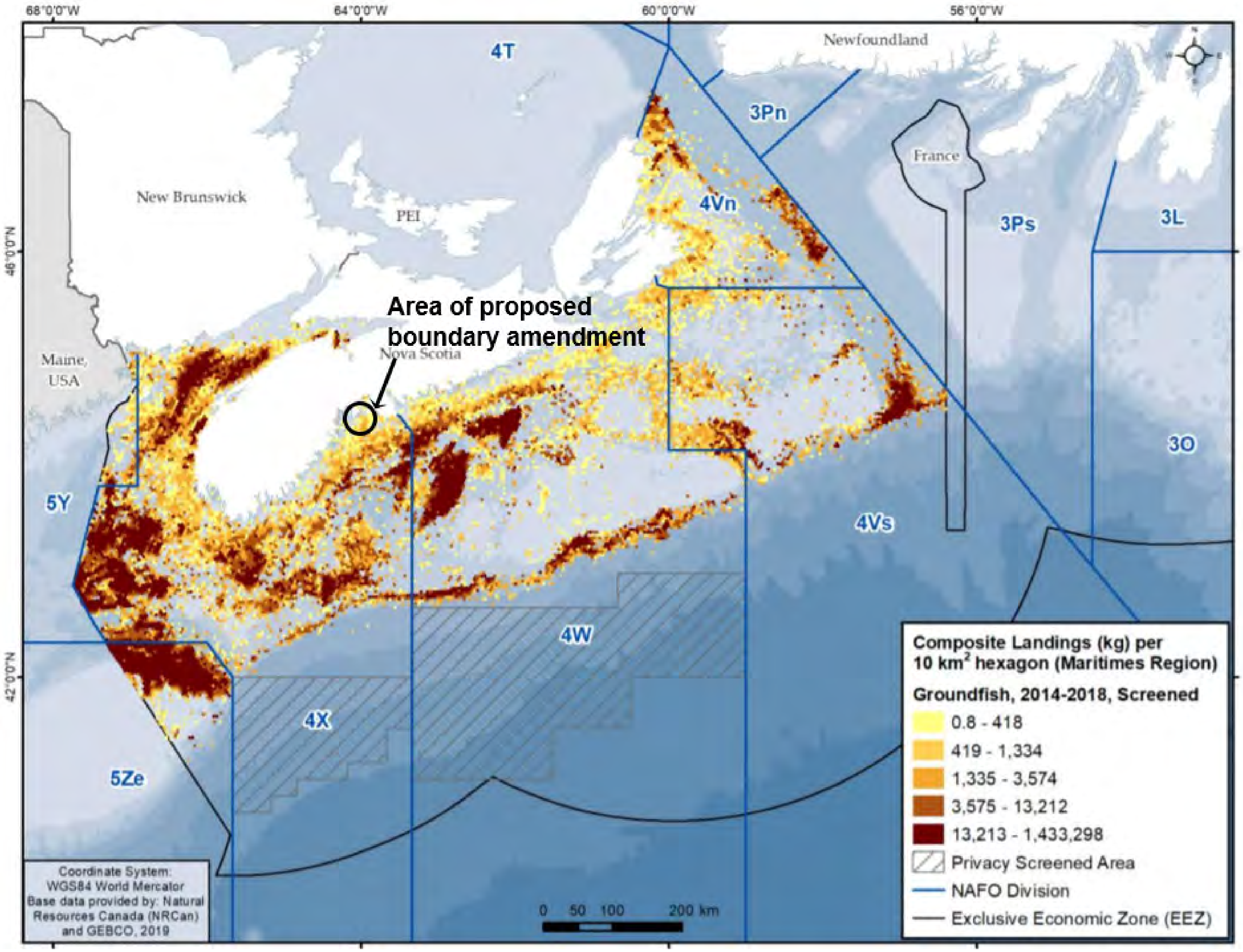


Figure 5. Commercial Cod, Haddock, and Pollock Landings (2014 – 2018)

Note: sourced from Rozalska and Coffen-Smout (2020)

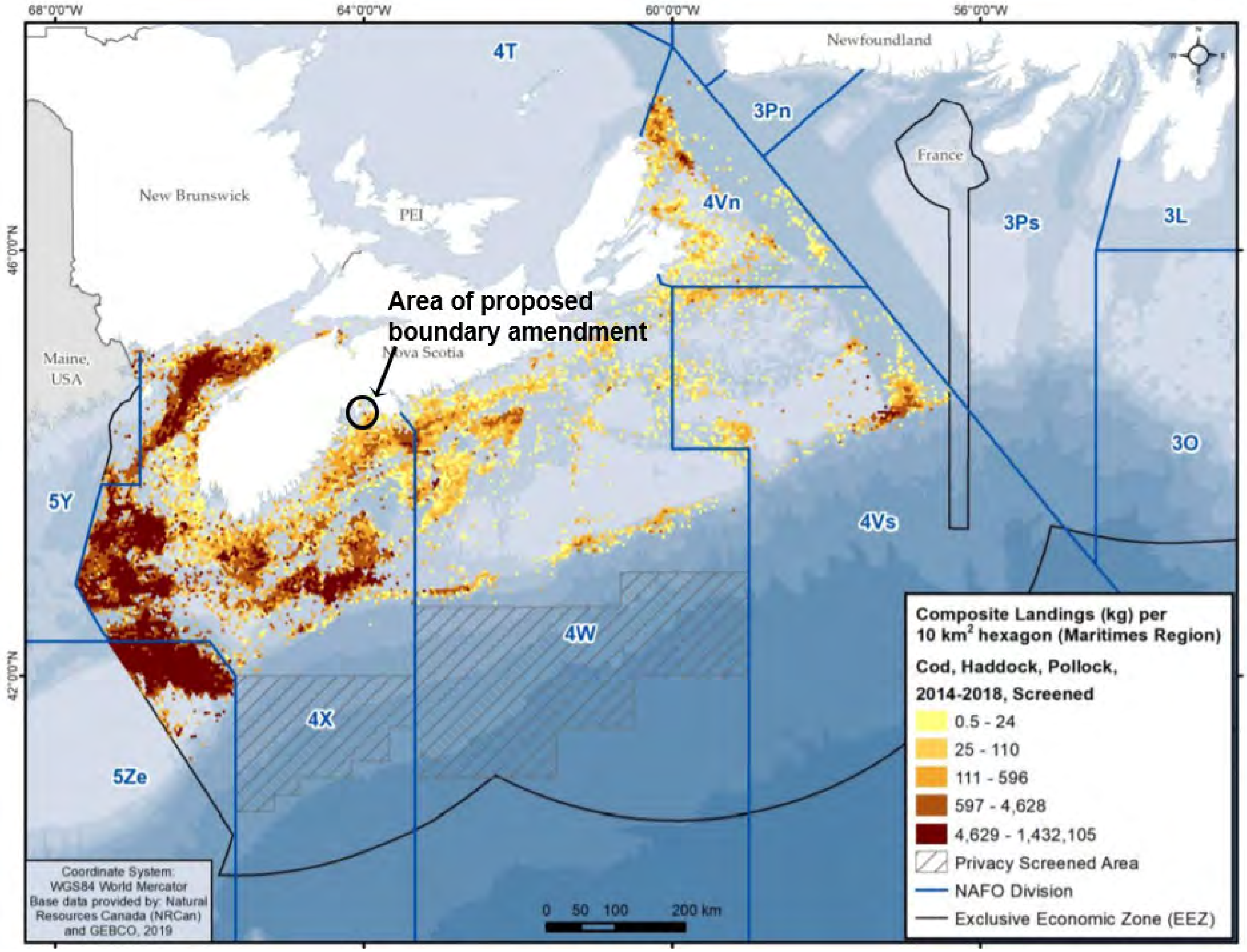


Figure 6. Commercial Flatfish Landings (2014 – 2018)

Note: sourced from Rozalska and Coffen-Smout (2020)

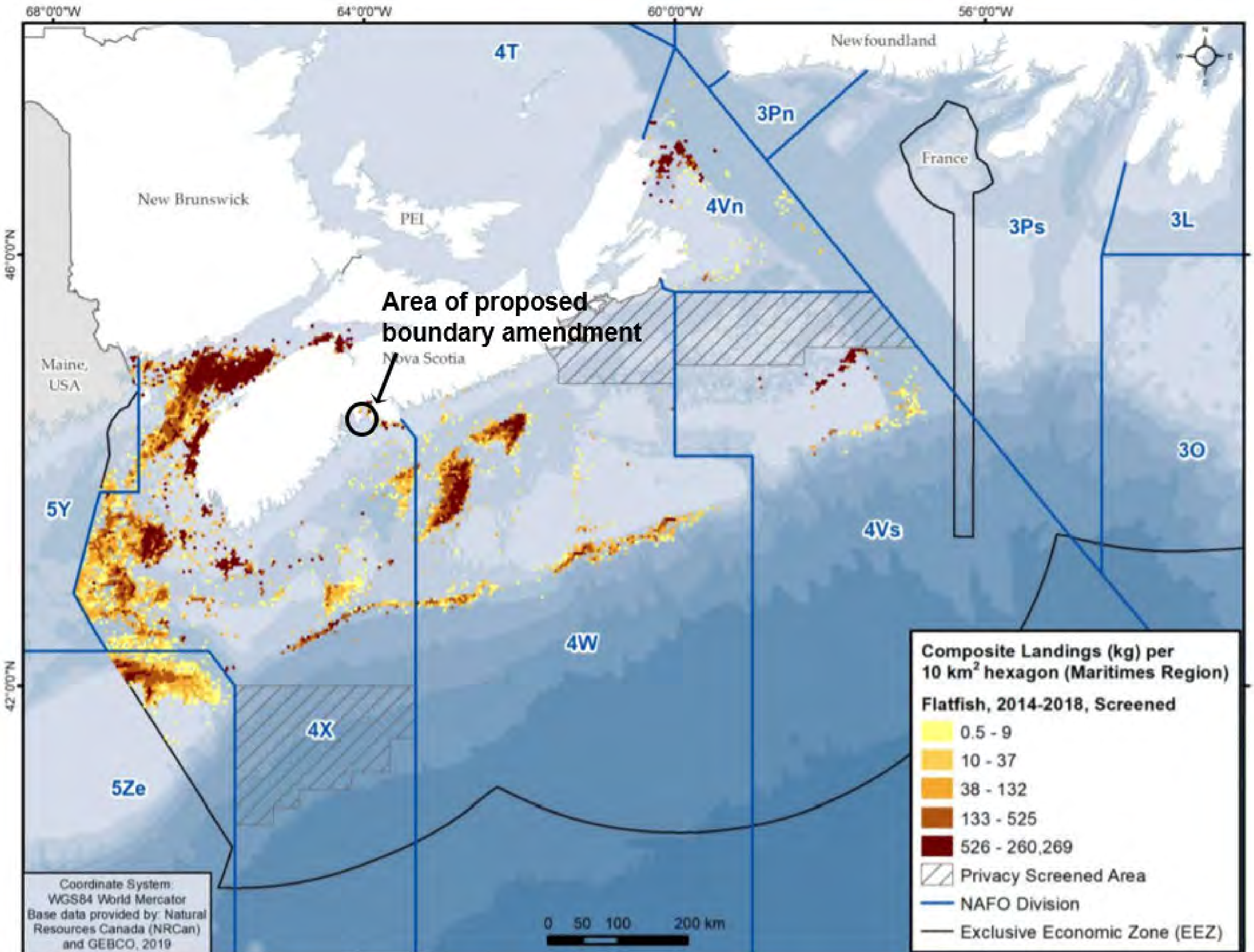
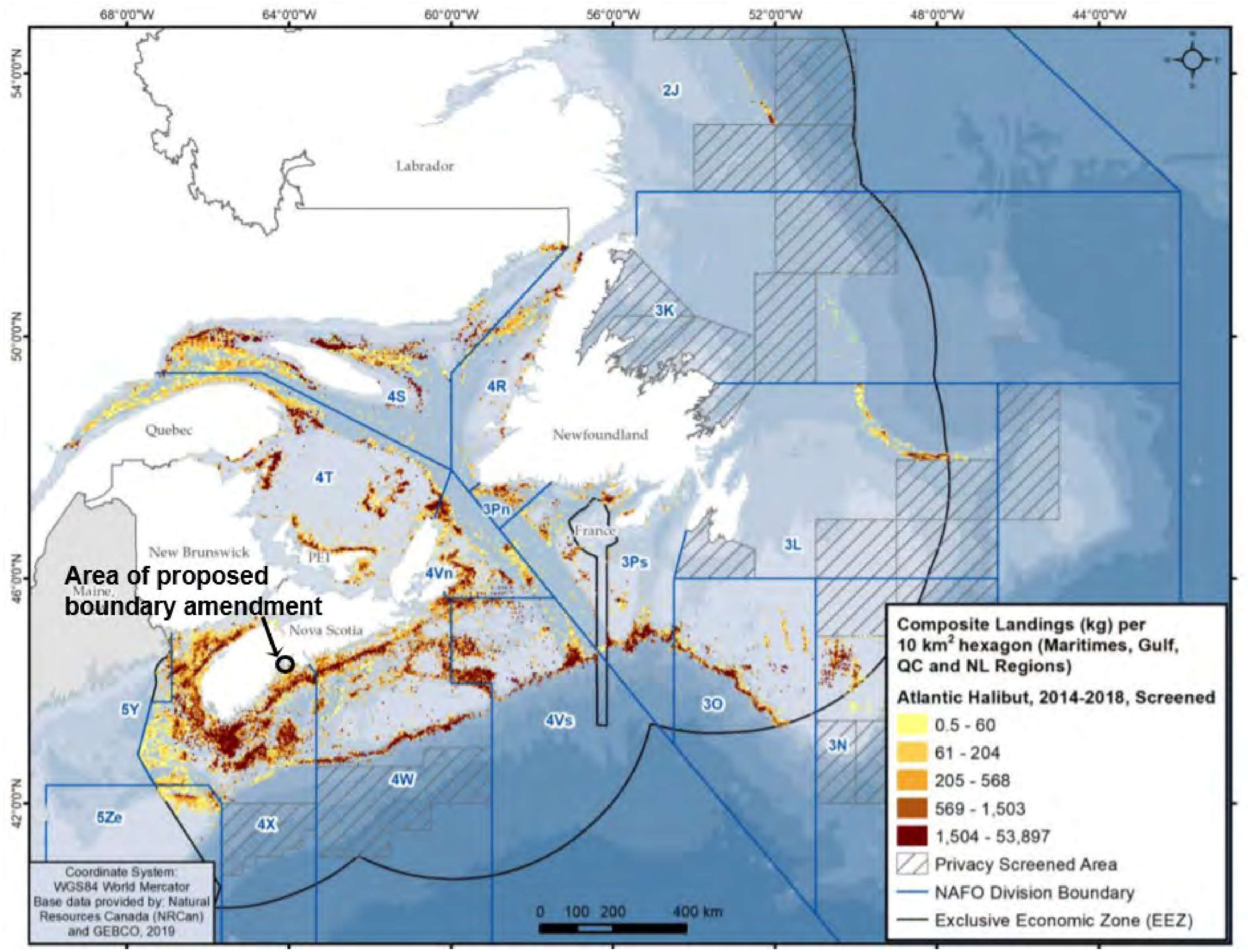


Figure 7. Commercial Atlantic Halibut Landings (2014 – 2018)
Note: sourced from Rozalska and Coffen-Smout (2020)



68°0'0"W
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60°0'0"W
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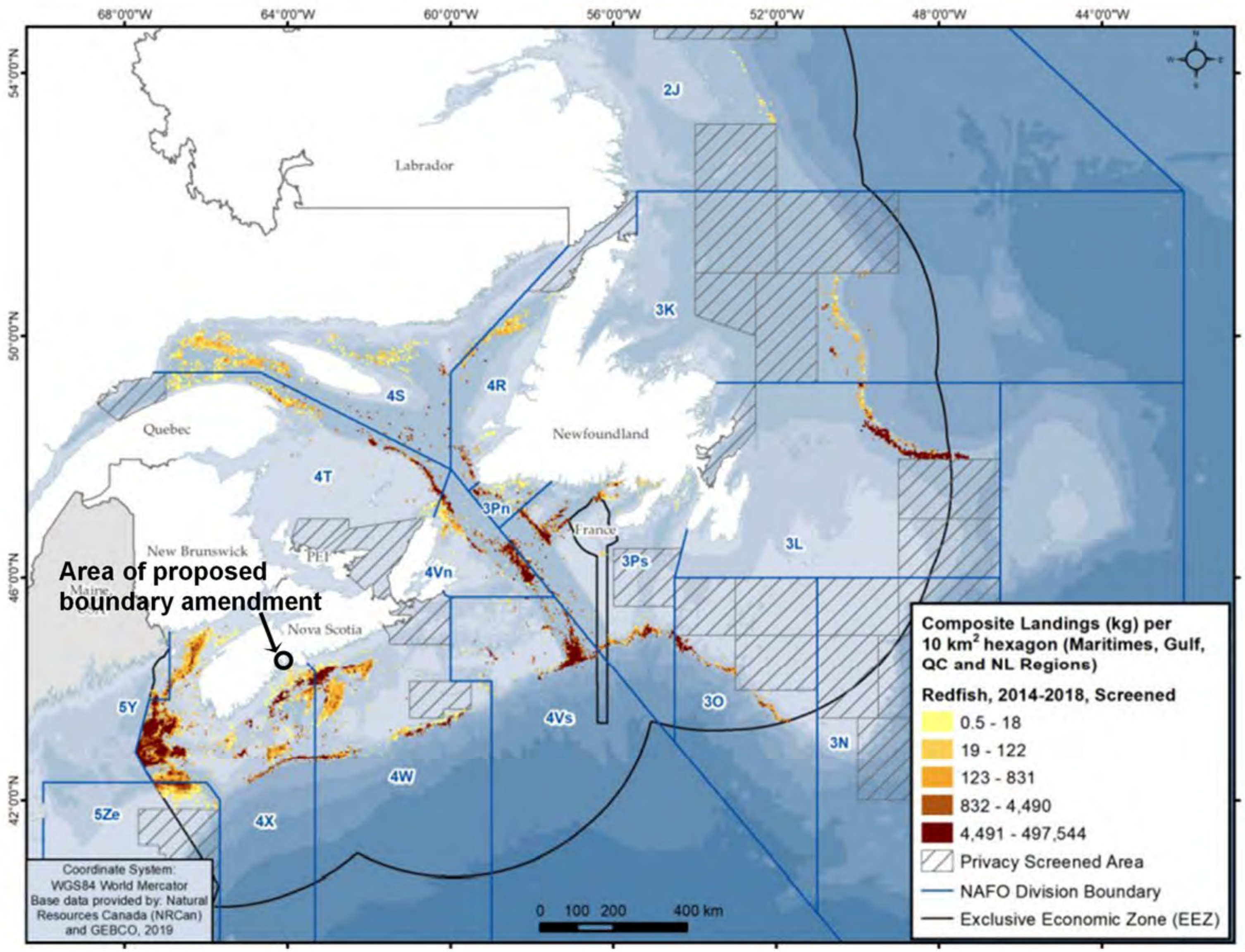
52°0'0"W
48°0'0"W
44°0'0"W
54°0'0"N
50°0'0"N
46°0'0"N
42°0'0"N
Labrador
Quebec
Newfoundland
New Brunswick
PEI
Maine
Nova Scotia
France
2J
3K
4R
4S
4T
3Pn
3Ps
3L
4Vn
4Vs
3O
3N
5Y
4W
4X
5Ze
Area of proposed boundary amendment
Composite Landings (kg) per 10 km² hexagon (Maritimes, Gulf, QC and NL Regions)
Atlantic Halibut, 2014-2018, Screened
0.5 - 60
61 - 204
205 - 568
569 - 1,503
1,504 - 53,897
Privacy Screened Area
NAFO Division Boundary
Exclusive Economic Zone (EEZ)
0 100 200 400 km
Coordinate System: WGS84 World Mercator
Base data provided by: Natural Resources Canada (NRCan) and GEBCO, 2019

Figure 8. Commercial Redfish Landings (2014 – 2018)



Note: sourced from Rozalska and Coffen-Smout (2020)

Pelagics
The most-common commercial species of pelagic fish off the shores of Nova Scotia include herring (Fig. 8), mackerel (Fig. 9), tuna, and alewife, with herring being the most valuable pelagic in 2021 (Table 4; Fisheries and Oceans Canada 2022a). When available, allocations for the Coastal NS spawning component herring (*Clupea harengus*) are based on the recent 5-year average of observed acoustic SSB (DFO 2020c). The five-year moving averages of spawning stock biomass of Coastal Nova Scotia herring stocks have decreased from 2019 to 2020 (DFO 2022b). Clark et al. (2012) presented evidence of the decline in spawning grounds, targeting of juveniles in the fishery, and declines in catches. The herring fishery largely takes place on dense summer-feeding, overwintering, and spawning locations and is dominated by purse seine, gillnet, and weir (Fisheries and Oceans 2021b).

The Northwest Atlantic mackerel stock ranges from North Carolina to Labrador and has northern and southern spawning contingents. The Department of Fisheries and Oceans has considered the status of the Atlantic mackerel stock to be in the critical zone since 2011 and the spawning stock biomass in 2020 was the lowest ever estimated (DFO 2021b). The mackerel fishery is conducted with gillnets, jiggers, hand lines, seines, and traps, depending on the region and time of year. In Southwest Nova Scotia, a small trapnet fishery takes place in April as mackerel migrates into the Gulf of St. Lawrence (Fisheries and Oceans Canada 2022b). It is primarily an inshore fishery of the spring and summer months and extends into more offshore waters for the fall and winter (DFO 2019c). The 2020 stock assessment recommended removals of mackerel should be as low as possible to allow the spawning stock to rebuild (DFO 2021b). Figure 9 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 has been rebuilt after a 10-year recovery plan commencing in 1999. The International Commission for the Conservation of Atlantic Tunas (ICCAT 2017) reported the North Atlantic swordfish biomass was recovered. This fishery is now sustainable and well controlled with Canadian annual landings of 1,505 t in 2013 being exported to the United States at a value of $12.3 million (Government of Canada 2015a). Swordfish (Fig. 10) are caught using longline and harpoon, primarily along the edges of Georges Bank, the Scotian Shelf, and the Grand Banks, from vessels often less than 65 feet. The Government of Canada (2016) lists ports in Nova Scotia the most dependant on revenues from swordfish as Shelburne, Sambro, Wood's Harbour, Clark's Harbour, Yarmouth, West Head, and Lower East Pubnico.

The bluefin tuna (Fig. 11) 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 2019). The 2021 ICCAT stock assessment summary report indicated that overfishing was not occurring, using 2012 to 2017 recruitment data (ICCAT 2021a). Data also suggest that, while recruitment has been variable with no distinct trend since at least the late 1970s, spawning stock biomass of western bluefin tuna may be increasing slightly. As of

2020, albacore tuna stocks are considered recovered and are not overfished nor undergoing overfishing (ICCAT 2020). Yellowfin-tuna stocks are also considered healthy (ICCAT 2019). Overfishing of bigeye-tuna appears to have ceased as of 2019, though the stock remains overfished (ICCAT 2021b).

The Atlantic mackerel fishery was the primary fishery in District 23 with 623,563 kg landed in 2017. Combined fisheries for mackerel, snow crab, pollock, and white hake landed 106,883 kg in District 25 for the year 2017. Landing data for specific fisheries were combined to protect participant confidentiality (A. Campbell pers. com.). The landings data for 2019 indicated fishing for mackerel, herring, and bluefin tuna in District 23. Atlantic mackerel and porbeagle/mackerel shark were fished in District 25. Atlantic mackerel was the top species landed in both districts in 2018 and 2019. The 2021 landings data for District 23 indicated mackerel continued to be the main pelagic species landed followed by bluefin tuna, whereas in 2022 herring were the top species followed by mackerel (D. Eberhard, pers. com.). For District 25, mackerel were the top species of 2021 followed by alewives/gaspereau, but, in 2022, elvers and eel were the only species reported (D. Eberhard, pers. com.).

Figures 9 - 12 show the approximate commercial pelagic landings off the coast of Nova Scotia between 2014 and 2018 (Rozalska and Coffen-Smout 2020).

Species list

- Atlantic mackerel (*Scomber scombrus*)
- Atlantic herring (*Clupea harengus*)
- North Atlantic bluefin tuna (*Thunnus thynnus*)
- Porbeagle shark (*Lamna nasus*)
- Alewives/gaspereau
- Elvers & eels

Figure 9. Commercial Mackerel Landings (2014 – 2018)
Note: sourced from Rozalska and Coffen-Smout (2020)

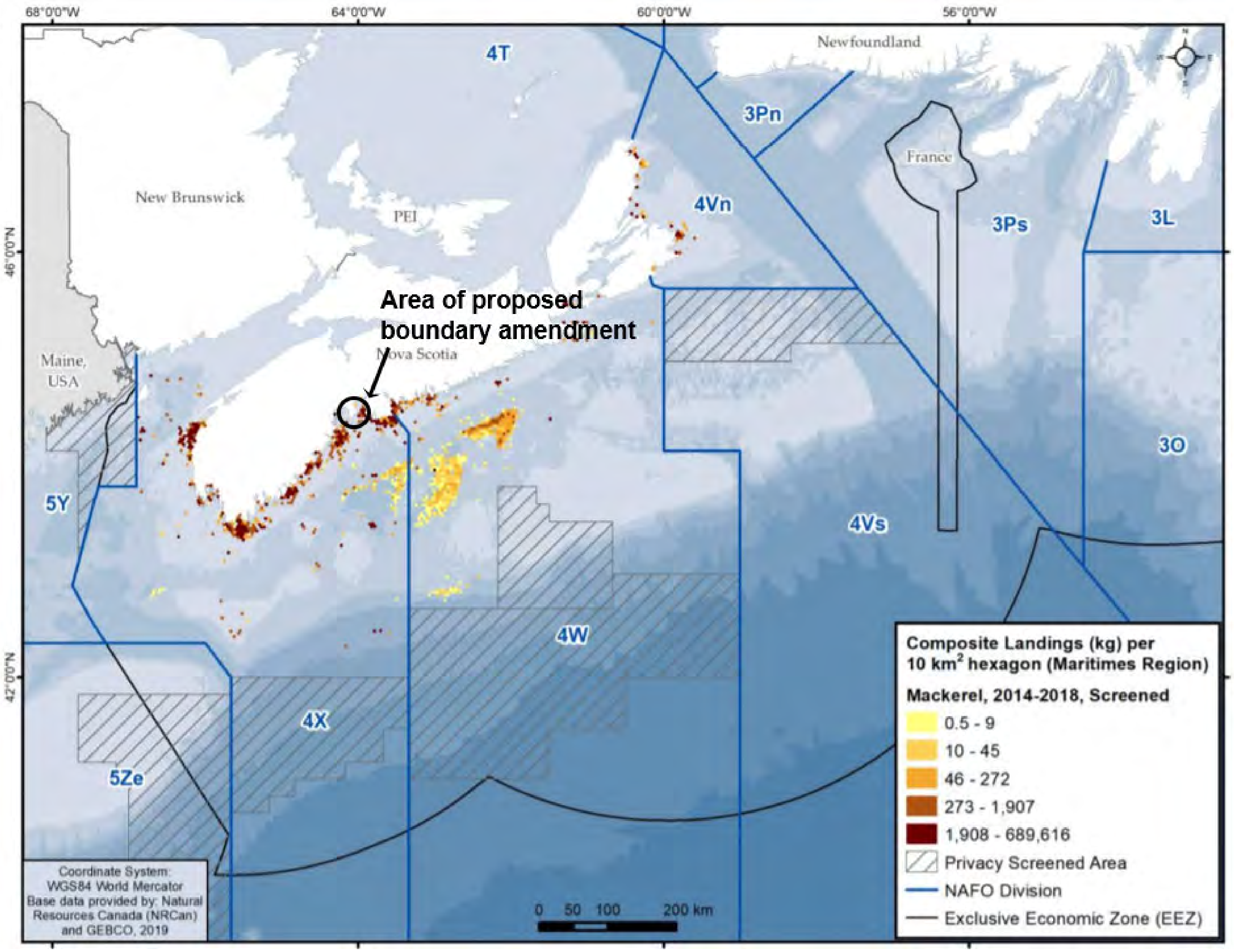
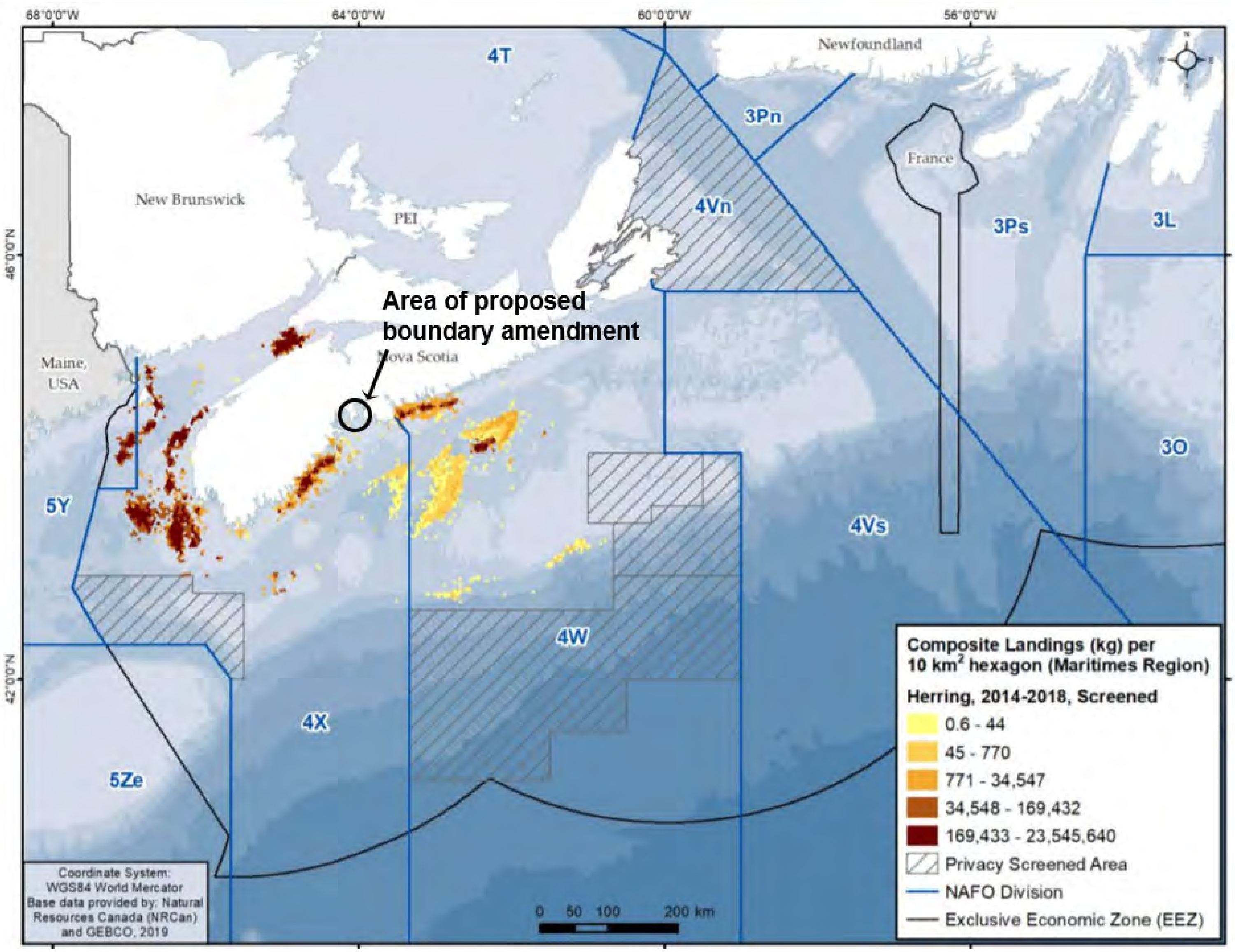

68°0'0"W
64°0'0"W
60°0'0"W
56°0'0"W
46°0'0"N
42°0'0"N
4T
Newfoundland
3Pn
France
New Brunswick
PEI
4Vn
3Ps
3L
Area of proposed boundary amendment
Nova Scotia
Maine, USA
3O
5Y
4Vs
4W
4X
5Ze
Composite Landings (kg) per 10 km² hexagon (Maritimes Region)
Mackerel, 2014-2018, Screened
0.5 - 9
10 - 45
46 - 272
273 - 1,907
1,908 - 689,616
Privacy Screened Area
NAFO Division
Exclusive Economic Zone (EEZ)
Coordinate System: WGS84 World Mercator
Base data provided by: Natural Resources Canada (NRCan) and GEBCO, 2019
0 50 100 200 km

Figure 10. Commercial Herring Landings (2014 – 2018)



Note: sourced from Rozalska and Coffen-Smout (2020)

Figure 11. Commercial Large Pelagic Fish Landings, Excluding Bluefin Tuna (2014 – 2018)
Note: sourced from Rozalska and Coffen-Smout (2020)

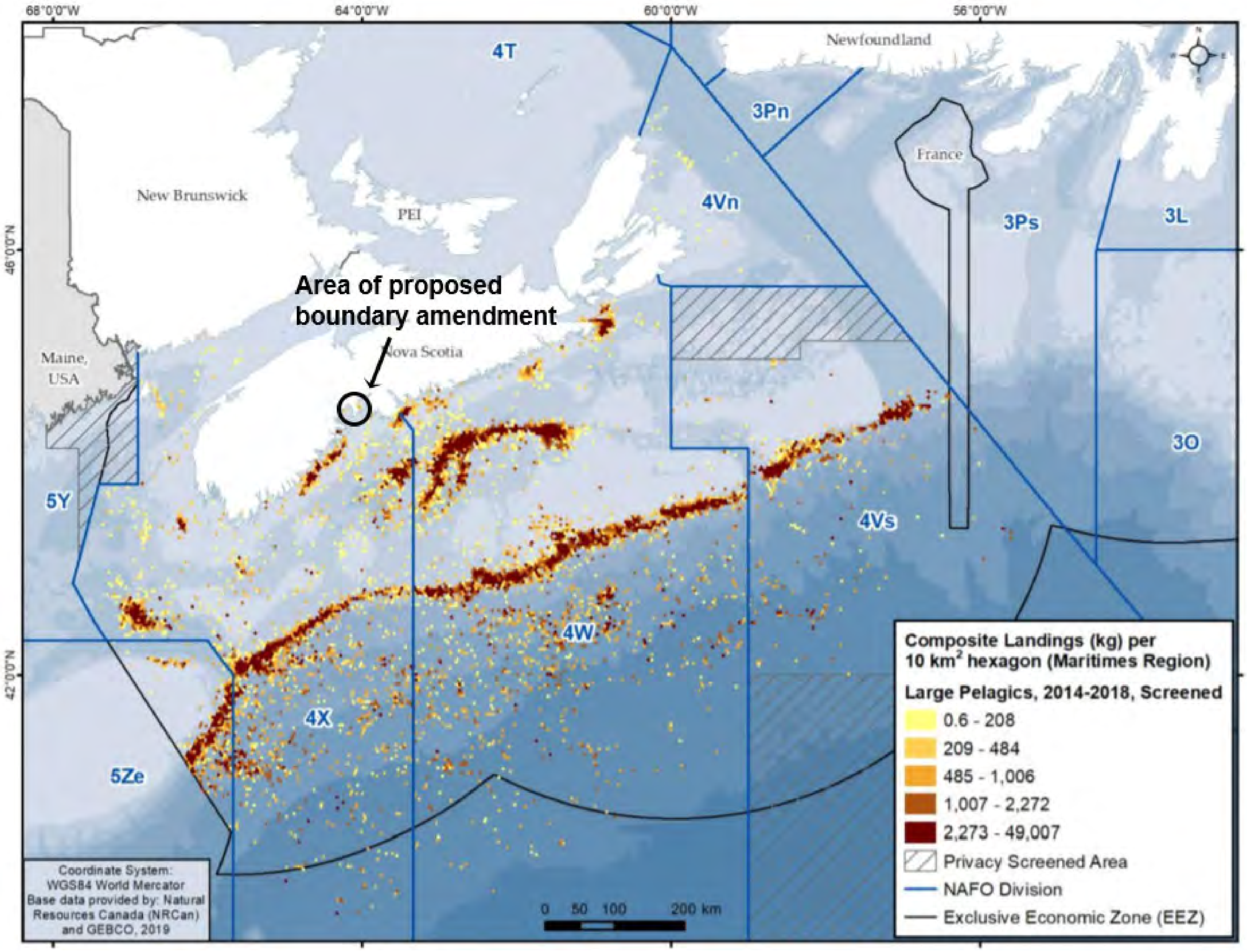
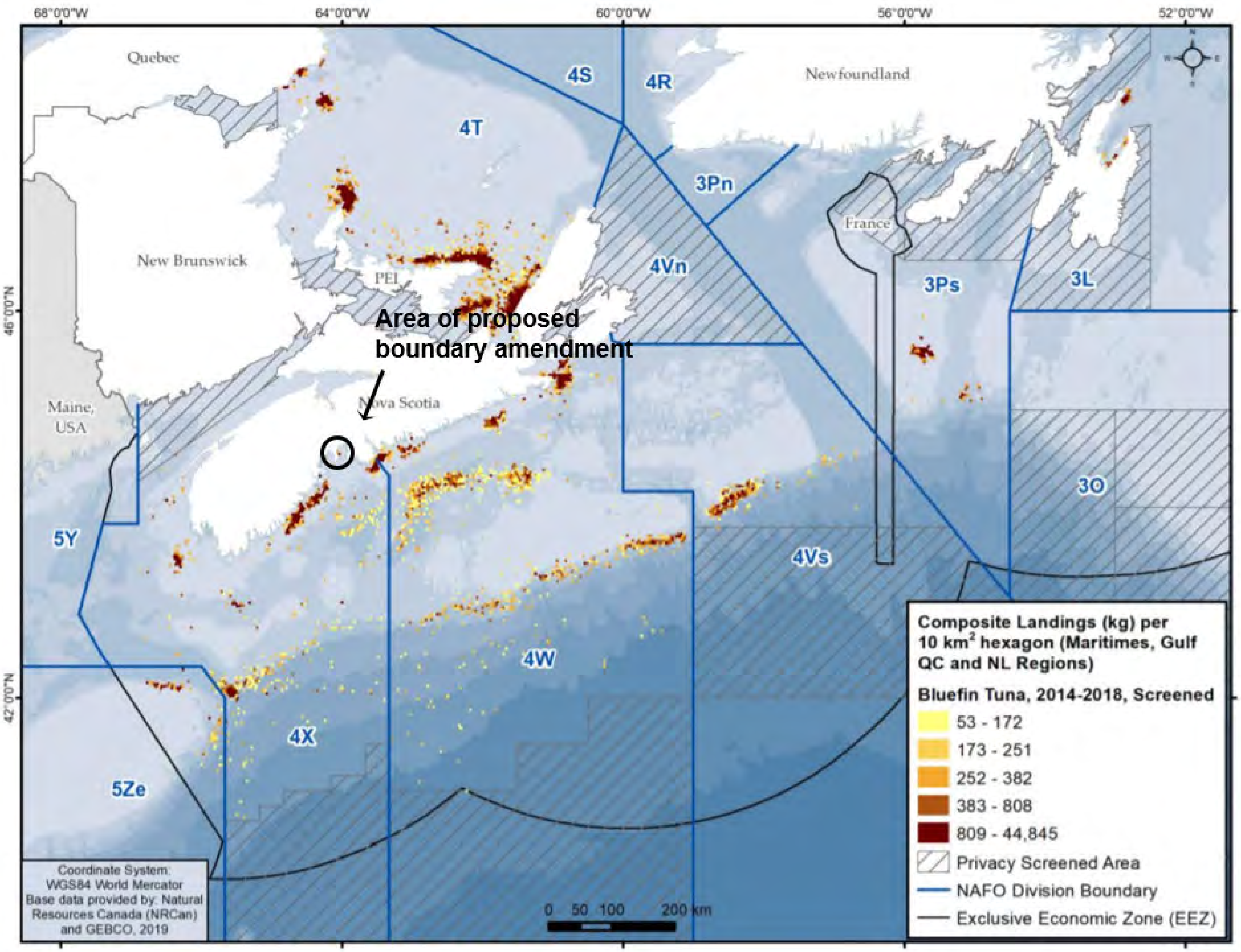

68°0'0"W
64°0'0"W
60°0'0"W
56°0'0"W
46°0'0"N
42°0'0"N
4T
Newfoundland
3Pn
France
New Brunswick
PEI
4Vn
3Ps
3L
Area of proposed boundary amendment
Nova Scotia
Maine, USA
3O
5Y
4Vs
4W
4X
5Ze
Composite Landings (kg) per 10 km² hexagon (Maritimes Region)
Large Pelagics, 2014-2018, Screened
0.6 - 208
209 - 484
485 - 1,006
1,007 - 2,272
2,273 - 49,007
Privacy Screened Area
NAFO Division
Exclusive Economic Zone (EEZ)
Coordinate System: WGS84 World Mercator
Base data provided by: Natural Resources Canada (NRCan) and GEBCO, 2019
0 50 100 200 km

Figure 12. Commercial Bluefin Tuna Landings (2014 – 2018)
Note: sourced from Rozalska and Coffen-Smout (2020)


68°0'0"W
64°0'0"W
60°0'0"W
56°0'0"W
52°0'0"W
46°0'0"N
42°0'0"N
Quebec
Newfoundland
New Brunswick
PEI
Nova Scotia
Maine, USA
France
4S
4R
4T
3Pn
4Vn
3Ps
3L
3O
4Vs
4W
4X
5Y
5Ze
Area of proposed boundary amendment
Composite Landings (kg) per 10 km² hexagon (Maritimes, Gulf QC and NL Regions)
Bluefin Tuna, 2014-2018, Screened
53 - 172
173 - 251
252 - 382
383 - 808
809 - 44,845
Privacy Screened Area
NAFO Division Boundary
Exclusive Economic Zone (EEZ)
Coordinate System: WGS84 World Mercator
Base data provided by: Natural Resources Canada (NRCan) and GEBCO, 2019
0 50 100 200 km

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, crabs, and clams (Table 5; Fisheries and Oceans Canada 2022a). Also harvested are sea cucumber and sea urchins.

Table 5. Atlantic Coast Commercial Landings for 2019
Note: sourced from Fisheries and Oceans (2022a)

2021 ATLANTIC COAST COMMERCIAL LANDINGS BY PROVINCE (metric tonnes, live weight)						
	Nova Scotia	**New Brunswick**	**PEI**	**Quebec**	**NL**	**Atlantic Total**
Shellfish						
Clams/quahog	25,394	x	369	1,086	x	47,685
Oyster	20	49	589	0	0	658
Scallop	52,631	3,139	266	458	1,077	57,572
Squid	45	0	0	0	11,260	11,305
Mussel	0	0	0	x	0	x
Lobster	48,113	22,567	18,598	11,375	4,984	105,638
Shrimp	17,743	2,776	0	9,518	35,998	66,035
Crab, queen	14,395	10,072	2,560	11,416	38,385	76,828
Crab, other	964	763	909	x	x	3,417
Whelks	x	0	0	935	x	2,163
Cockles	x	0	0	0	x	x
Sea cucumbers	x	x	0	813	6,042	9,210
Sea urchin	x	547	0	x	298	1,439
Other	0	0	0	0	0	0
Total	**162,595**	**40,619**	**23,291**	**36,974**	**121,195**	**384,674**
Others						
Marine plants	x	x	0	x	0	x
Lumpfish roe	x	x	0	x	61	x
Miscellaneous	x	x	0	1	2,521	2,522
Total	147	12,460	0	5	2,582	15,194

X: suppressed to meet confidentiality requirements

Invertebrate fisheries constitute the largest piece of the Nova Scotia fishery (Fisheries and Oceans Canada 2022a), of which, the lobster fishery is the primary component. In 2021, Nova Scotia landed 48,113 t of lobster valued at $1 billion (Fisheries and Oceans Canada 2022a). The inshore lobster fishery dominates the Maritimes lobster landings and is shown in Figure 13; the landings for 2015 and 2016 were the highest on record (DFO 2020d, DFO 2022c). The proposed farm falls within lobster fishing area (LFA) 33, which saw an increase in landings from 1996 to 2016. The catch per unit effort (CPUE) trends increased from 2007 to 2018, after which a decrease is evident; however, the population status was deemed healthy at the end of the 2020 - 2021 fishing season (DFO 2022c). 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 very fine to fine sand (see **Appendix B Saddle Island**

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. com.). Lobster was the most commercially valuable species landed in District 33 during 2021 and 2022 (D. Eberhard, pers. com.).

Fisheries for red crab, Jonah crab, and rock crab are smaller in scale than for snow crab (queen). Snow crab is the second most valuable fishery product in Nova Scotia (Fisheries and Oceans 2022a). 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. 14; Rozalska and Coffen-Smout 2020). In 2018, crabs were landed in District 23 (green, rock, and Jonah) while snow, rock, green, and Jonah crab were landed in District 25. In 2019, 2021, and 2022, green and rock crab were landed in District 23 (A. Campbell, pers. com.; D. Eberhard pers. com.); green, rock, and Jonah crabs were landed in District 25 in 2019 (A. Campbell, pers. com.). In 2021 green and rock crabs were again landed in District 25, and green, rock and snow were landed in 2022 (D. Eberhard pers. com.). Commercial snow crab landings for 2014 through 2018 are shown in Figure 15, and landings for 2018 and 2019 are illustrated in Figure 16. The Saddle Island aquaculture site is in crab fishing area 4X (also called CFA 24 west), which is the southern-most extent of snow-crab distribution in the Northwest Atlantic. Surveys for snow crab indicate that the commercial biomass in 4X remain very low (Zisserson et al. 2021), and a stock assessment of the Scotian Shelf biomass and allowable catches indicated a continual decrease since 2016 (DFO 2020e).

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. 17). 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. Figure 18 illustrates the location of historical shrimp-trap locations on the Scotian Shelf. Saddle Island is within shrimp fishing area 16, which currently has no total allowable catch and is not active (Government of Canada 2021a). No landings were noted in the 2019 landings data (A. Campbell, pers. com.) or the 2021 - 2022 data (D. Eberhard, pers. com).

The commercial fishery for scallops is typically offshore, although a smaller inshore fishery does occur along parts of the Atlantic coast (Fig. 19 & 20). 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). The Saddle Island site is within scallop fishing area (SFA) 29, which encompasses Baccaro Point to Cape North. Primarily, opportunistic fishing occurs in this area (Government of Canada 2017). A bed of scallops east of Baccaro Point to Queens/Lunenburg County was identified in 2001 and has been limited to a 3- to 4-week annual fishing period since 2006 (Government of Canada 2017). Over the years, the areas have been redefined with continual alterations to fishing restrictions. Latitude and longitude coordinates are defined in the licence conditions (Government of Canada 2017). The preliminary 2017 data indicated landings of scallops only in District 25 (A. Campbell, pers. com.). There were no reports of scallop landings in Districts 23 and 25 in 2019, but in 2021 and 2022, there were landings of scallops reported for District 25 (D. Eberhard, pers. com.).

Fisheries and Oceans Canada offers a real-time map of openings and closures of Canadian harvesting areas for bivalve shellfish (mussels, oysters, clams, and scallops) (Fisheries and Oceans Canada 2023). 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 March 28, 2023, all species of bivalve molluscs could be harvested in Aspotogan Harbour (Fig. 21).

Species list

- Lobster (*Homarus americanus*)
- Shrimp (*Pandalus borealis*)
- Rock crab and Jonah crab (*Cancer irroratus* and *C. borealis*)
- Green crab (*Carcinus maenas)*
- Snow/queen crab (*Chionoecetes opilio*)
- Scallop (*Placopecten magellanicus*)

Figure 13. Total Lobster Catch
Note: Sourced from Serdynska et al. (2022)

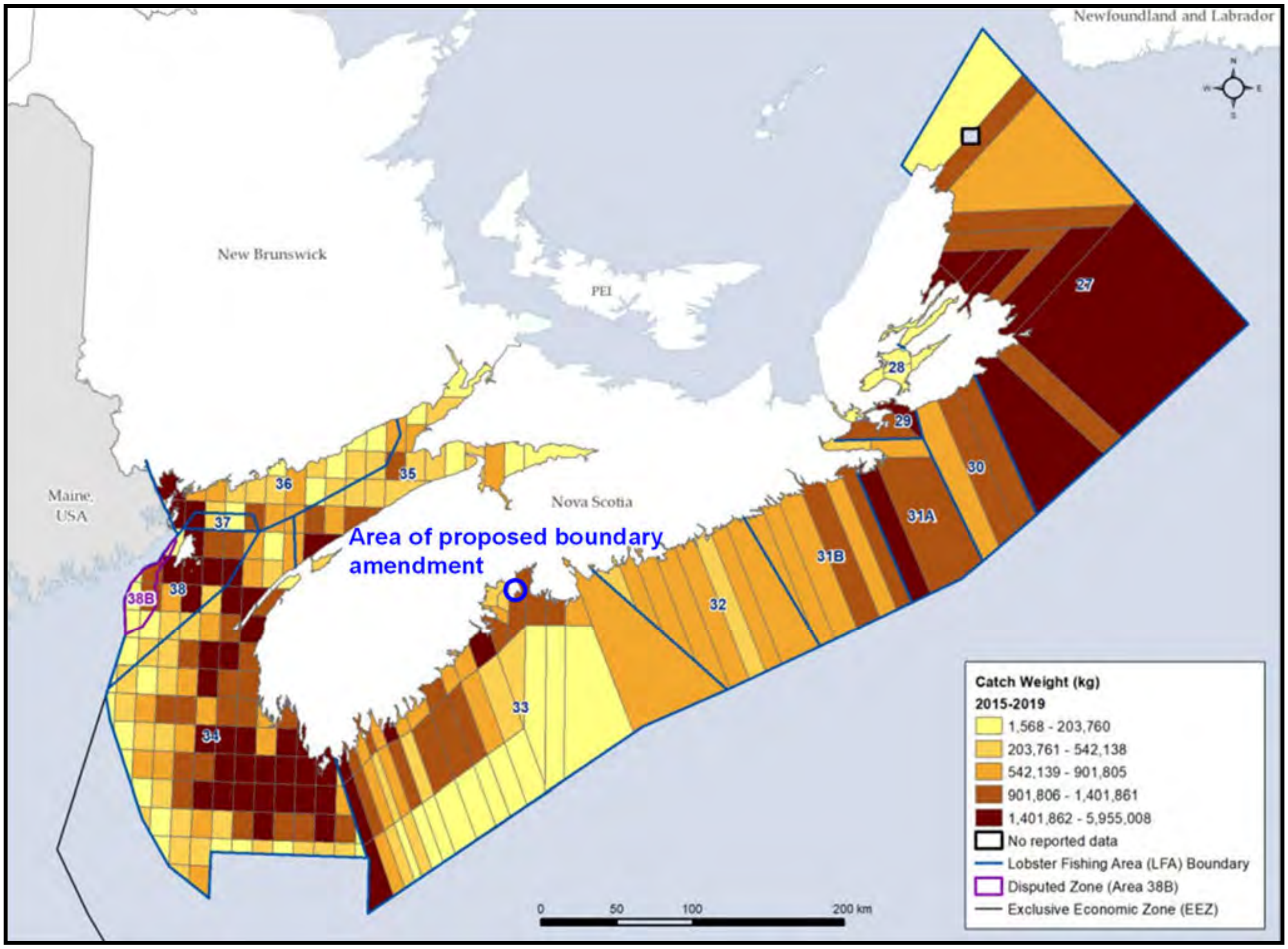


Figure 14. Crab Landings Other than Snow Crab (2014 – 2018)
Note: sourced from Rozalska and Coffen-Smout (2020)

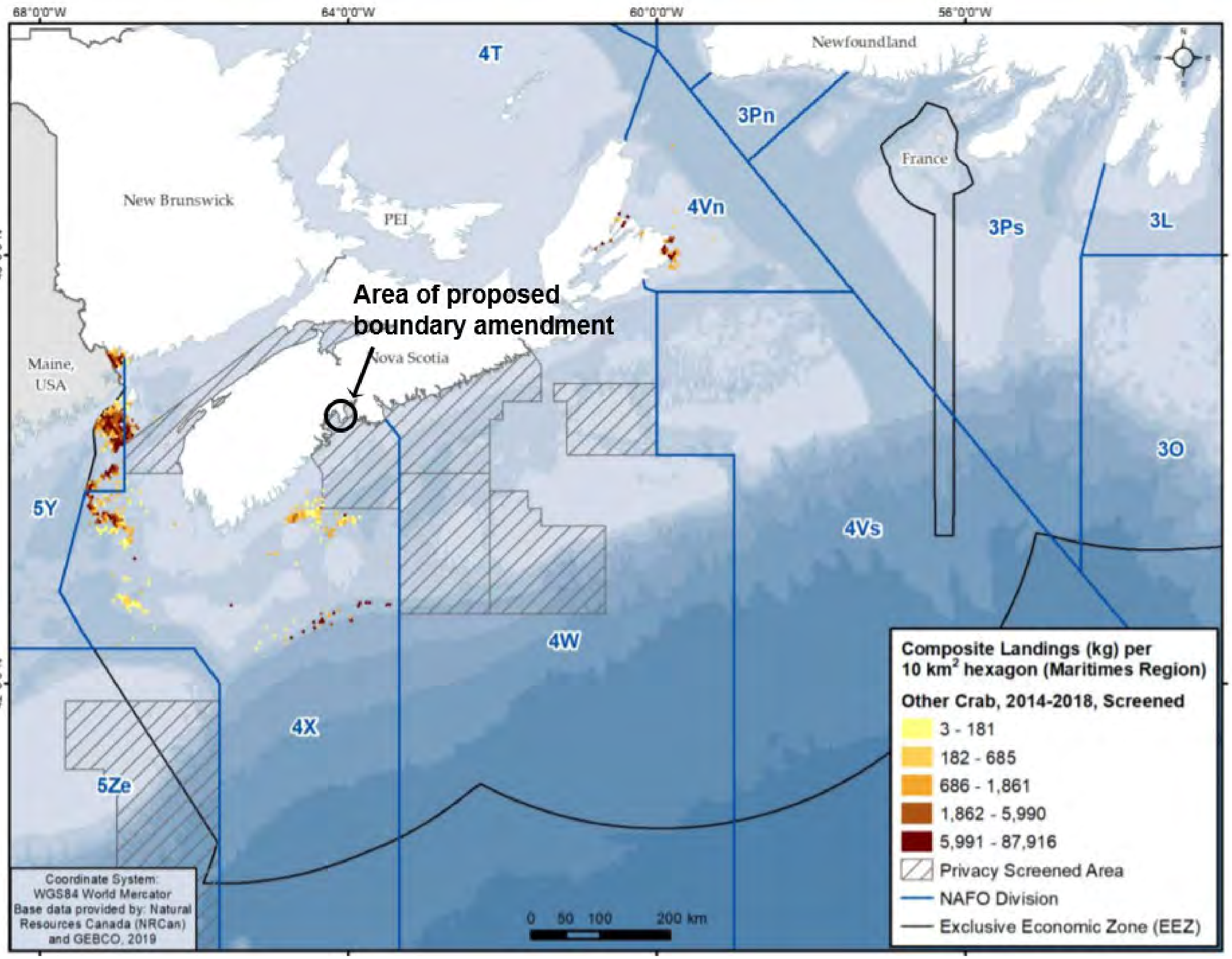


Figure 15. Commercial Snow Crab Landings (2014 – 2018)
Note: sourced from Rozalska and Coffen-Smout (2020)

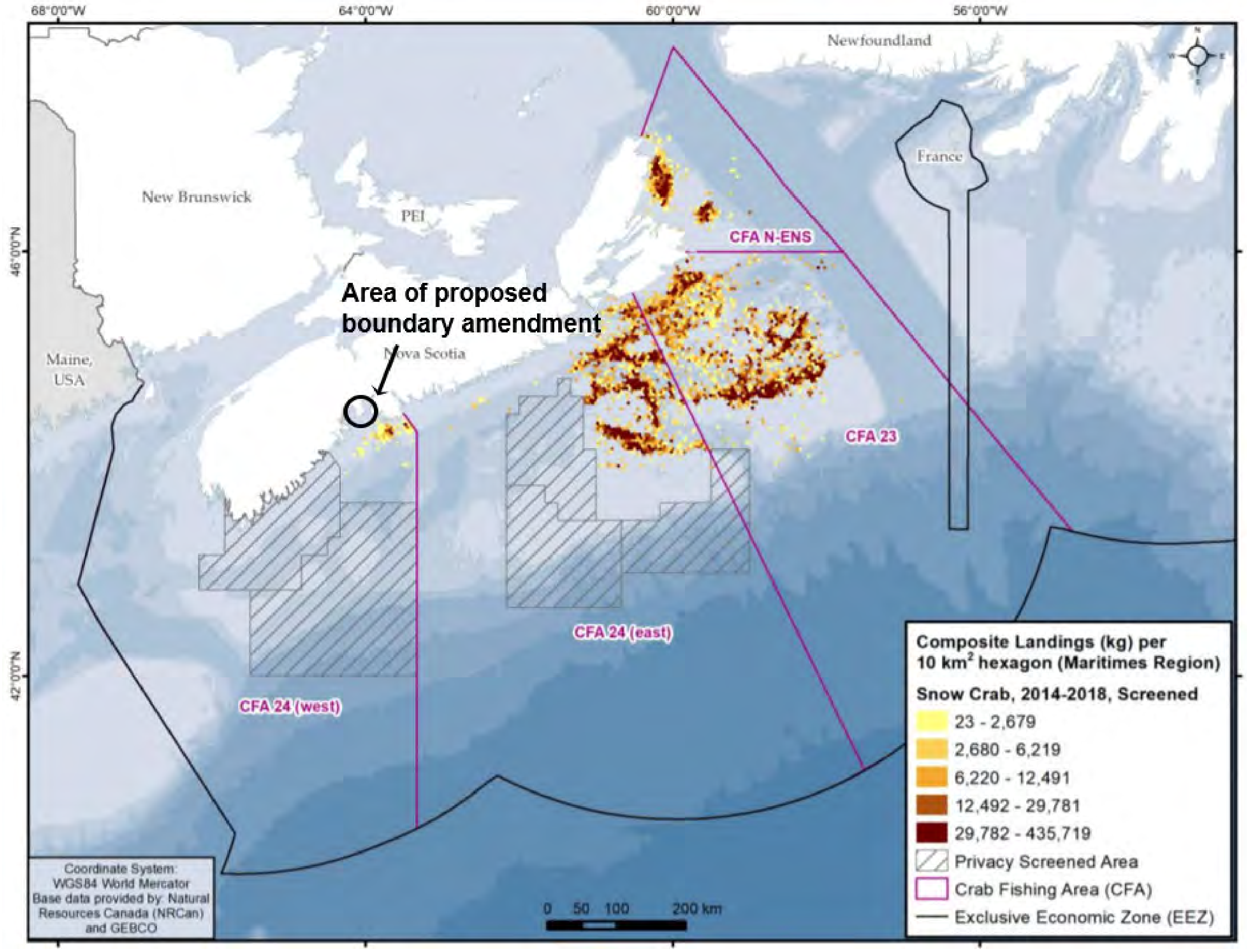


Figure 16. Commercial Snow Crab Landings (2018 – 2019)
Note: Sourced from DFO (2020e)

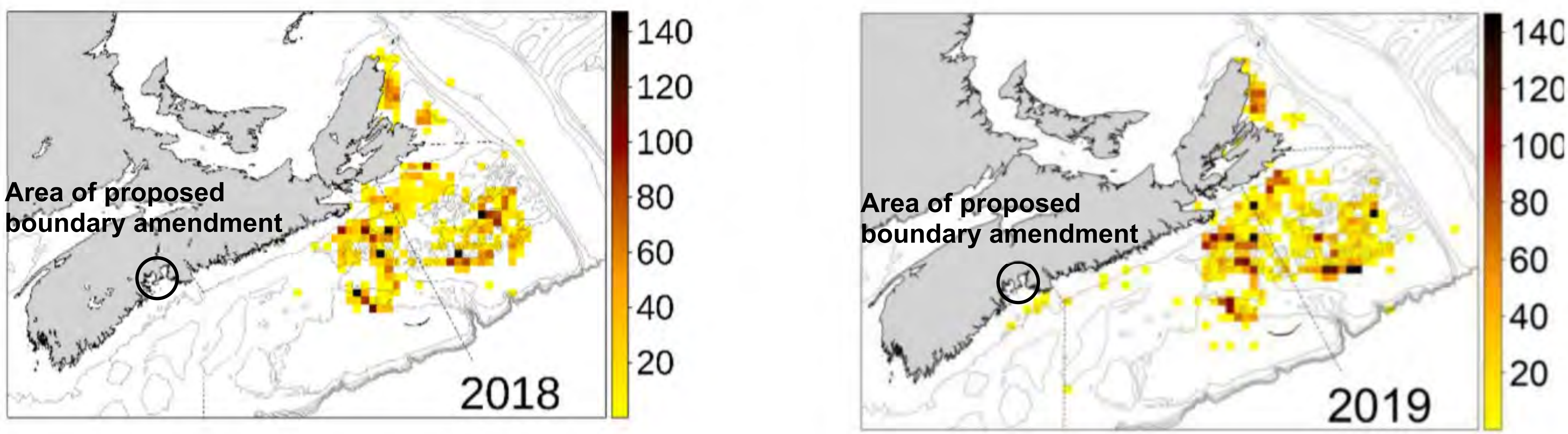


Figure 17. Shrimp Fishing Areas in Atlantic Canada
Note: Sourced from Government of Canada (2015b)

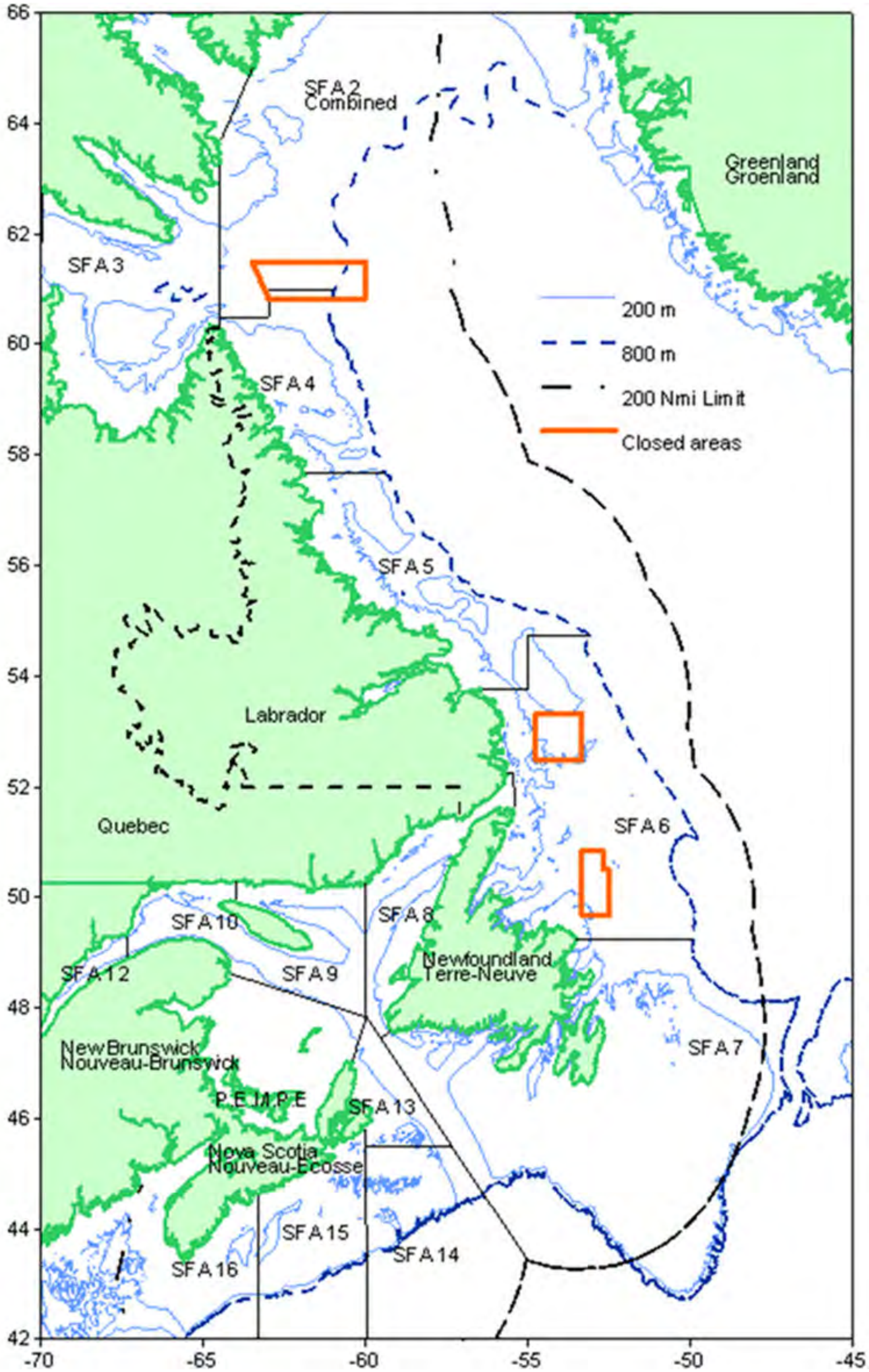


Figure 18. Northern Shrimp Trap Locations (1996 – 2014)
Note: Sourced from Hardie et. al. (2018)

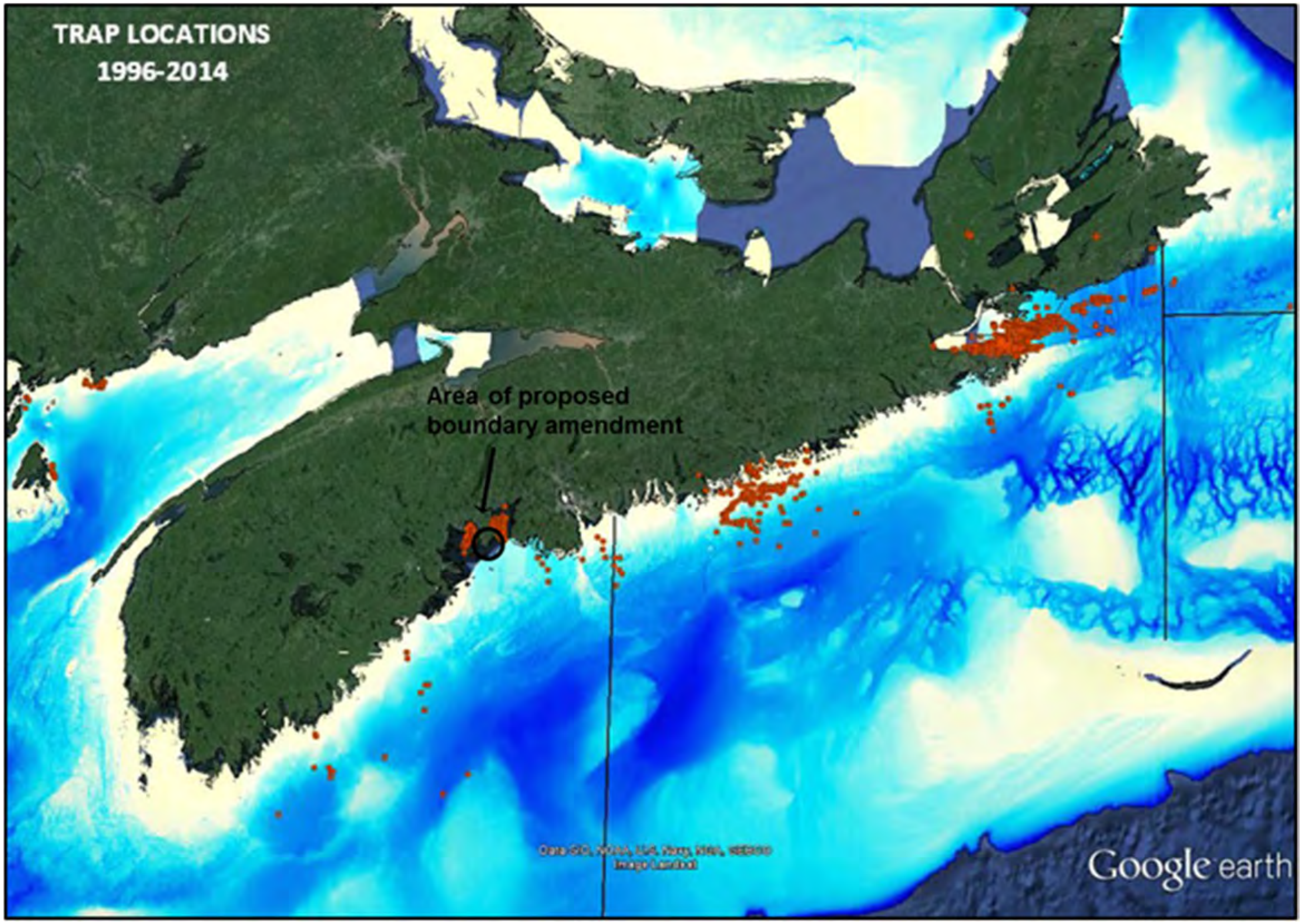


Figure 19. Commercial Scallop Landings (2014 – 2018)
Note: sourced from Rozalska and Coffen-Smout (2020)

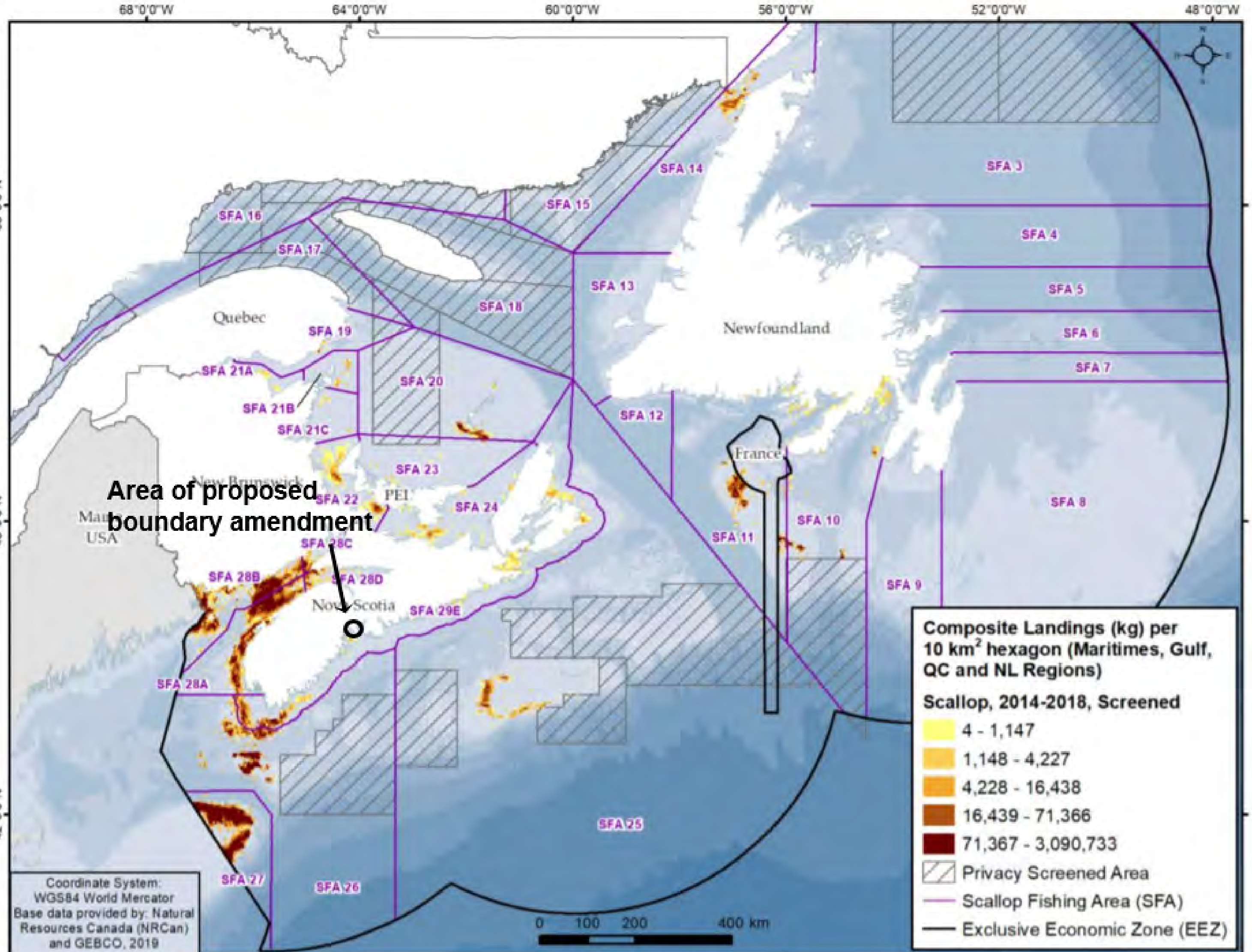

Area of proposed boundary amendment
Composite Landings (kg) per 10 km² hexagon (Maritimes, Gulf, QC and NL Regions)
Scallop, 2014-2018, Screened
4 - 1,147
1,148 - 4,227
4,228 - 16,438
16,439 - 71,366
71,367 - 3,090,733
Privacy Screened Area
Scallop Fishing Area (SFA)
Exclusive Economic Zone (EEZ)
Coordinate System: WGS84 World Mercator
Base data provided by: Natural Resources Canada (NRCan) and GEBCO, 2019
Quebec
Newfoundland
New Brunswick
PEI
Nova Scotia
France
USA
SFA 3
SFA 4
SFA 5
SFA 6
SFA 7
SFA 8
SFA 9
SFA 10
SFA 11
SFA 12
SFA 13
SFA 14
SFA 15
SFA 16
SFA 17
SFA 18
SFA 19
SFA 20
SFA 21A
SFA 21B
SFA 21C
SFA 22
SFA 23
SFA 24
SFA 25
SFA 26
SFA 27
SFA 28A
SFA 28B
SFA 28C
SFA 28D
SFA 29E
68°0'0"W
64°0'0"W
60°0'0"W
56°0'0"W
52°0'0"W
48°0'0"W
50°0'0"N
46°0'0"N
42°0'0"N
0 100 200 400 km

Figure 20. Scallop Production Areas
Note: sourced from DFO (2016)

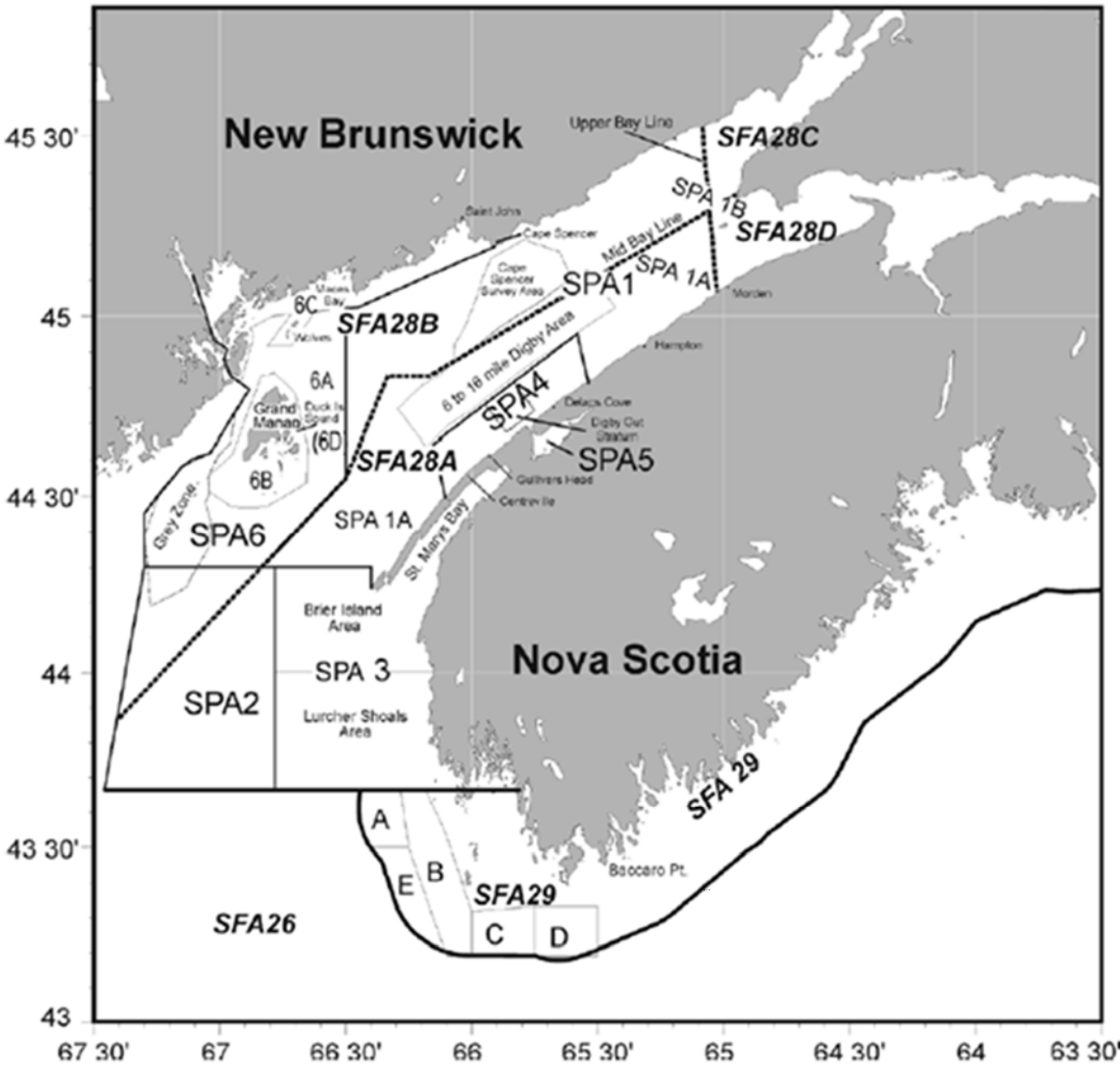
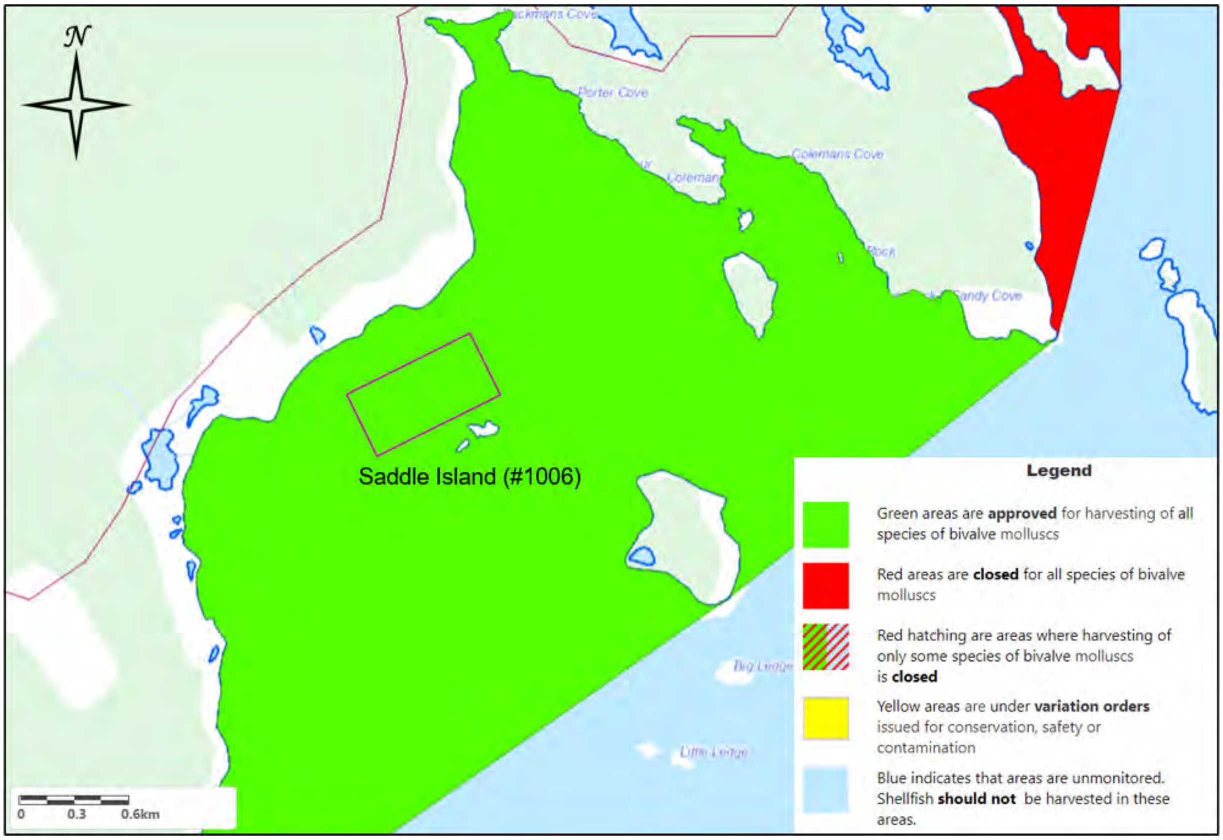


Figure 21. Real Time Shellfish Harvesting Classifications of the Aspotogan Harbour Area on March 28, 2023
Note: Fisheries and Oceans Canada is the central CSSP agency with respect to the real-time status of shellfish growing area classifications. Fisheries and Oceans Canada should be contacted directly for information on shellfish area closures (Fisheries and Oceans Canada 2023a)



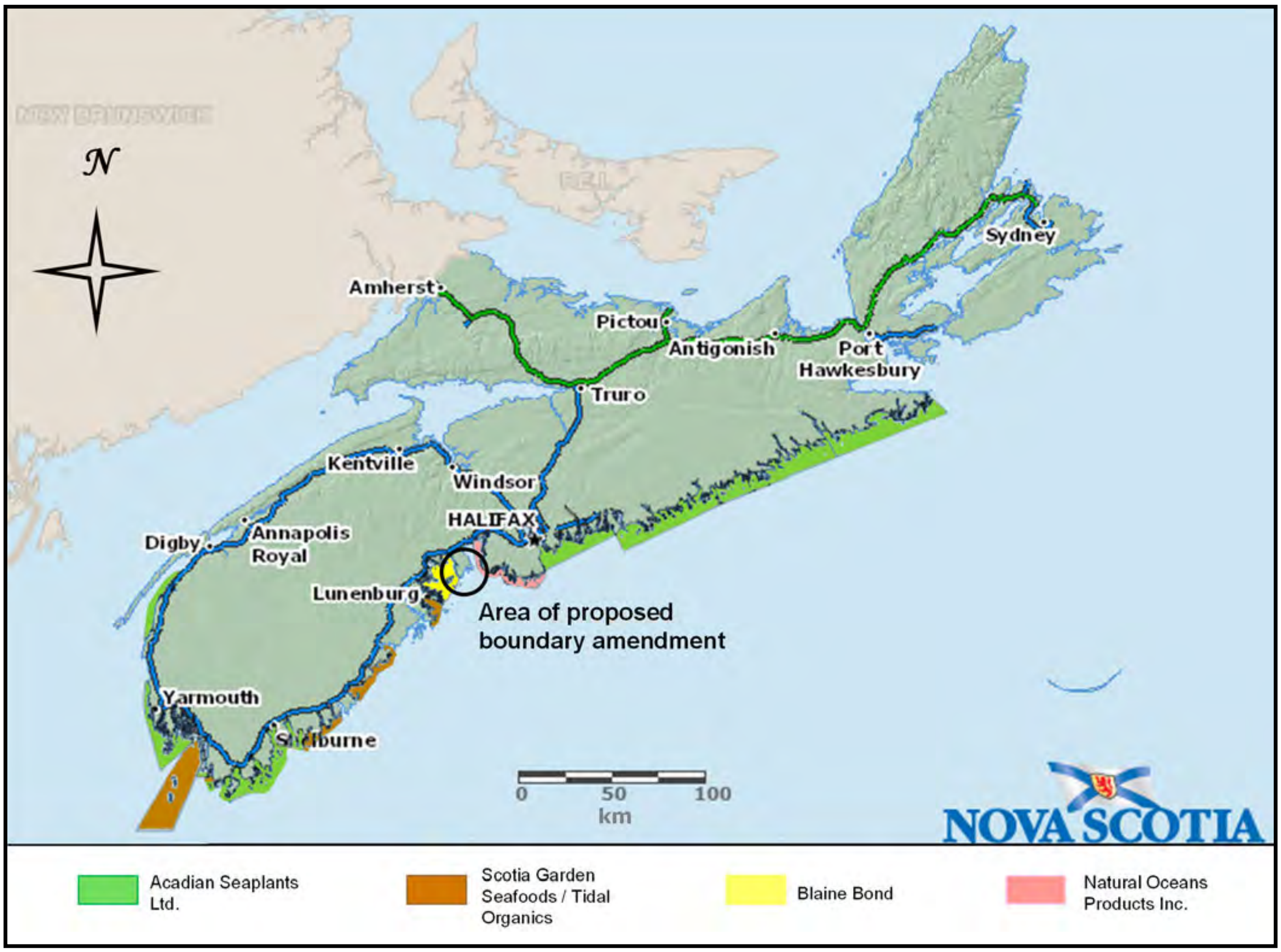
Seaweeds

Marine plants that are regulated under the *Fisheries Act* and harvested commercially in Nova Scotia include rockweed (*Ascophyllum nodosum*), Irish moss (*Chrondus Chrispus*), and kelp (*Saccharina latissima* and *Laminaria digitata*). Dulse (*Palmaria palmata*) is also harvested commercially but is exempt from the *Fisheries Act* if harvested manually.

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. 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 ([redacted] because rockweed harvesting takes place in shallow, intertidal water but 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 within 5 km (by waterway) of the Saddle Island site. The leases nearest the Saddle Island site are on the eastern shore of St. Margaret's Bay which is leased by Natural Oceans Products Inc. and Blaine Bond leases on the shores of Chester Basin (W. Vissers, pers. com.; Fig. 22).

Figure 22. Rockweed Licences in Nova Scotia
Note: sourced from Nova Scotia Department of Fisheries and Aquaculture (2023)



3.1.2 Recreational Fisheries

The Department of Fisheries and Oceans Canada was contacted for recreational fishery landings; however, this data is not available through their database (A. Campbell, pers. com.). Local angling associations, such as the Nova Scotia Association of Anglers and hunters do not record landing numbers.

Nova Scotia is divided into six recreational fishing areas (RFA's) to allow for regional management. Recreational fishing area 3 encompasses Halifax and Lunenburg. There were over 76,000 sportfishing licences sold in Nova Scotia in 2020 (Nova Scotia Department of Fisheries and Aquaculture 2021a). In 2021, 79,000 general fishing licences were sold (McLernon 2022). Freshwater species being fished by recreational fishermen in Area 3 include trout (rainbow, speckled, and brown), striped and small-mouth bass, chain pickerel, shad, white perch, and yellow perch. 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).

The Saddle Island aquaculture site is within clam harvesting area 4: inland and tidal waters of the counties of Shelburne, Queens, and Lunenburg and that portion of Halifax County West of Pennant Point. Clams and quahogs may be harvested by hand and hand-held tools only. While no licence is required, there are size limits and daily bag limits on the number of clams that can be taken (Fisheries and Oceans Canada 2022c). No licence is required for mussels, but fishing seasons vary depending on the area; recreational harvesters are directed to call the nearest DFO office for up-to-date information before harvesting shellfish.

The recreational scallop fishery requires a licence from DFO. Licence conditions specify the season dates and minimum scallop size. The daily bag limit is 100 scallops (Fisheries and Oceans Canada 2022c).

Recreational licences for harvesting of marine worms are available on an open-entry basis from DFO. The Saddle Island aquaculture site is in marine worm harvest area 3. Times and areas of closures are updated annually and are listed in licence conditions (Fisheries and Oceans Canada 2022c).

3.1.3 Aboriginal Fisheries

Aboriginal landings were reported in Maritimes Statistical District 25 for 2015 (Halifax County line to Oakland on the western side of Mahone Bay); however, the landing data, species fished, value, and fishing effort were not provided by the Department of Fisheries and Oceans Canada (C. O'Neil, pers. com.). This information was requested once again for the 2019 landing year; however, information could not be provided by district due to confidentiality purposes. In Southwest Nova Scotia, haddock, halibut, winter flounder, sculpin, herring, mackerel, bluefin tuna, alewives/gaspereau, elvers, soft shell clam, sea scallop, lobster, and Jonah crab were landed in 2019. Gear used for all fisheries included gill nets, longline, tended line, hand line, angling, traps, drag, and rakes/tongs. Data for 2021 and 2022 indicate lobsters and elvers were landed in aboriginal fisheries of Districts 23 and 25 (D. Eberhard, pers. com.).

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 2021b) 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 2021c) 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 sulfide 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 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 Saddle Island 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 benefiting invertebrate fishing activities around the site.

Table 6. Potential Environmental Impact Hazards and Measures to Control Identified Hazards at the Saddle Island 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 by 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 by COHFT and review/approval of production plan with NSDFA
Cleaning of nets causes release of biofouling	• Grow out	Y	Y	Controlled by biofouling-control plan and net-washing protocol; approved by NSDFA
Disposal of non-organic waste	• Grow out	N		Controlled by waste-management strategy and waste-management plan; approved by NSDFA

Overfeeding causes settlement of uneaten feed	• Feeding	Y	Y	Controlled by recording of daily feed amounts and calculation of feed rate, use of Fishtalk, a software system, to control records, and underwater camera system to monitor 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 by sea-lice treatment plans and post-treatment reports; approved by NSDFA
Release of chemicals or antibiotics from treatments	• Disease treatment	Y	Y	Controlled by administration of treatments under the direction of a veterinarian and subsequent reporting; approved by NSDFA
Equipment disposal	• Net change	N	N	Controlled by 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

Prevailing winds in the Atlantic Region are westerly to northwesterly in winter and southwesterly in summer. In winter, wind speeds average around 20 kt (37 km/h) with gales occurring 10 to 20% of the time and storm-force winds 1 to 2%. Summers are calmer with average wind speeds of 10 to 15 knots (18.5 - 27.8 km/h), and gales occurring less than 2% of the time. Summer storms are rare (Environment Canada 2016).

The Saddle Island aquaculture site #1006 is located along the southern shore of the Aspotogan Peninsula, near Saddle Island on the south shore of Nova Scotia's Atlantic seaboard. The site is sheltered from most wind directions by the mainland and neighbouring islands. The most significant wind directions for this site are the south-by-west and the east-by-south, to which the site is exposed to the Atlantic Ocean.

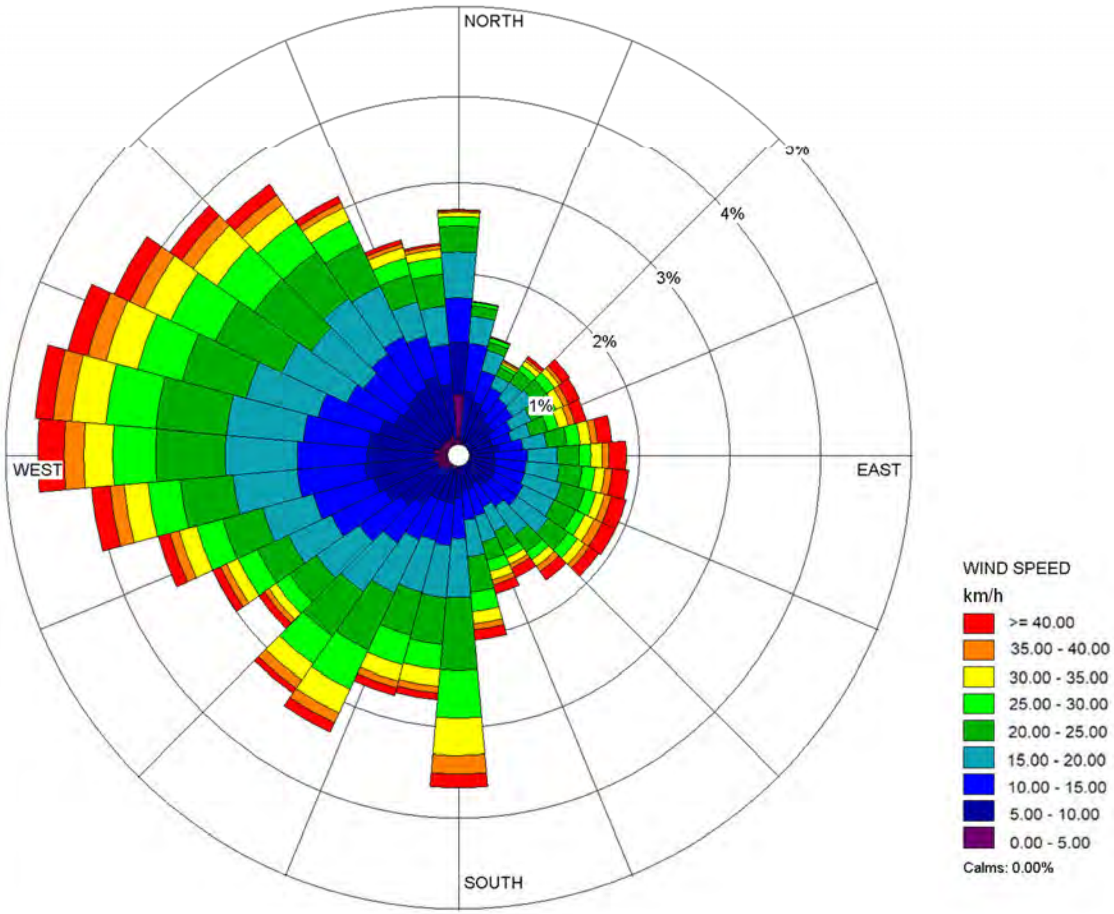
Hourly wind-speed and direction data were collected from the Lunenburg weather station, located at N44.36003° W64.29614° (Government of Canada 2023a). Data collected between January 1, 2011 and December 31, 2022 were used to produce the wind-rose plot of Figure 23. Based on this data, the most common and strongest winds in the Saddle Island area occur between 255 and 285º (coming from approximately the west-southwest through the west-northwest). The most-common wind-speed class is 15 to 20 km/h (Fig. 24). Maximum wind speed and direction recorded at the Lunenburg weather station is presented in Table 7.

Figure 23. Wind-rose Plot of Lunenburg Weather Station Data Collected Between January 1, 2011 and December 31, 2022
Note: the bars on the plot indicate the direction the wind was coming from; Data sourced from Government of Canada (2023a)

WIND ROSE PLOT:
Lunenburg, Nova Scotia
Climate ID: 8203210

DISPLAY:
Wind Speed
Direction (blowing from)

COMMENTS:



DATA PERIOD:
Start Date: 2011-01-01 - 00:00
End Date: 2022-12-31 - 23:00

TOTAL COUNT:	CALM WINDS:
97665 hrs.	**0.00%**

AVG. WIND SPEED:
5.07 m/s

COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

DATE:
2023-04-03

PROJECT NO.:
SW2016-061

Figure 24. Frequency of Wind Speed Observed at the Lunenburg Weather Station between January 1, 2011 and December 31, 2022
Note: Data sourced from Government of Canada (2023a)

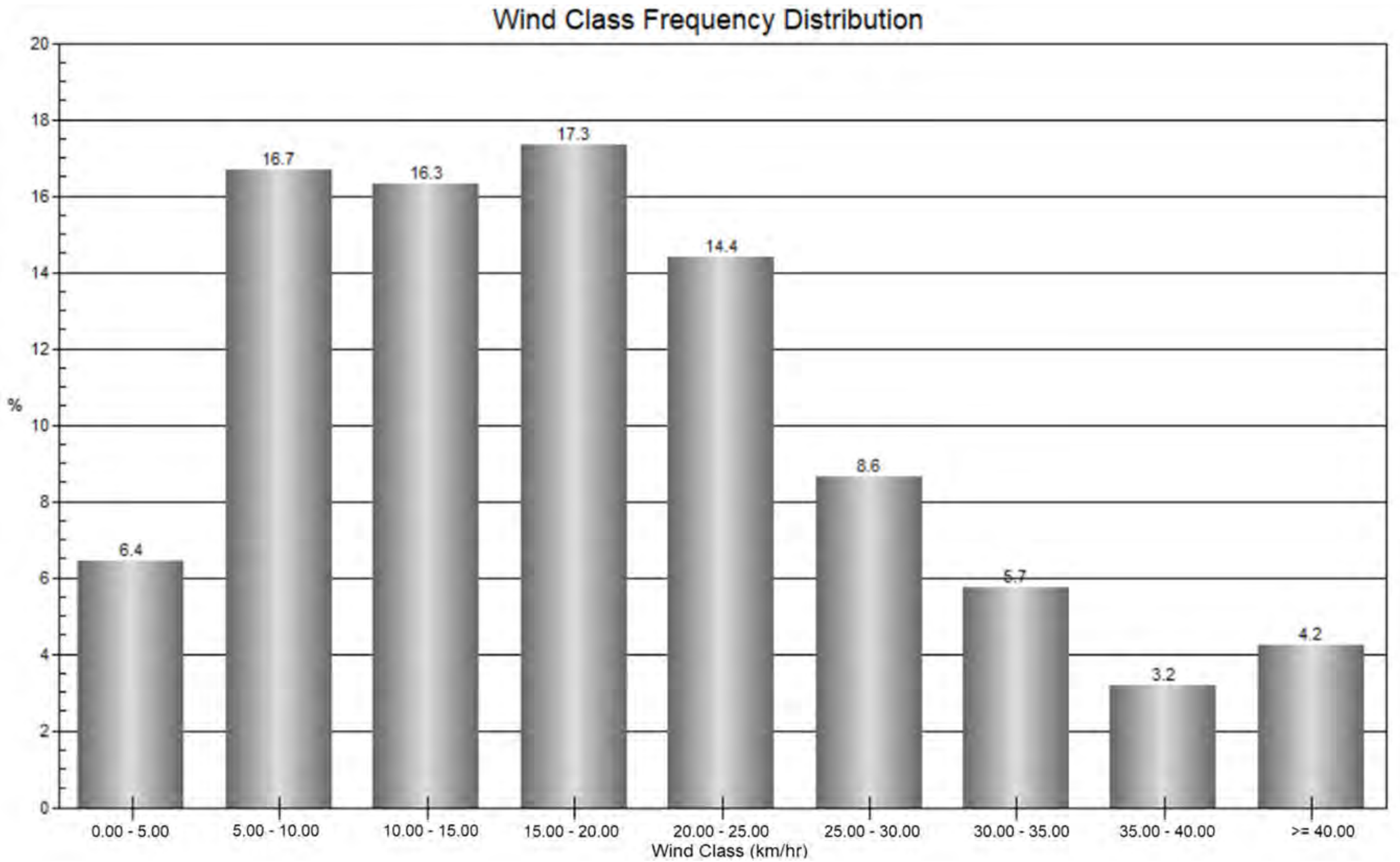

Wind Class Frequency Distribution
20
18
16
14
12
10
8
6
4
2
0
%
6.4
16.7
16.3
17.3
14.4
8.6
5.7
3.2
4.2
0.00 - 5.00
5.00 - 10.00
10.00 - 15.00
15.00 - 20.00
20.00 - 25.00
25.00 - 30.00
30.00 - 35.00
35.00 - 40.00
>= 40.00
Wind Class (km/hr)

Table 7. Maximum Wind Speed and Direction Measured at the Lunenburg Weather Station
Note: current to December 31, 2022 (Government of Canada 2023a)

Date of Maximum Wind of the Year	Wind Speed (km/h)	Wind Direction
January 17, 2022	85	ESE
February 2, 2021	71	ENE
February 8, 2020	79	SW
October 17, 2019	74	E
January 4, 2018	89	ENE
March 14, 2017	81	ENE
December 30, 2016	74	E
December 15, 2015	68	E
January 1, 2014	122	WNW
December 24, 2013	89	NW
December 22, 2012	67	ESE
February 25, 2011	69	S

4.1.2 Waves

Wave heights are typically determined by wind conditions, with the highest waves occurring during the coldest, windiest months. Wave heights in Atlantic-region off-shore waters are greater than 2 m more than half the time, whereas, in summer, only 10 to 20% of the time do waves exceed 2 m (Environment Canada 2016). Since 1948, average summertime and wintertime wave heights in Atlantic Canada have grown by 2 cm and 20 cm per decade, respectively (Howarth et al. 2021). Should climate change occur as predicted under a high emissions scenario, average wave heights in Nova Scotia are projected to increase by 40 to 180 cm by 2090, with the Atlantic Coast experiencing greater increases than the Bay of Fundy or Northumberland Strait coastlines (Howarth et al. 2021).

Wind and waves conditions in St. Margaret's Bay were described by Karimi and Steinke (2020). While the location modelled is not the actual location of the Saddle Island aquaculture site, Karimi and Steinke suggested the data produced would be useful for understanding the approximate wave climate in the region. Modelled data was produced for a location west of Shut-in Island, approximately 7 km from the Saddle Island aquaculture site, for 10- and 50-year return periods. Results showed the largest waves are generated from the south and reach significant wave heights of 3.35 m (10-year return) and 3.43 m (50-year return. Figures 25 and 26 are polar plots showing the maximum wave height at 10-year and 50-year return periods for St Margaret's Bay at coordinate 44° 32.554'N, 63° 58.175'W, near Shut-in Island. The marine aquaculture site at Saddle Island, however, is partially sheltered to the south by the proximity of Saddle Island. Waves generated from the south-southwest reach significant wave heights of 2.41 m (10-year return) and 2.51 m (50-year return).

Figure 25. Maximum Wave Height at 10-year Return Period and Direction of Travel (from) for St. Margaret's Bay
Note: from Karimi and Steinke (2020)

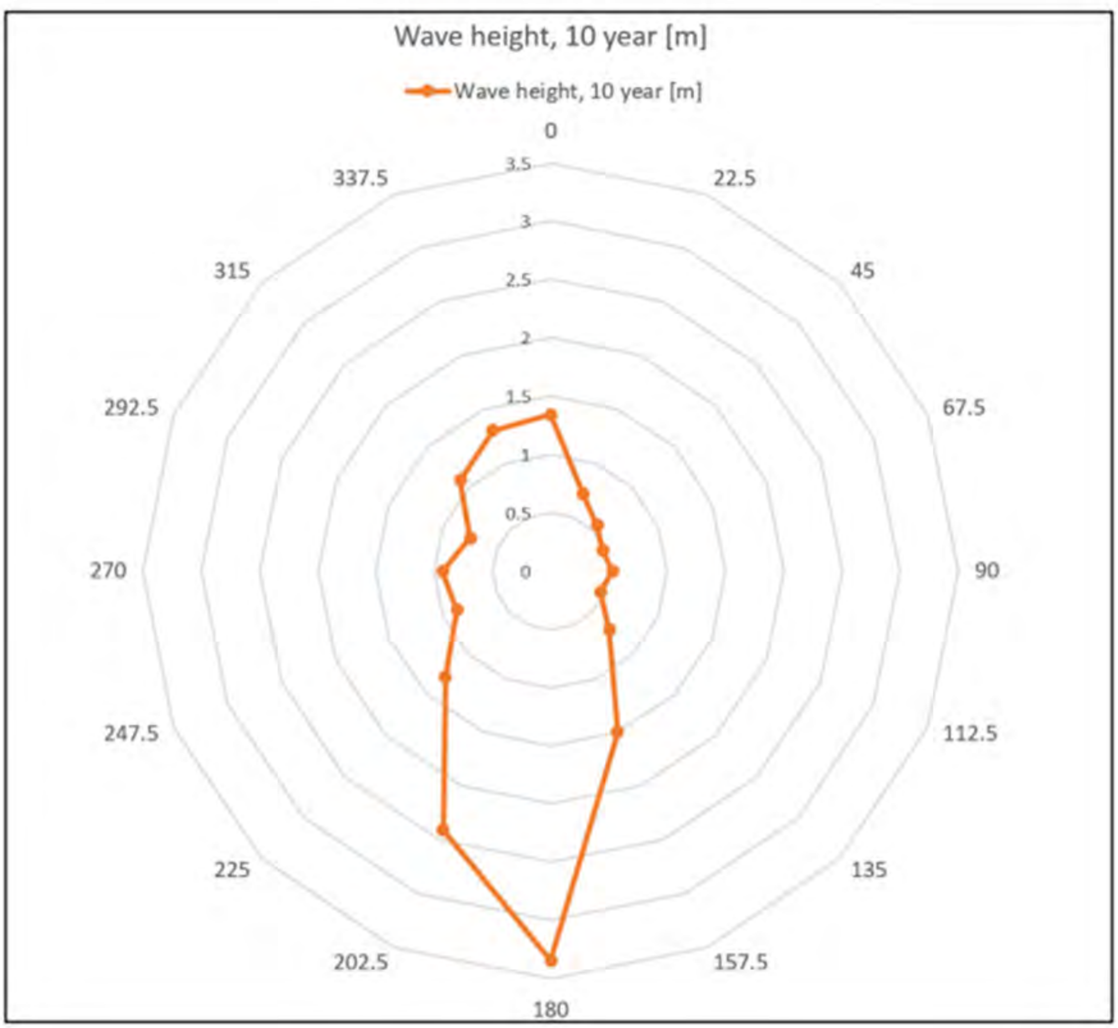
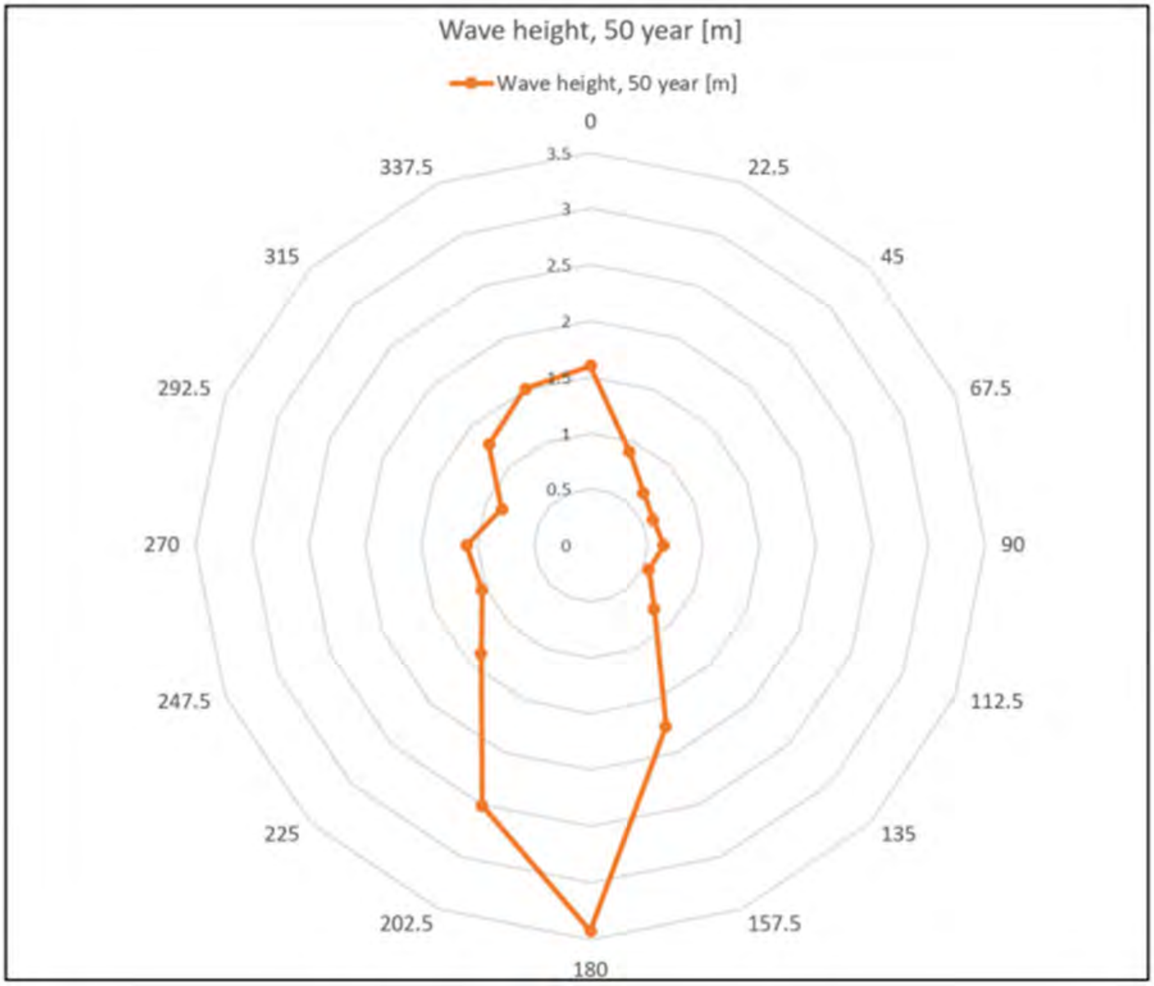


Figure 26. Maximum Wave Height at 10-year Return Period and Direction of Travel (from) for St. Margaret's Bay
Note: from Karimi and Steinke (2020)



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 Aspotogan Harbour 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 2023b) tide tables for Owls Head (Station #473), the predicted highest high tide for 2023 is 1.9 m and the lowest low tide is -0.1 m, giving a maximum tidal range of 2.0 m. On average, the tidal range is approximately 1.3 m. If a storm surge occurs 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 May 10 to June 20, 2023, using a 600-kHz Teledyne RDI Workhorse Sentinel (ADCP) deployed by NSDFA. The data were trimmed to 29.5 days, which represents one lunar cycle, before applying statistical analyses. The current meter was located near the center of the proposed lease at coordinates (N44° 30.281’ W64° 02.897).

At depths 2 – 15 m above the seafloor, the most common directions of flow were between 55° and 75°. A weaker and less-frequent reciprocal current flowed to the west southwest. The depth-averaged current speed of all recorded profiles at this site was 3.1 cm/s. The maximum recorded speed was 18.8 cm/s occurring 14.5 m from the bottom; however, the most frequently observed speeds were between 2.0 and 4.0 cm/s. The minimum current speed observed was 0 cm/s, which was recorded in most depth bins. Overall, current speeds < 10 cm/s occurred 98.7% of the time. The current speeds and directions varied little throughout the water column, but average current speeds increased slightly with proximity to the surface. Table 8 summarizes the current observations from Saddle Island.

Graphs illustrating the current directions and current speed frequency distributions are in **Appendix B Saddle Island 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 Saddle Island

		Speed							Direction	Misc.
Distance from Bottom (m)	Distance from Surface (m)	Most Frequent (cm/s)	Minimum (cm/s)	Average (cm/s)	Maximum (cm/s)	< 5.0 cm/s (%)	< 10.0 cm/s (%)	> 15.0 cm/s (%)	Highest Frequency (°)	Data Availibility (%)
2	**16**	2.0 - 4.0	0.1	2.7	10.5	89.3	100.0	0.0	55 - 65	100.0
3	**15**	0.0 - 2.0	0.0	2.6	10.7	90.4	99.9	0.0	55 - 65	100.0
4	**14**	0.0 - 2.0	0.1	2.5	11.0	92.5	99.9	0.0	55 - 65	100.0
5	**13**	0.0 - 2.0	0.0	2.6	12.1	92.3	99.7	0.0	55 - 65	100.0
6	**12**	2.0 - 4.0	0.0	2.7	12.4	91.3	99.6	0.0	65 - 75	100.0
7	**11**	2.0 - 4.0	0.0	2.8	14.4	87.7	99.5	0.0	55 - 65/65 - 75	100.0
8	**10**	2.0 - 4.0	0.0	2.9	13.3	86.7	99.4	0.0	65 - 75	100.0
9	**9**	2.0 - 4.0	0.0	3.0	13.3	85.8	99.3	0.0	65 - 75	100.0
10	**8**	2.0 - 4.0	0.0	3.1	16.5	83.5	99.2	0.02	65 - 75	100.0
11	**7**	2.0 - 4.0	0.0	3.4	14.4	79.3	98.5	0.0	65 - 75	100.0
12	**6**	2.0 - 4.0	0.0	3.5	15.5	77.3	97.6	0.05	55 - 65	100.0
13	**5**	2.0 - 4.0	0.0	3.6	17.0	77.4	97.2	0.1	65 - 75	100.0
14	**4**	2.0 - 4.0	0.0	3.7	16.7	76.1	97.0	0.2	65 - 75	100.0
15	**3**	2.0 - 4.0	0.0	4.0	18.7	72.5	94.6	0.3	55 - 65	100.0
Depth Averaged		**2.0 - 4.0**	**0.0**	**3.1**	**18.8**	**84.5**	**98.7**	**0.05**	**65 - 75**	**100.00**

4.1.6 Salinity

Salinity at the existing, successful aquaculture site is tolerable for Atlantic salmon. Studies of Scotian Shelf currents have indicated that near-shore, surface waters (< 20 m deep) of the Nova Scotia current maintain a consistent salinity of less than 31 psu (Dever et al. 2016). Burke (2022) demonstrated salinities of 30.5 psu and less in surface waters near St. Margarets Bay in autumn.

Figure 27 illustrates sea-surface seasonal salinities in Maritime waters (Copernicus Programme). In general, salinities are stable around Saddle Island and exhibit an approximate range of 30 to 31 ppt.

Figure 27. Seasonal Sea-surface Salinities in Maritime Waters
Note: Images were obtained from the Copernicus Marine Environment Monitoring Service, My Ocean visualization tool, Blue Ocean, salinity (Copernicus 2023)

4.1.7 Temperature

Temperatures at the Saddle Island aquaculture site were recorded and collected by KCS between May 2021 and March 2023 (Fig. 28). The minimum water temperature experienced was approximately 0.8℃, which occurred in February 2022 at 1 m below the surface. The maximum water temperature recorded was approximately 20.9°C in August 2022 at 1 m deep. Water temperatures at 5 and 10 m remained above 0°C as well. The existing, successful aquaculture site at Saddle Island would indicate that the temperatures in this area are tolerable for Atlantic salmon.

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 on the south shore of Nova Scotia. The thirty-year frequency of presence of sea ice for the South Shore is 1 - 4% (Fig. 29), and the median of predominant ice type is grey ice (Fig. 30). Both Figures 29 and 30 illustrate the thirty-year averages for the week of February 12, the week that appears to have the greatest sea-ice coverage on the south shore of Nova Scotia. 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 28. Daily Water Temperature Data from the Saddle Island Aquaculture Site #1006

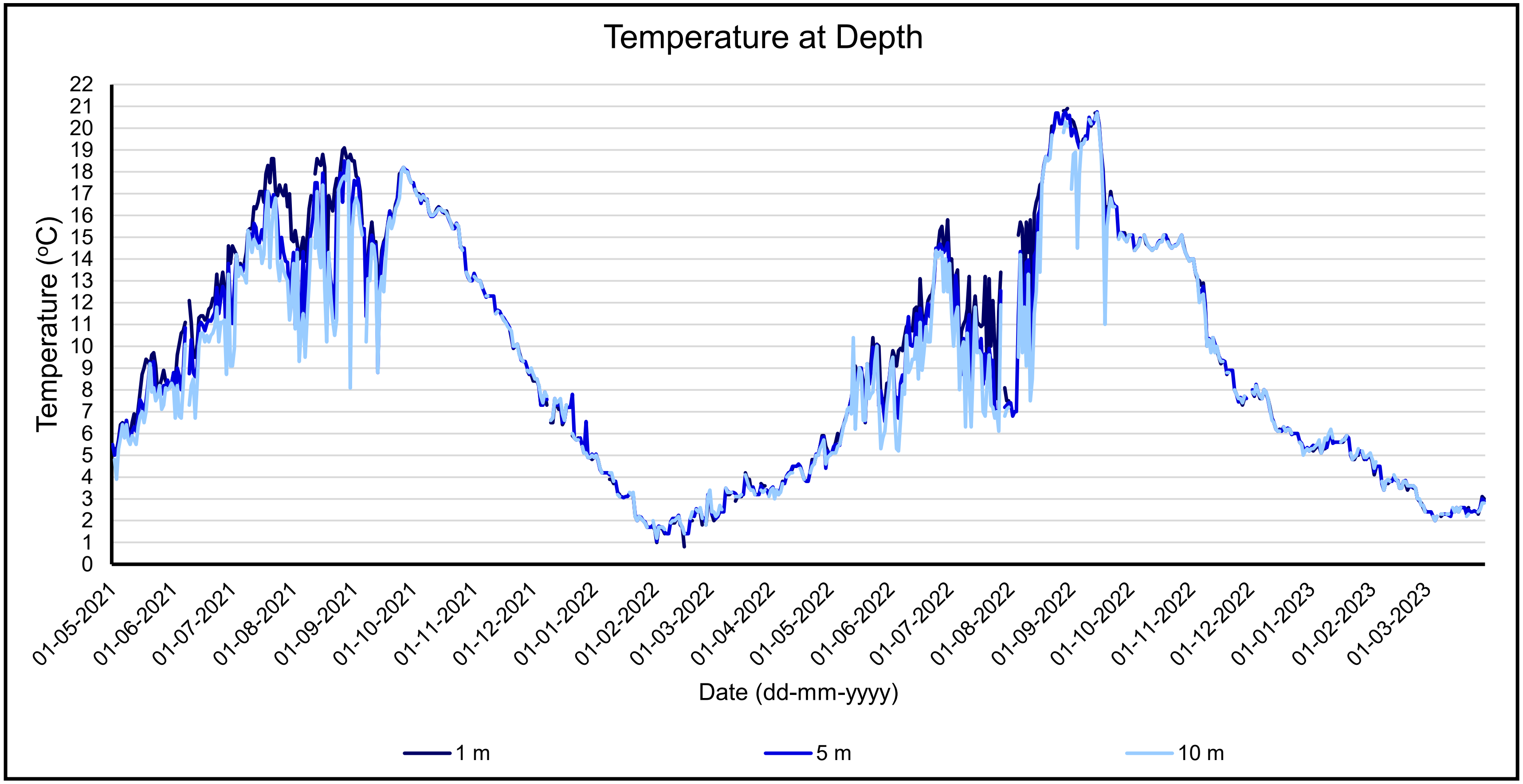


Figure 29. Frequency of Presence of Sea Ice in Atlantic Canada
Note: Figure sourced from Government of Canada (2021b)

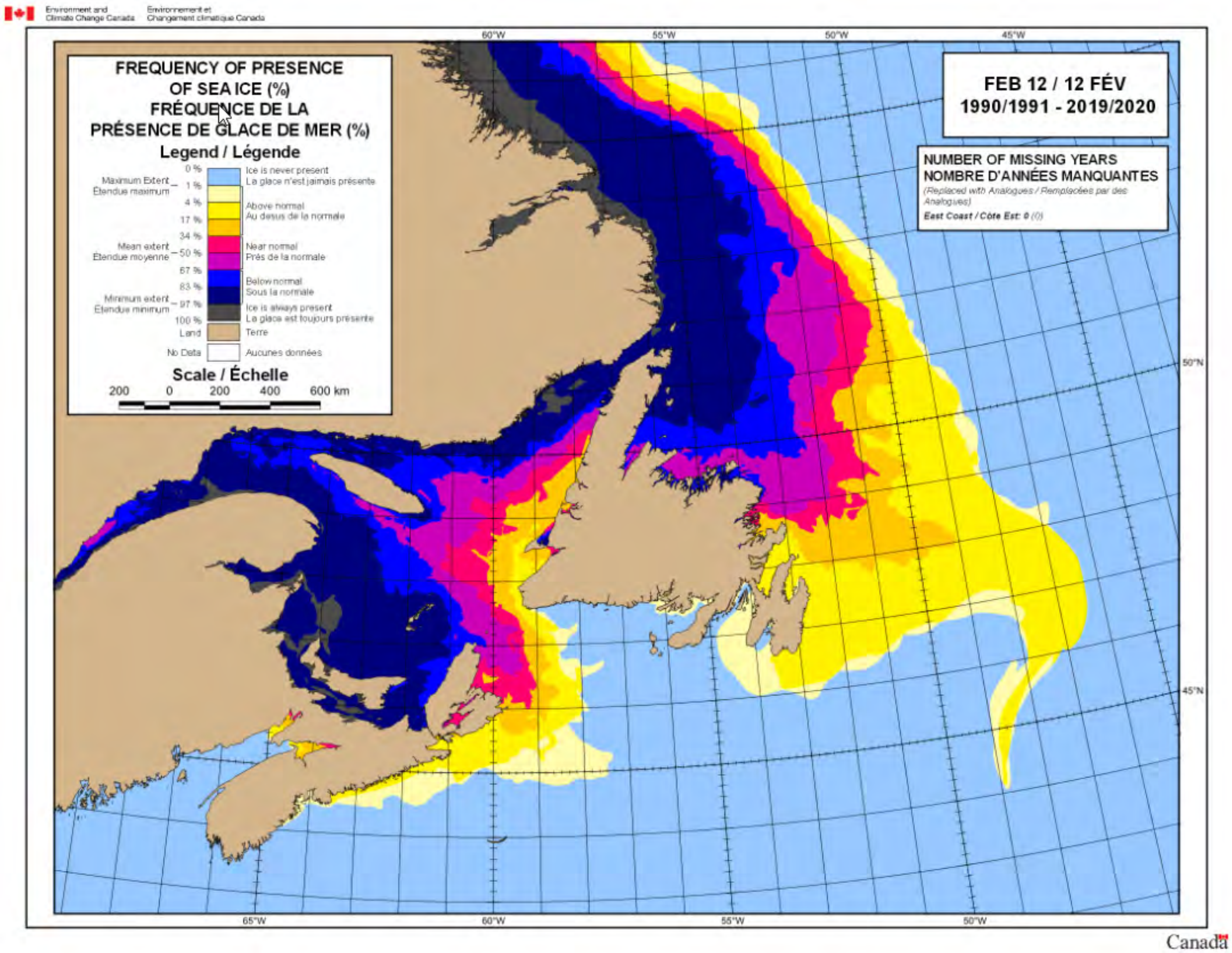
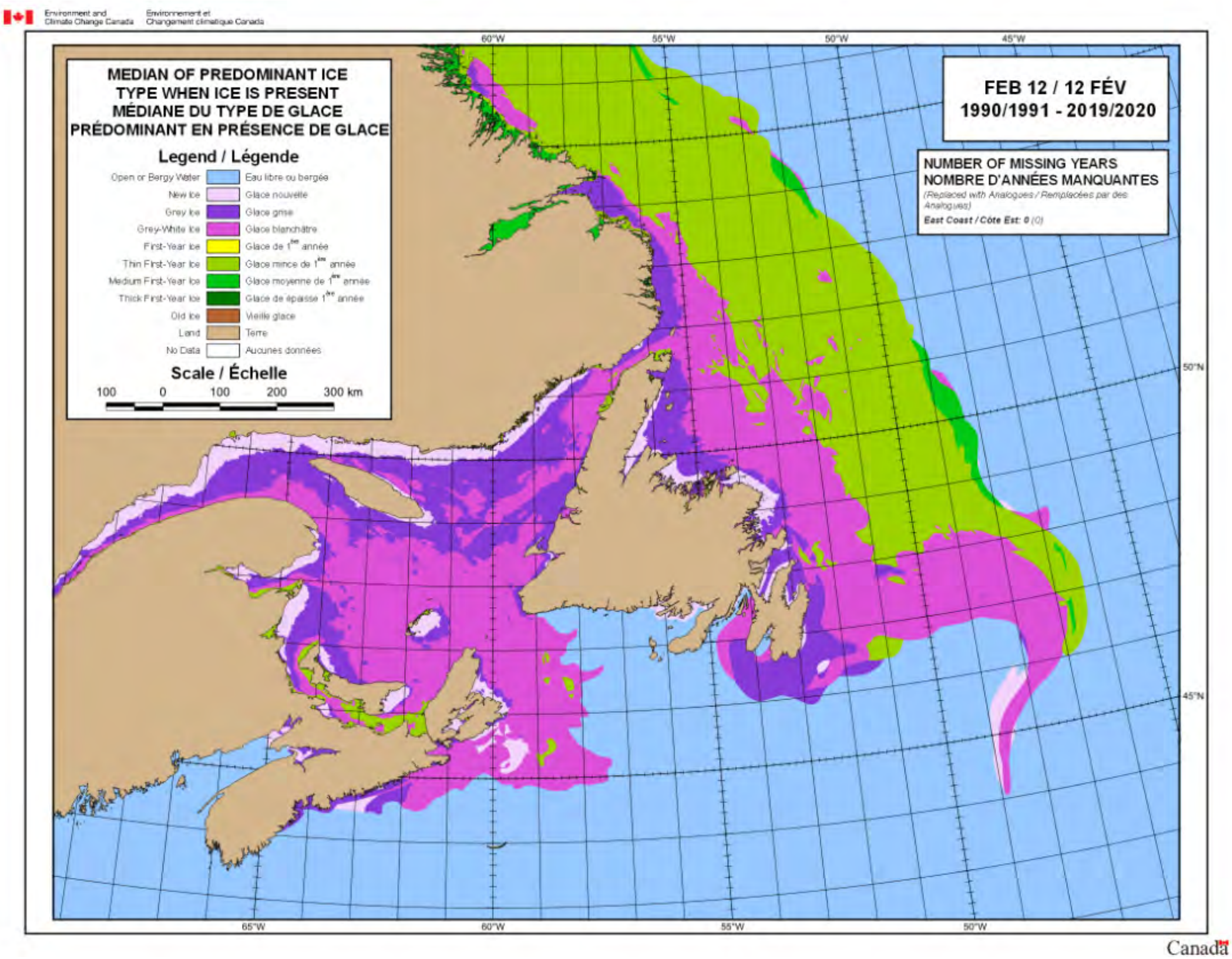


Figure 30. Median of Predominant Ice Type in Atlantic Canada
Note: Figure sourced from Government of Canada (2021b)



4.1.8 Oxygen

Sea-surface dissolved-oxygen (DO) data presented in Figure 31 are from the Copernicus Programme - My Ocean visualization tool (Copernicus 2023). The two satellite images are from the year 2022 and show the dates of highest and lowest DO. On April 16, 2022, DO at 4 m deep was 355.05 mmol/m3 (11.4 mg/L) and on September 15, DO was 277.96 mmol/m3 (8.9 mg/L).

DO concentrations at the Saddle Island aquaculture site were recorded by KCS staff during site operations from 2021 to 2023. The minimum DO value recorded was approximately 5.85 mg/L in June 2022. The maximum concentration recorded was approximately 13.15 mg/L in May 2021. For adult salmon, the lower limit of DO for optimal growth is generally accepted as 6 mg/L. The Saddle Island site typically displays DO values well above this threshold. Figure 32 displays the historical DO-concentration trends from the Saddle Island site.

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

Figure 31. 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 2023)

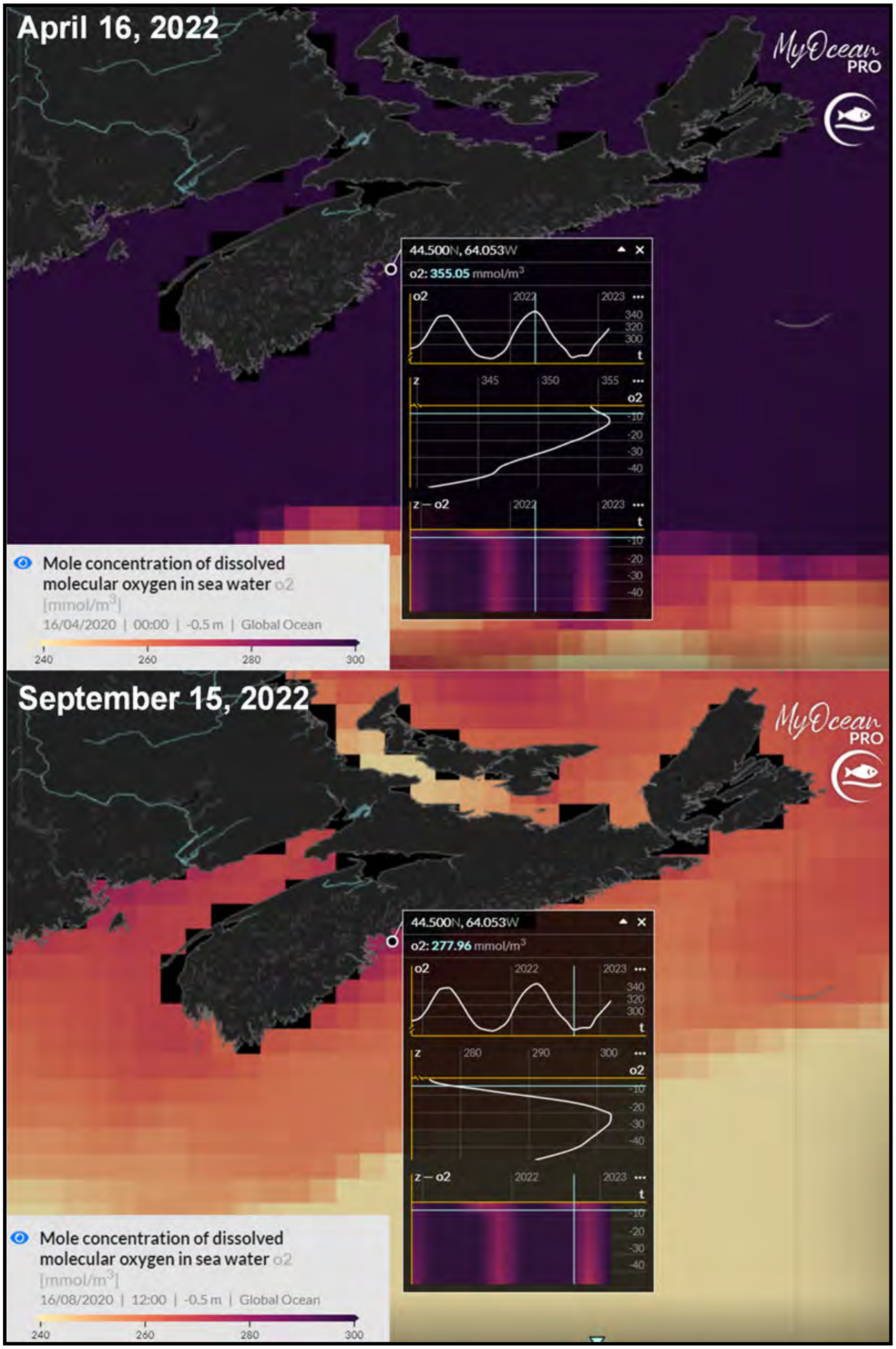
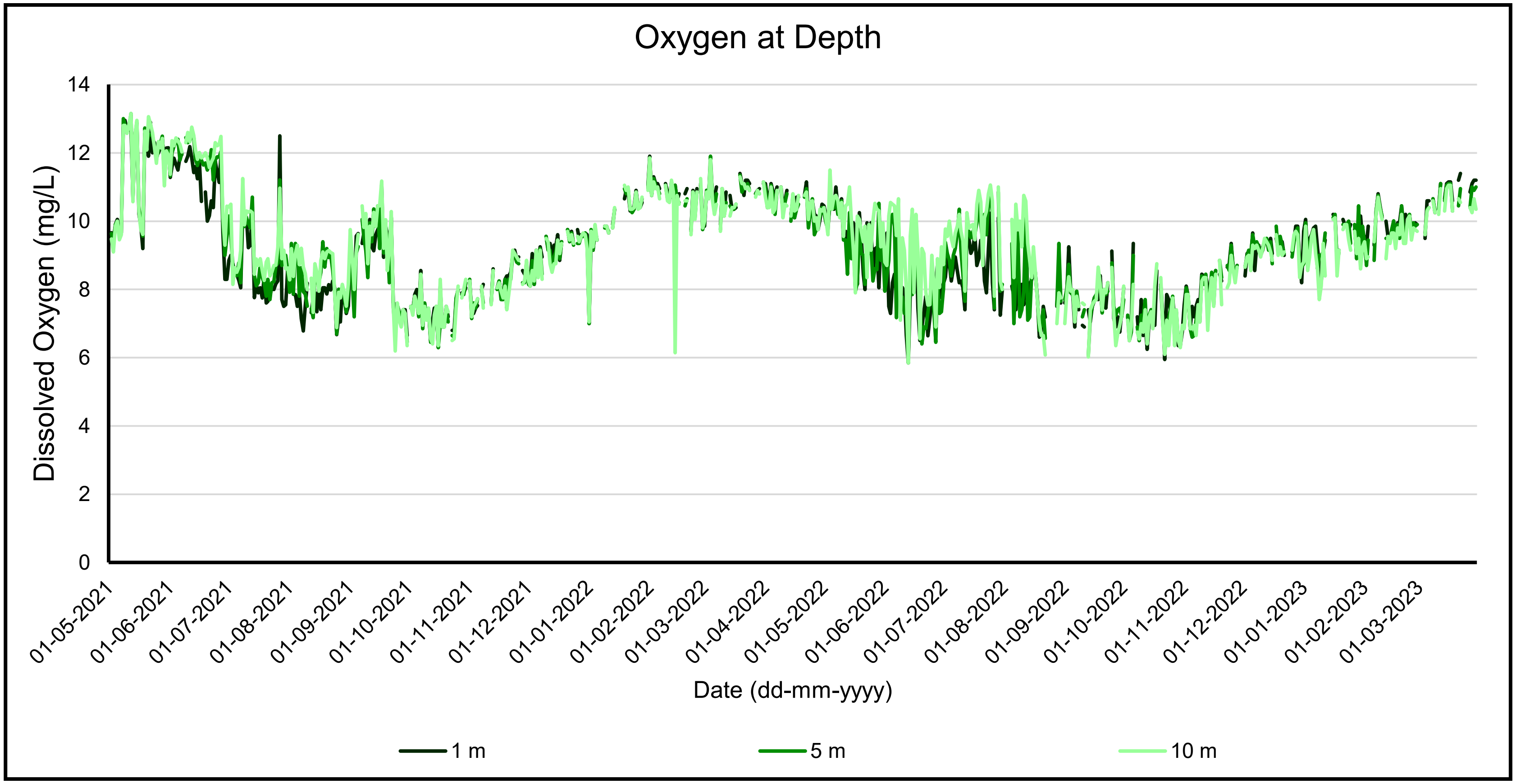


Figure 32. Dissolved-oxygen Concentration at the Saddle Island Aquaculture Site #1006



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 other records including inventory (biomass, fish number, average weight), feeding (type and quantity), and fish density.

Table 9. Requirements for Water-quality Monitoring and Approved Mitigation Strategies

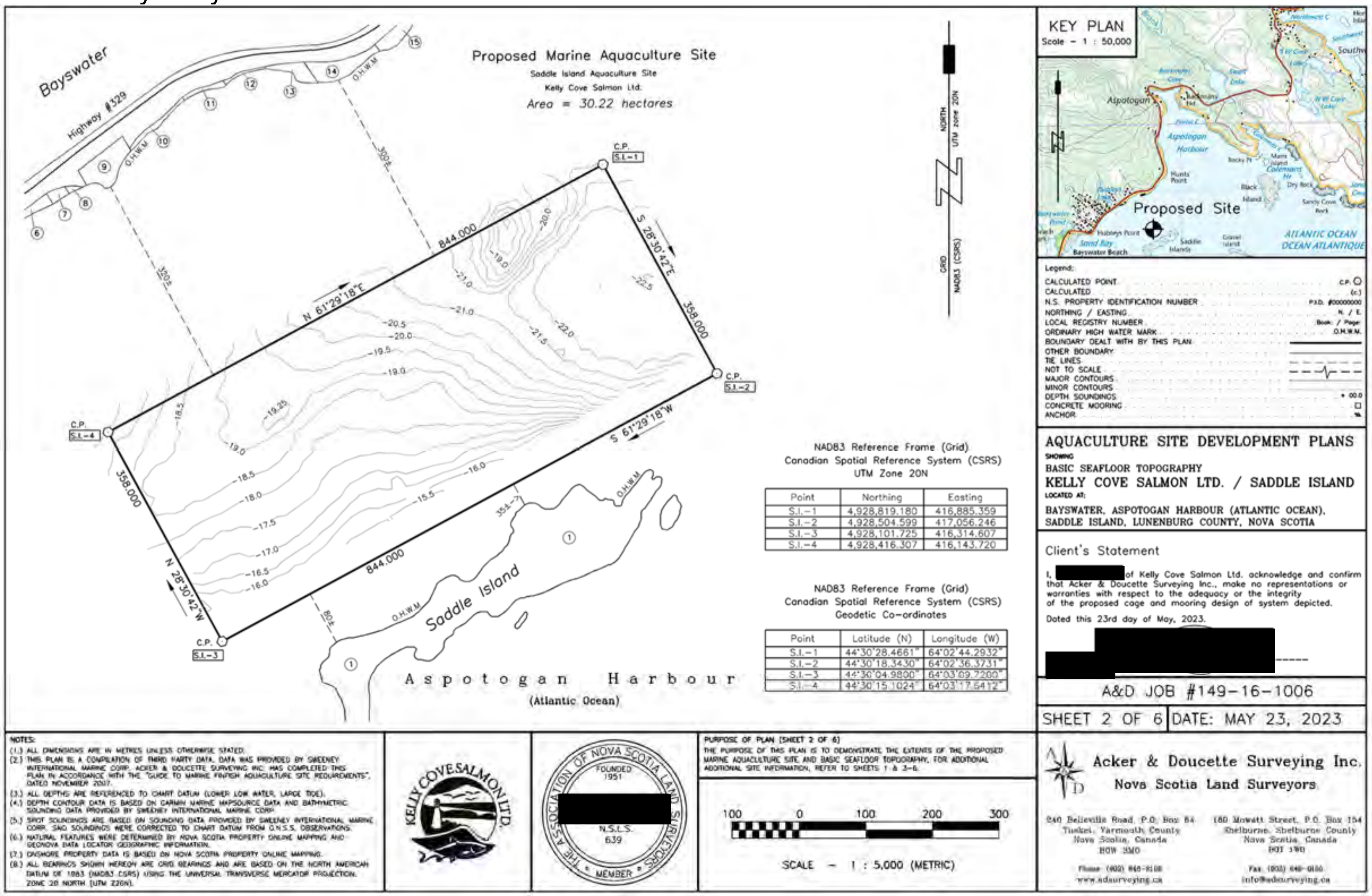
Parameter	Monitoring Requirements	Mitigation Threshold	Mitigation
Dissolved Oxygen	• Measured at 1-, 5-, and 10-m (or bottom of net) depths inside at least one stocked cage, at least once daily • Measured at 1-, 5-, and 10-m depths outside the cages, at least once daily • Daily record keeping	• When 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 Saddle Island aquaculture site is presented in Figure 33. Section **4.2 Baseline Monitoring** provides additional information.

Figure 33. Bathymetry of Site #1006 Shown with 2-m Isobaths



4.2 Baseline Monitoring

Baseline and fish and fish habitat surveys of the proposed lease area were conducted on June 8, 2023. The baseline survey report is entitled Saddle Island Baseline Assessment Report and dated August 21, 2023 (**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 (2021c) and Fisheries and Oceans Canada's Aquaculture Activities Regulations (Government of Canada 2015c) Sections 8 and 9. Specifically, Annex 7 in the *Aquaculture Activities Regulations* Guidance Document (Government of Canada 2018a) 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 2018b). It should be noted that at the time of the baseline monitoring, the 2021 version of the NSDFA Standard Operating Procedures (NSDFA 2021c) was followed.

4.3 Site Design

The Saddle Island 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 Saddle Island Baseline Assessment Report**. Details of the site design are presented in Figures 45 to 47 and section **7.2.3.1 Infrastructure**.

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

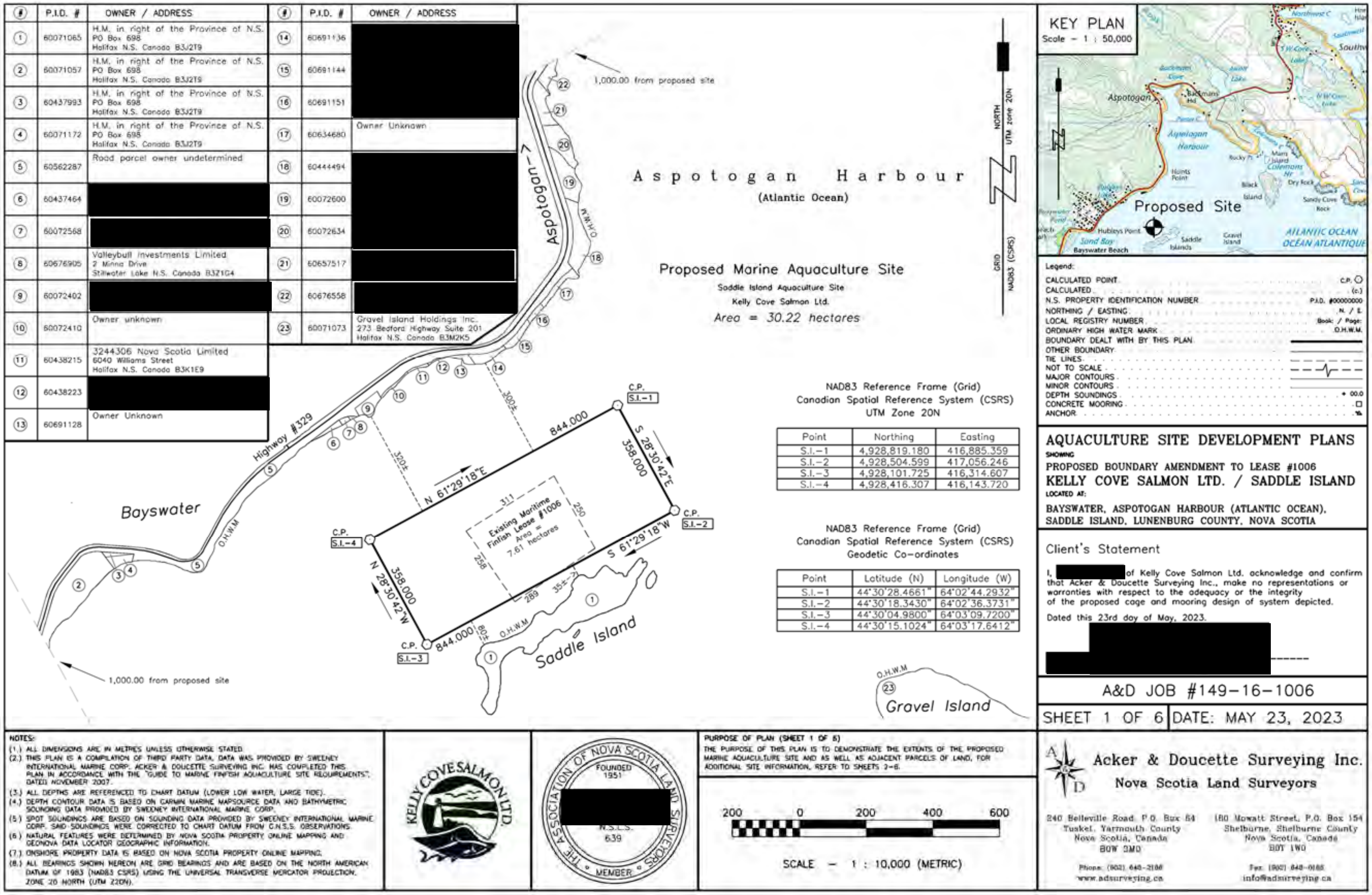
5.1 Description of Other Users

5.1.1 Adjacent Property Owners

Acker & Doucette Surveying produced aquaculture-site development plans, identifying adjacent property owners within 1,000 m to the west and north (Fig. 34) of the proposed lease boundaries for Saddle Island #1006.

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

Figure 34. Plan View of the Proposed Boundary Amendment of the Saddle Island Aquaculture Site Showing Nearby Property Owners



5.1.2 Pleasure Craft and Commercial Vessels

Within 10 km of the Saddle Island site, there are eight public wharves and/or boat launches (Fig. 35). The core and non-core fishing harbours are small-craft harbours maintained by DFO (Government of Canada 2022a). Locations of municipal wharves and boat launches were identified by the Municipality of Chester (2021), St. Margaret's Bay Regional Tourism Development Association (2023), and Nova Scotia Parks (date unspecified). KCS operates daily from a private wharf owned by [redacted] and has no plans to use any small-craft harbour wharf managed by DFO. All wharves currently used by KCS to service the Saddle Island site are privately owned.

The Big Tancook Island ferry is located approximately 14.0 km (by waterway) southwest of the site. The ferry travels from the town of Chester to Big Tancook Island. There is no direct interaction between the ferry route and the Saddle Island site.

All pleasure craft and commercial vessels must abide by navigation buoys and markers (Fig. 36).

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

Figure 35. Public Wharves and Boat Launches near Saddle Island Aquaculture Site

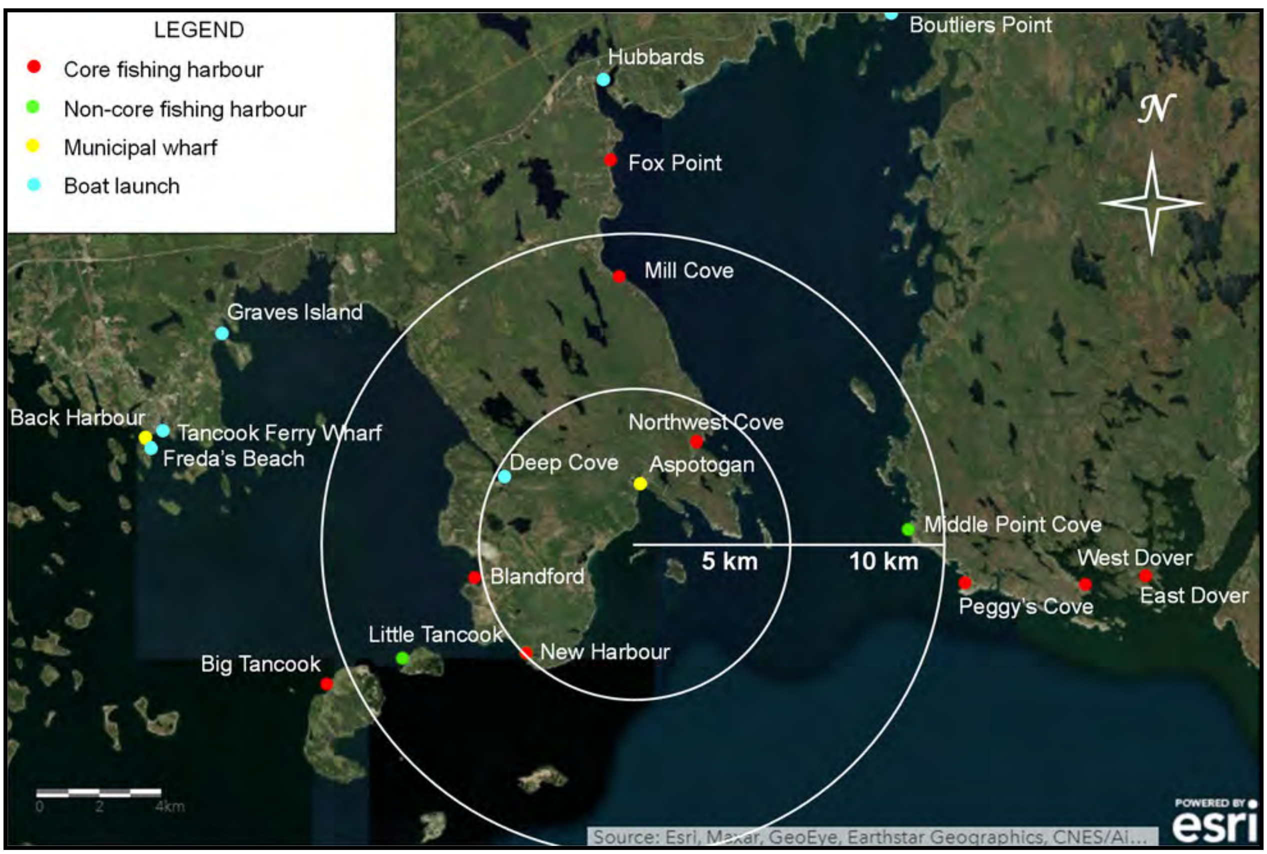
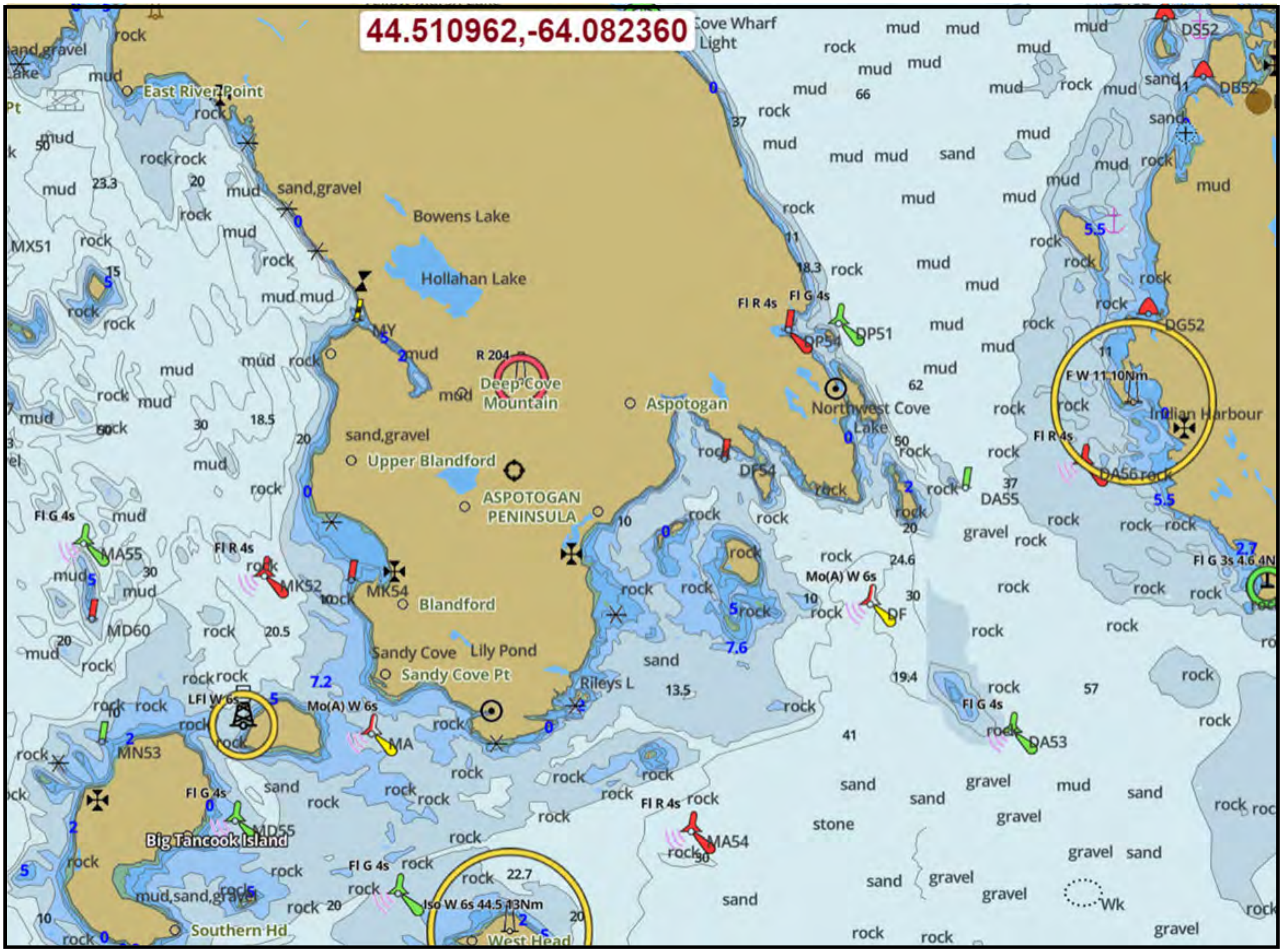


Figure 36. Navigation Buoys and Anchorage Areas in Aspotogan Harbour
Note: Figure was sourced from i-Boating



5.1.3 Fish and Seafood Processors

Three (3) fish and seafood processors have been identified within the area of the Saddle Island site (Fig. 37). The closest processor to the site is Seldon Miller Fisheries, located 8.8 km north-northeast (by waterway) of the site on the western shore of St. Margaret's Bay. The processor is located at 2522 NS-329, Hubbards and products include lobsters, fresh and frozen fish, and fresh fish fillets. Granville Gates and Sons Ltd. is located at 60 Gates Fish Plant Rd., Hubbards, on the eastern shore of Mahone Bay, approximately 11 km west-southwest (by waterway) of the Saddle Island site. It operates under Cedar Bay Grilling, which produces a wide range of frozen salmon products. Atlantic Sea Cucumbers Ltd. is at 212 Pauls Point Rd., Hacketts Cove, approximately 15 km northeast (by waterway) of the Saddle Island site, on the eastern shore of St. Margaret's Bay. It processes locally caught sea cucumbers with an output of approximately 1100 lbs per day. No known, negative interaction has been identified between fish and seafood processors and the existing Saddle Island aquaculture site. Deep Cove Aqua Farms, a seafood retailer, is located about 5 km west of the Saddle Island aquaculture site (~11 km by water).

Figure 37. Fish and Seafood Processors near Saddle Island (#1006)

5.1.4 Recreation and Tourism

The Aspotogan area boasts many beautiful beaches and provincial parks with coastal hiking, cycling, sea kayaking, and walking trails. The area around Saddle Island has several beaches open to the public. Within 10 km of the aquaculture site is Bayswater Provincial Park (1.2 km from the site), Mill Cove Beach (aka Pebble Beach) (9.8 km), and Cyrus Beach (8.7 km). Several lighthouses are present in the Saddle Island area, commonly visited by tourists, including the Peggy's Cove Lighthouse (10.4 km from the Saddle Island site), East Ironbound Island (7.7 km), and Indian Harbour (8.4 km).

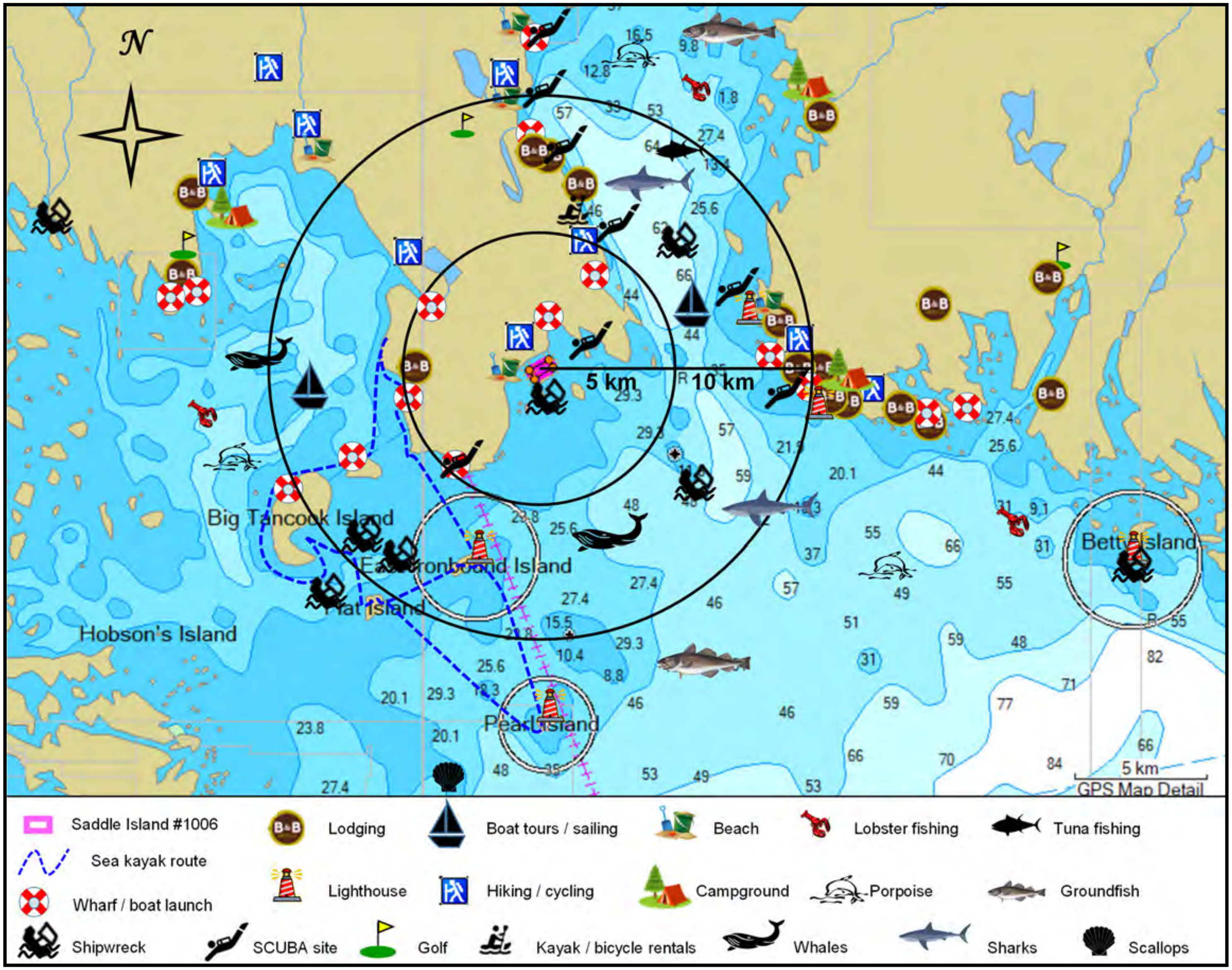
There are eight sites within 10 km of the aquaculture lease that are known SCUBA-diving locations. The closest is Admirals Point (1.6 km), followed by New Harbour (4.8 km), The Lodge (6.2 km from the aquaculture site), Birchy Head (7.2 km), Paddy's Head (8.2 km), Mill Cove wharf (8.3 km), Mill Cove Beach (9.4 km), and Cranberry Cove (10 km) (Dive Buddies 4 Life 2023, PADI 2023).

Freewheeling Adventures, at The Lodge, rents sea kayaks and bicycles. At least three boat-tour companies make excursions in St. Margarets Bay, and there are several marinas and sailing clubs.

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

Figure 38 illustrates several tourist and recreational attractions near the Saddle Island aquaculture site.

Figure 38. Resource Map of the Area around the Saddle Island Site



5.1.5 Communities and Lodging

There are several small communities near the Saddle Island site. Saddle Island is located at the southern portion of the Aspotogan Peninsula, which separates St. Margaret's Bay (to the east) and Mahone Bay (to the west). The closest communities are Bayswater and Aspotogan which are 1.2 km west-northwest and 1.7 km north, respectively, from the site. Population data for these two communities are unavailable from Statistics Canada. The other largest and closest communities are Hubbards and the Village of Chester. Hubbards is approximately 19 km (by waterway) to the north and Chester approximately 20.7 km (by waterway) to the west-northwest of the site.

There are several overnight accommodations within 10 km of the Saddle Island aquaculture site, including Fish 'n Shells Hotel, Oceanstone Inn, Clifty Motel, and Century Bed and Breakfast (Table 10). Several vacation home and cottage rentals are also within 10 km of the aquaculture site. Campgrounds in the area include King Neptune Campground (8.9 km from the aquaculture site), Wayside Camping Park (13.4 km), and Graves Island Provincial Park (13.5 km).

Table 10. Lodging Options near Saddle Island #1006

Type of Lodging	Lodging	Distance and Location in Relation to the Site	General Location
Hotel, Lodge, Inn, and Bed and Breakfast	Century House B&B	4.6 km – WSW	Blandford
	Fish 'n Shells Hotel	8.4 km – N	Hubbards
	Oceanstone Inn and Cottages	9.1 km – ENE	Indian Harbour
	Clifty Cove Motel	9.0 km – E	Indian Harbour
	Peggy's Cove B&B	10.6 km - E	Peggy's Cove
	The Breakwater Inn	10.6 km - E	Peggy's Cove
Campground	King Neptune	9.0 km – E	Indian Harbour
	Wayside Camping Park	13.4 km - NE	Glen Margaret
	Graves Island Provincial Park	13.5 km - WNW	Chester

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 Region 6 Solid Waste Management. Monday is the currently designated collection day on the biweekly schedule, with garbage, recycling, bulky items, and compost all collected on the same day. In addition, the Lunenburg Regional Community Recycling Centre, located in Whynott's Settlement, also accepts recycling and hazardous household waste. Businesses in the Municipality of the District of Lunenburg can access the Community Recycling Centre, free of charge, to dispose of recyclables, paper, and cardboard (Municipal Joint Services Board Lunenburg Regional 2023). The two nearest bottle exchanges and ENVIRO-DEPOT™ are Giffin's Depot in Ingramport and Adam's Bottle Exchange Limited in Chester Basin (DivertNS 2021).

Municipal wastewater is one of the largest sources of pollution to surface water in Canada (Government of Canada 2020a). The Government of Canada manages the risks associated with effluent discharge under the *Canadian Environmental Protection Act 1999* (Government of Canada 2021c). 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. The Municipality maintains wastewater treatment plants and sewer collection systems at New Germany, Cookville, Hebbville, and Conquerall Bank (Municipality of the District of Lunenburg 2023).

5.1.6.2 Industrial and Economic Drivers

Tourism is also a contributor to the local economy with nearby Peggy's Cove, Chester, Lunenburg, and Mahone Bay offering many shops, restaurants, and lodging. Refer to section **5.1.3 Fish and Seafood Processors** and section **5.1.4 Recreation and Tourism** for additional details.

5.1.6.3 Agriculture

According to the Statistics Canada 2021 census profile, 755 people were employed in Lunenburg County's agricultural, forestry, fishing, and hunting industries (Statistics Canada 2023). Agriculture is an important component of Lunenburg County's economy. Berry crops and livestock farms, as well as vineyards, are large contributors to the economy (District of Lunenburg 2023). The closest known terrestrial farms to the Saddle Island aquaculture site are Dan Grows Microgreens and Supplies in East River (~13.6 km north of #1006) and Seabright Farm, which produces mushrooms (~15.7 km northeast of #1006).

5.1.7 First Nations Territories/Reserves

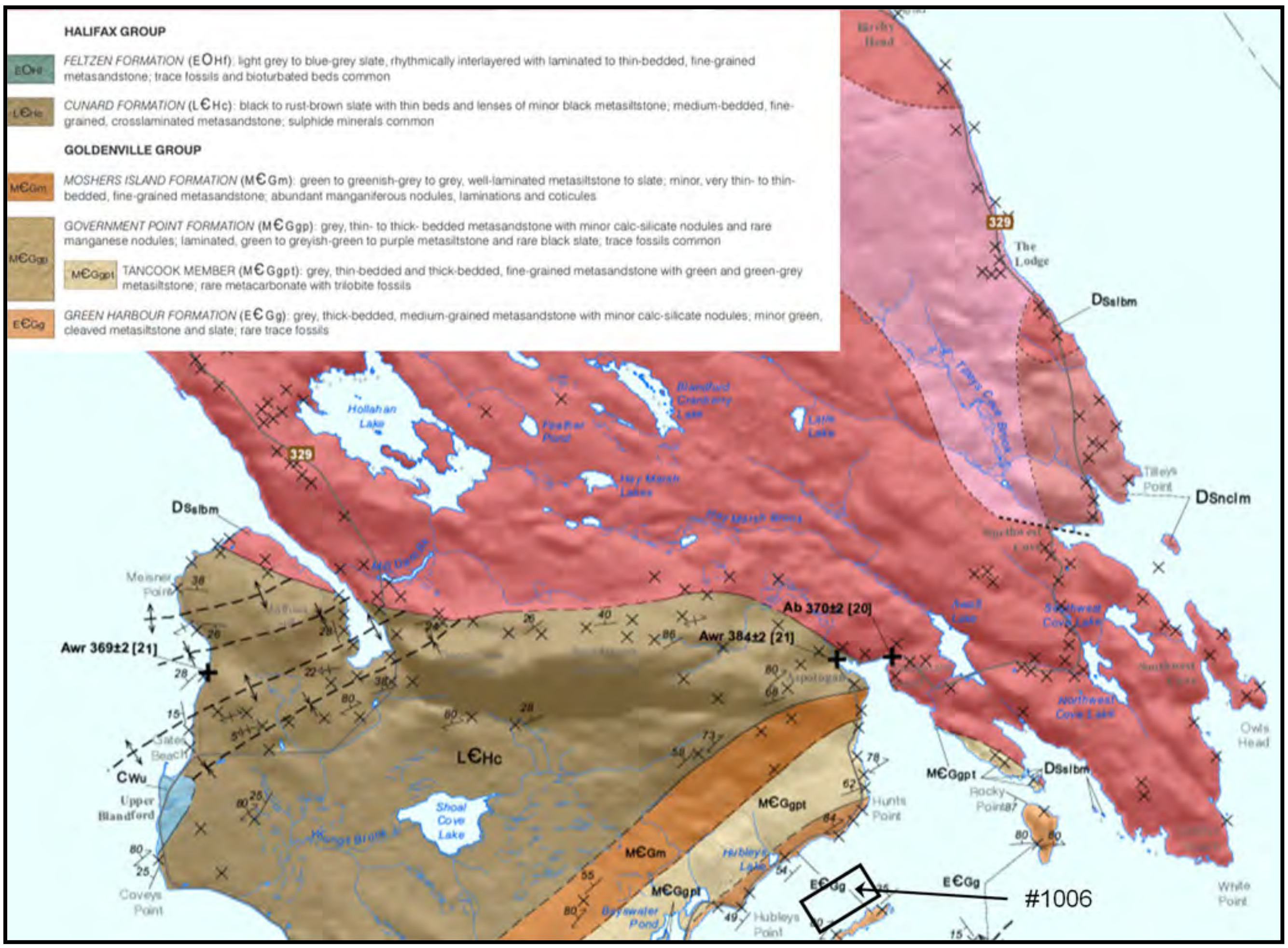
The closest First Nations communities to the Saddle Island site are the Acadia First Nations Gold River and the Sipekne'katik Pennal 19 reserves. Gold River has a population of 81 (Statistics Canada 2023). This reserve lies on 270 hectares of land (Acadia First Nations 2023) and is located approximately 21.5 km from the aquaculture site. In 2021, the Sipekne'katik Pennal 19 reserve had a population of 30 individuals and a total private dwelling count of 9 (Statistics Canada 2023). The reserve is in Indian Brook, approximately 45 km from the Saddle Island site.

5.1.8 Geology and Archaeology

Aspotogan Peninsula is comprised of many geological formations with a large portion of biotite monzogranite from the South Mountain Batholith. Saddle Island and the shoreline north of site #1006 are comprised of the Goldenville Group Green Harbour Formation containing sandstone, siltstone, and slate with rare trace fossils (Fig. 39; Corey et al. 2012).

In the past, impacts to paleontological resources were assessed by the Nova Scotia Museum. In general, most cage-based aquaculture sites, like Saddle Island, cause minimal damage to submerged archaeological resources as the anchors are the only portion of the site in contact with the seafloor.

Figure 39. Geological Formations of Aspotogan Harbour
Note: Figure sourced from Corey et al. (2012)



5.1.9 Shipwrecks

Several shipwrecks may be near the proposed site (Maritime Museum of the Atlantic 2005); however, detailed locations or coordinates are not available. M n Estimates of some of the wreck locations are shown on Figure 43. Several shipwrecks have been reported in Mahone Bay and

St. Margaret's Bay. These include, but are not limited to the *Sweat*, the *Young Teazer*, the *Speedwell*, the *Henry*, the *Elcy Elvy*, the *Sailor's Fancy*, the *Ashlow*, the *Olive Branch*, the *La Have*, the *Ella D.*, the *Edgewood*, the *Con Rein*, the *Flo F. Mader*, the *Opaljune*, the *Velma W*., the *Atlantic Roamer*, and the *Tickles*.

An American privateer schooner named the *Sweat* had been raiding the South Shore in 1779 until it was deliberately lured onto a ledge by a Liverpool schooner on December 10, 1779, where it was grounded. The ledge, now known as Sweat Ledges, is located near Heckman's Island.

The *Young Teazer* had been involved in several raids before being cornered in Mahone Bay. A crew member subsequently blew the schooner up and she sank in the waters between Mason and Rafuse Islands on June 27, 1813. Some of the wreckage from this vessel was salvaged and built into a store in Mahone Bay.

The *Speedwell* was wrecked at an unknown location in St. Margaret's Bay, on May 20, 1835, from causes unknown.

A brigantine named *Henry* was stranded in the fog on May 15, 1885, at Betty Island Point, resulting in a partial loss.

The *Elcy Elvy* was stranded on Gimlet Reef, Mahone Bay on September 15, 1886, due to stress of weather; this resulted in a total loss.

The *Sailor's Fancy* was stranded in Shut-In Island when the steering gear broke on October 10, 1891. Cargo accounted for $300 of this total loss.

The *Ashlow* was stranded approximately 11 km east of East Ironbound Island on October 3, 1902.

The *Olive Branch* was stranded in Aspotogan on December 1, 1904, resulting in a total loss.

The steamer, *La Have*, was stranded off Big Tancook Island on May 14, 1918.

The *Ella D*. burnt in a fire on January 1, 1920, in Chester Basin, resulting in a loss.

On March 26, 1921, the *Edgewood* schooner was stranded in St. Margaret's Bay due to an unknown cause.

The schooner, *Con Rein*, collided with a US submarine off Black Island on August 29, 1921. It was a total loss, including $9000 worth of cargo.
On January 10, 1923, the *Flo F. Mader* was stranded and lost in Mahone Bay Harbour.

On November 10, 1923, the *Opaljune* was stranded at Tancook Island. Not much is known about the event, but the ship was considered a loss.

The *Velma W*. was wrecked when she smashed into the wharf on Tancook Island October 7, 1962.

The *Atlantic Roamer* was wrecked in St. Margaret's Bay on September 5, 1972, due to a fire in the engine room.

A fishing vessel named *Tickles* was grounded in Mahone Bay due to an unknown cause on July 17, 1973.

5.1.10 Important Habitats and Conservation Areas

There are a few significant habitats within 5 km of the proposed Saddle Island site. Gravel Island, located approximately 660 m southeast of the site, is an important area for eiders, gulls, blue herons, and great cormorants. Saddle Island is a habitat supporting species of concern, primarily birds. Bayswater Beach Provincial Park contains marsh lands and aquatic vegetation, approximately 1.2 km west of the site. In addition, marshes, swamps, and fens are present throughout the peninsula which are suitable habitats for various lichens (Fig. 40; Nova Scotia Canada 2021).

There are four (4) existing protected areas within 5 km of the site: Bayswater Beach Provincial Park, Blandford Game Sanctuary, Deep Cove Conservation Lands, and St. Margaret's Bay Islands Nature Reserve (Fig. 41; Nova Scotia Canada 2012). The Bayswater Beach Provincial Park is known for white, sandy beaches and picnic areas and is located 1.2 km to the west of the site. On Aspotogan Peninsula, the Blandford Nature Reserve is separated into two areas, to the north and the south of the Deep Cove Conservation Lands. The area is ecologically important due to the presence of old jack-pine forests, rare plants and lichens, wetlands, and a large population of migratory birds. Also on the mainland, and managed by the Nature Conservancy of Canada, the Deep Cove Conservation Lands are known for biodiversity and ecosystems of jack pines, bogs, and rare lichens. Specifically, this area supports habitat for rare and endangered lichens such as boreal felt lichen, powdered moon lichen, and vole ears lichen as well as rare mountain sandwort (Nature Conservancy Canada 2023). The St. Margaret's Bay Islands Nature Reserve (Horse Island) is located 4 km to the northeast of the site. The forests, coastal barrens, beaches, and dunes on St. Margaret's Bay Islands Nature Reserve, a group of islands in St. Margaret's Bay, support nesting habitat for rare birds (Nova Scotia Canada 2013).

For additional information regarding important bird areas and habitats surrounding the Saddle Island 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; **Appendix C**).

Figure 40. Significant Species and Habitats
Note: Base map was obtained from Nova Scotia Canada (2021)

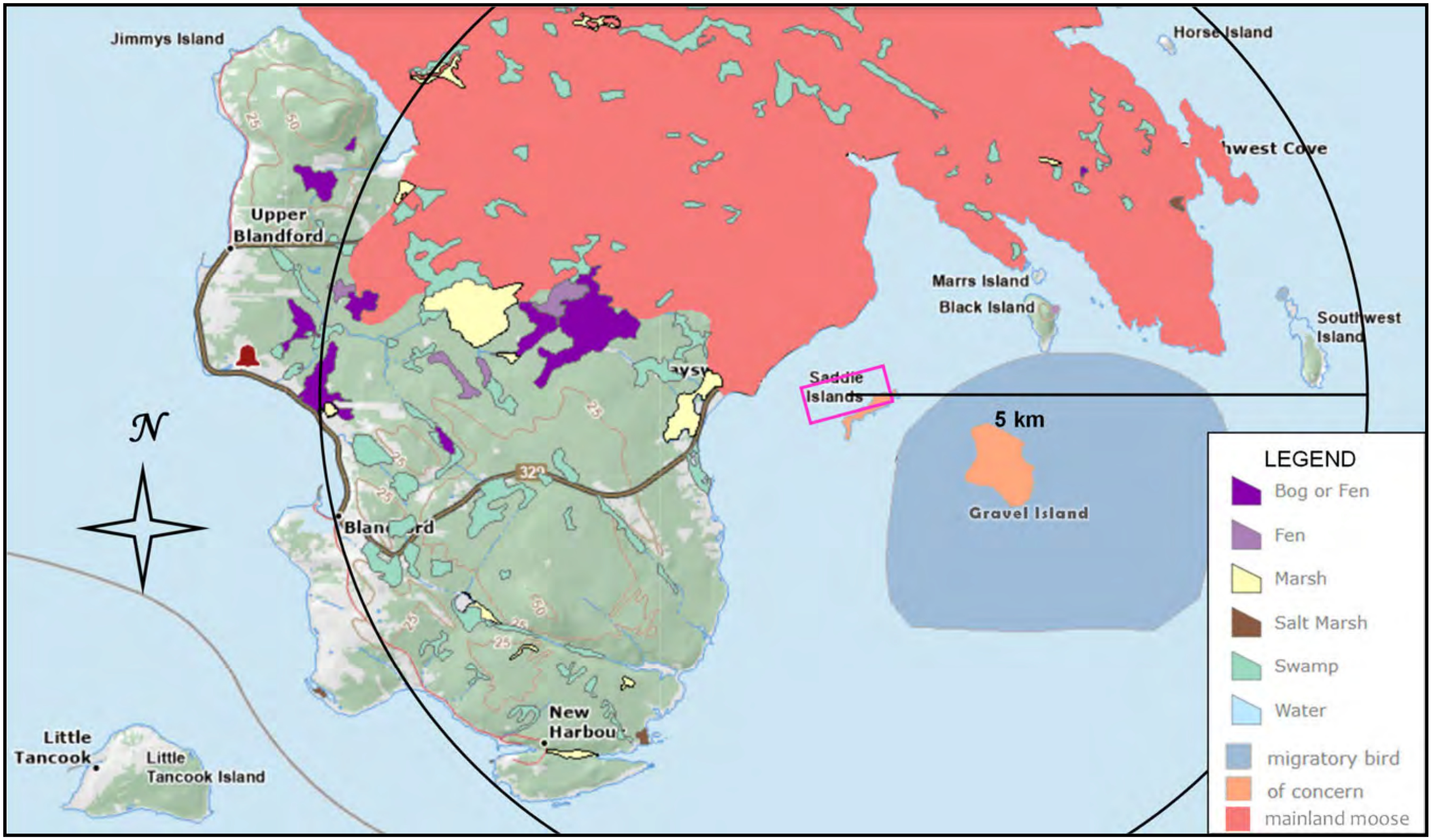


Figure 41. Parks and Protected Areas
Note: Base map was obtained from Nova Scotia Canada (2012)

5.2 Significance of Proposed Area to Wildlife

5.2.1 National Wildlife Area

Currently, there are 57 designated National Wildlife Areas (NWA) in Canada. A total of seven (7) NWAs are present in the province of Nova Scotia with an eighth (Isle Haute) in progress; however, none of the NWAs are within 50 km of the proposed aquaculture site. The closest is Boot Island, in the Minas Basin (Government of Canada 2022b).

5.2.2 Wetlands

In Canada, 37 sites have been designated as Wetlands of International Importance. Three (3) are in Nova Scotia; however, none of the wetlands are within 50 km of the aquaculture site (Ramsar 2014). The nearest Wetland 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 2021d). The Government of Canada has adopted the Marine Protected Areas Protection Standard. The MPA Protection Standard is based on International Union for the Conservation of Nature (IUCN) standards and guidelines and prohibits four key industrial activities: oil and gas activities, mining, dumping, and bottom trawling (Government of Canada 2023b).

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 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. The 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 sustain 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 2021e), with two (2) areas of interest for MPAs in Nova Scotia, including the Fundian Channel – Browns Bank and Eastern Shore Islands. The nearest area of interest is Eastern Shore Islands, which is approximately 85 km east of the aquaculture site (Government of Canada 2023c).

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 2017a). 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) designated the upper beaches of the Bay of Fundy, to include 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 Minas Basin WHSRN site, which is the only WHSRN site located in Nova Scotia.

The Saddle Island site is not located in an Important Bird Area (IBA). The nearest IBA is NS026: Grassy Island Complex, which is comprised of three locations within Mahone Bay and St. Margaret's Bay (Fig. 42; Birds Canada 2023a). This area is nationally significant as it has been known to be frequented by threatened and congregatory bird species, specifically nesting roseate terns. Each island of the Grassy Island complex is greater than 9 km away from the proposed Saddle Island boundaries.

The location of the Saddle Island site falls within block 188 of the Canadian Wildlife Service (CWS) survey areas (Fig. 43). According to CWS records (A. Hicks, pers. com.), several migrating birds inhabit the area off Bayswater Beach (i.e., bird block 188). Surveys, completed between February 2000 and March 2010 by CWS and NSDNR, identified several species of waterfowl in this block (Table 11). The common eider was the most common type of bird noted, followed by the long-tailed duck, and unidentified mergansers. No Barrow's goldeneye or harlequin ducks were counted in this area over the survey period. While this bird block is not considered an Important Bird Area (IBA) by Important Bird Areas Canada (2023), Nova Scotia Canada (2021) recognizes the area surrounding Gravel Island, an island east-southeast of the Saddle Island site, as a significant habitat for species of concern, primarily birds such as eiders, gulls, blue heron, and great cormorants. For additional information regarding important habitats for birds around the Saddle Island aquaculture site, refer to section **5.1.10 Important Habitats and Conservation Areas**.

Bird sightings around the Saddle Island aquaculture site have not been documented. Only the official surveys from CWS are available.

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 42. Important Bird Area (NS026) nearest to the Saddle Island Aquaculture Site

Figure 43. Map of Canadian Wildlife Service Survey Areas Block 188

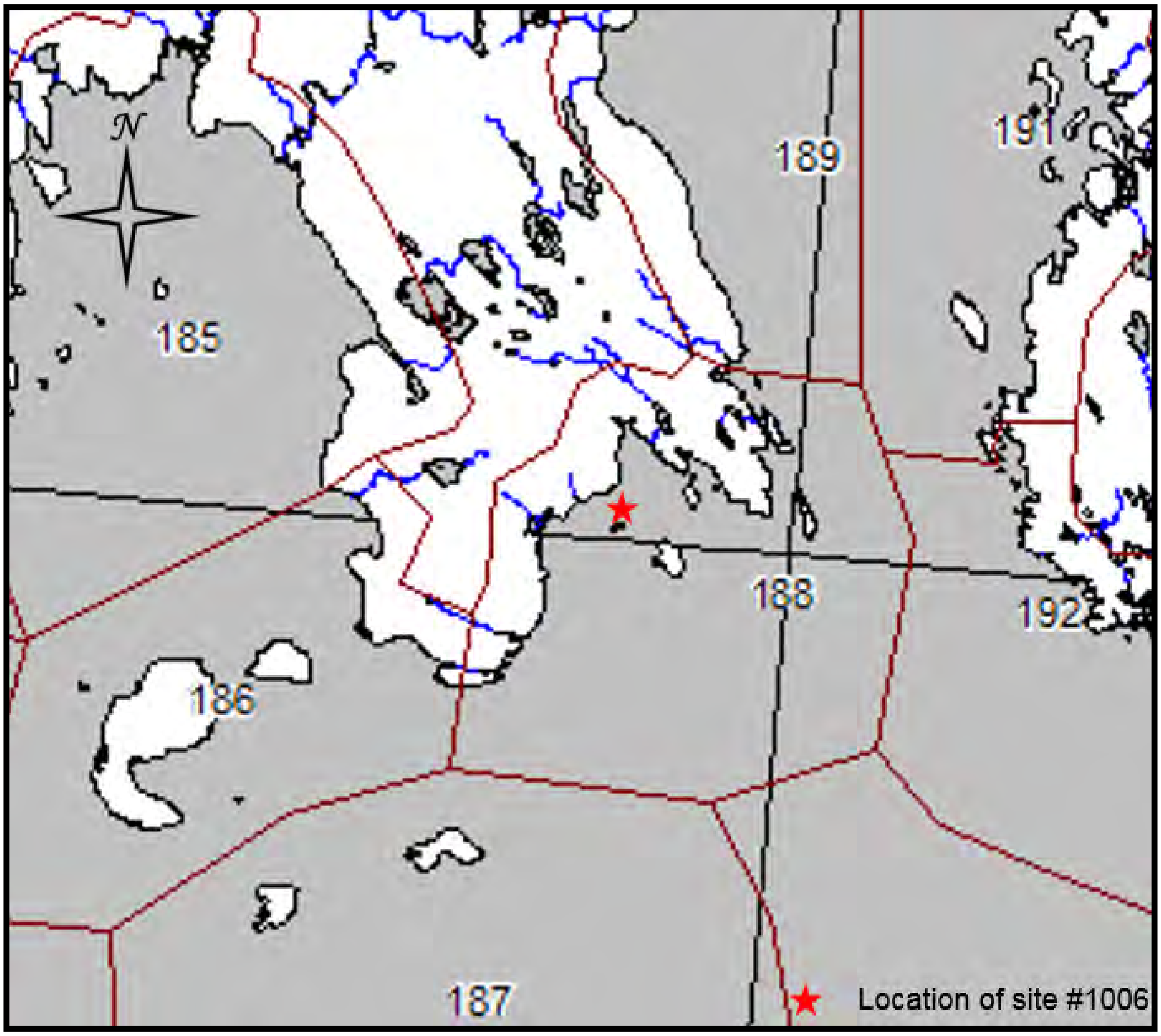


Table 11. Waterfowl Identified in Block 188

	Canadian Wildlife Services – Block 188 Numbers of Sightings per Survey										
Bird Names	**02-Feb-00**	**17-May-00**	**21-Mar-01**	**08-Aug-01**	**06-Sep-01**	**13-Aug-02**	**28-Feb-05**	**07-Mar-06**	**12-Mar-07**	**10-Feb-10**	**Grand Total**
American Black Duck	4	0	10	0	0	0	0	30	9	0	**53**
American Green-winged Teal	0	0	0	0	0	0	0	0	0	0	**0**
American Wigeon	0	0	0	0	0	0	0	0	0	0	**0**
Atlantic Brant	0	0	0	0	0	0	0	0	0	0	**0**
Barrow's Goldeneye	0	0	0	0	0	0	0	0	0	0	**0**
Black Scoter	0	0	0	0	0	0	0	0	0	0	**0**
Blue-winged Teal	0	0	0	0	0	0	0	0	0	0	**0**
Bufflehead	0	0	0	0	0	0	0	0	0	0	**0**
Canada Goose	0	0	0	0	0	0	0	0	0	0	**0**
Common Eider	0	227	605	60	0	20	140	172	225	87	**1536**
Common Goldeneye	0	0	0	0	0	0	3	0	15	20	**38**
Common Loon	0	0	0	0	0	0	2	5	11	0	**18**
Common Merganser	0	0	0	0	0	0	0	0	0	0	**0**
Gadwall	0	0	0	0	0	0	0	0	0	0	**0**
Greater Scaup	0	0	0	0	0	0	0	0	0	0	**0**
Harlequin Duck	0	0	0	0	0	0	0	0	0	0	**0**
Hooded Merganser	0	0	0	0	0	0	0	0	0	0	**0**
King Eider	0	0	0	0	0	0	0	0	0	0	**0**
Lesser Scaup	0	0	0	0	0	0	0	0	0	0	**0**
Long-tailed Duck	21	0	44	0	0	0	139	218	44	0	**466**
Mallard	0	0	0	0	0	0	0	1	0	0	**1**
Northern Pintail	0	0	0	0	0	0	0	0	0	0	**0**
Northern Shoveler	0	0	0	0	0	0	0	0	0	0	**0**
Red-breasted Merganser	19	0	0	0	0	0	0	0	0	0	**19**
Ring-necked Duck	0	0	0	0	0	0	0	0	0	0	**0**
Seal	0	0	0	0	0	0	0	51	0	0	**51**
Snow Goose	0	0	0	0	0	0	0	0	0	0	**0**
Surf Scoter	0	0	0	0	0	0	0	0	0	0	**0**
Unidentified Cormorant	0	0	9	0	0	5	0	0	0	0	**14**
Unidentified Diving Duck	0	0	0	0	0	0	0	0	0	0	**0**
Unidentified Duck	0	0	0	0	0	0	0	0	0	0	**0**
Unidentified Goldeneye	6	0	4	0	0	0	0	0	0	0	**10**
Unidentified Loon	0	0	16	0	0	0	0	0	0	0	**16**
Unidentified Merganser	0	0	9	0	0	0	11	82	156	2	**260**
Unidentified Scaup	0	0	0	0	0	0	0	0	0	0	**0**
Unidentified Scoter	0	0	0	0	0	0	0	0	0	0	**0**
Unidentified Teal	0	0	0	0	0	0	0	0	0	0	**0**
White-winged Scoter	0	0	0	0	0	0	0	0	0	0	**0**
Wood Duck	0	0	0	0	0	0	0	0	0	0	**0**
Grand Total	**50**	**227**	**697**	**60**	**0**	**25**	**295**	**559**	**460**	**109**	**2482**

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 on the SARA list present around the Saddle Island 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 federal Species at Risk Public Registry and associated pages (Government of Canada 2021f).

COMMON NAME	SCIENTIFIC NAME	COMMENTS
Endangered Species		
Atlantic whitefish	*Coregonus huntsmani*	-Last COSEWIC designation (Nov 2022): endangered -Protected under the *Species at Risk Act* (Schedule 1) and the NS *Endangered Species Act* -Historically, found only in the Tusket and Petite Rivière watersheds and their adjacent estuaries and bays but was extirpated from the Tusket River system sometime after 1982 (Fisheries and Oceans Canada 2018) -The Petite Rivière watershed in Lunenburg County is the only known population of Atlantic whitefish and is approximately 39 km southwest of the site -Poor damming practices and insufficient fish passage have led to declines [ECCC and CWF (no date)]
Blue whale	*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 water 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*

Eskimo curlew	*Numenius borealis*	-Last COSEWIC status (Nov 2009): endangered -May be extinct -Occasionally staged in the Maritimes; diet included coastal shrimp-like invertebrates -Protected under the *Species at Risk Act* (Schedule 1) and the *Migratory Birds Convention Act*
Leatherback sea turtle (Atlantic population)	*Dermochelys coriacea*	-Last COSEWIC designation (Dec 2022): endangered -Atlantic Canadian waters are an important foraging area for these turtles -Protected under the federal *Species at Risk Act* (Schedule 1)
Little brown myotis	*Myotis lucifugus*	-Last COSEWIC designation (Nov 2013): endangered -Protected under the federal *Species at Risk Act* (Schedule 1) -Largest threat to the bat is white-nose syndrome, a fungal infection
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 -Lives in coastal and shelf waters along the eastern seaboard of North America -Protected under the federal *Species at Risk Act* (Schedule 1) and under the *Marine Mammal Regulations* under the *Fisheries Act* -Not known to frequent the area around the Saddle Island site
Northern myotis	*Myotis septentrionalis*	-Last COSEWIC designation: (Nov 2013): endangered -Protected under the federal *Species at Risk Act* (Schedule 1) -Largest threat to the bat is white-nose syndrome, a fungal infection

Piping plover (*melodus* subspecies)	*Charadrius melodus melodus*	-Last COSEWIC designation (Nov 2013): endangered -Nests above high-water mark on exposed gravel or sandy beaches -On the Atlantic coast they often nest in association with small cobble and other small beach debris on ocean beaches, sand spits, or barrier beaches; they also forage for food on these beaches -Protected under the federal *Species at Risk Act* (Schedule 1), the federal *Migratory Birds Convention Act*, and the *Nova Scotia Endangered Species Act* -No known beaches in the vicinity of the site (Birds Canada 2023b)
Red knot rufa	*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 2017b) -Protected under the federal *Species at Risk Act* (Schedule 1) and the *Nova Scotia Endangered Species Act* -Proximity to the study area is unknown
Roseate tern	*Sterna dougallii*	-Last COSEWIC designation (Apr 2009): endangered -2 largest colonies are at The Brothers and Country Islands (COSEWIC 2009b) -Protected under the federal *Species at Risk Act* (Schedule 1), the federal *Migratory Birds Convention Act* and the *Nova Scotia Endangered Species Act* -Confirmed sightings in the area approximately 10 km southwest of the site on Grassy Island, Mahone Bay and 13 km northeast of the site on Wedge Island, St. Margaret's Bay. Both islands serve as nesting grounds (Birds Canada 2023a).

Tri-coloured bat	*Perimyotis subflavus*	-Last COSEWIC designation (Nov 2013): endangered -One of the smallest bats in North America -Declines of more than 75% in Eastern Canada, and expected to continue to decline due to fungal infections (COSEWIC 2013) -Largest threat to the bat is white-nose syndrome, a fungal infection -Protected under the federal *Species a Risk Act* (Schedule 1) and the Nova Scotia *Endangered Species Act*
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 federal Species at Risk Public Registry and associated pages (Government of Canada 2021f)

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 Coast of New Brunswick and Nova Scotia -May be near the area (Birds Canada 2023b)
Barn swallow	*Hirundo rustica*	-Last COSEWIC designation (May 2021): special concern -Protected under the *Migratory Birds Convention Act, 1994* -Considered endangered under the Nova Scotia *Endangered Species Act* -Birds Canada (2023b) have confirmed sightings in Aspotogan Harbour
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 - Protected under the *Species at Risk Act* (Schedule 1) -Considered vulnerable under the Nova Scotia *Endangered Species Act* -No sightings on the Aspotogan Peninsula (Birds Canada 2023b).
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 *Species at Risk Act* (Schedule 1), the *Migratory Birds Convention Act, 1994*, and the *Canada National Parks Act* -Considered endangered under the Nova Scotia *Endangered Species Act* -Possible evidence of breeding on the Aspotogan Peninsula (Birds Canada 2023b)

Chimney swift	*Chaetura pelagica*	-Last COSEWIC status (Apr 2018): threatened -The species breeds in Nova Scotia -Roosts in chimneys, crevices, caves, and hollow trees -Protected under the *Species at Risk Act* (Schedule 1), the *Migratory Birds Convention Act, 1994*, and the *Nova Scotia Endangered Species Act* -Considered endangered by the Nova Scotia *Endangered Species Act* -Possible evidence of breeding in the St. Margaret's Bay area (Birds Canada 2023b)
Eastern Meadowlark	*Sturnella magna*	-Last COSEWIC designation (May 2011): threatened -Threatened by loss of grassland habitat of breeding and wintering grounds. -Protected under the federal *Species at Risk Act* (Schedule 1) -Possible evidence of breeding on Aspotogan Peninsula in the *Second Atlas of Breeding Birds of the Maritime Provinces* (Birds Canada 2023b).
Eastern whip-poor-will	*Caprimulgus vociferus*	-Last COSEWIC designation (Apr 2022): special concern -Prefers to nest in semi-open forests or patchy forests with clearings, such as barrens or forests that are regenerating following major disturbances -Protected under the federal *Species at Risk Act* (Schedule 1) and the *Migratory Birds Convention Act, 1994* -Considered threatened under the Nova Scotia *Endangered Species Act* -No known evidence of breeding in the vicinity of the proposed project (Birds Canada 2023b)
Least bittern	*Ixobrychus exilis*	-Last COSEWIC designation (Apr 2009): threatened -Prefers large marshes with relatively stable water levels throughout the nesting period -Wintering habitat includes emergent marshes, like those used for breeding, and brackish and saline swamps -Protected by the *Canada National Parks Act*, the federal *Species at Risk Act*, and the *Migratory Birds Convention Act, 1994* -No known evidence of breeding in the vicinity of the proposed project (Birds Canada 2023b)

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 < 5ºC
Wood thrush	*Hylocichla mustelina*	-Last COSEWIC designation (Apr 2012): threatened -Nests mainly in second growth and mature deciduous and mixed forests, with saplings and well-developed understory layers -Prefers large forest mosaics, but may also nest in small forest fragments

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 2021f)

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 -Protected under the federal *Species at Risk Act* (Schedule 1) -May be present in the study area
Barrow's goldeneye	*Bucephala islandica*	-Last COSEWIC designation (May 2011): special concern -Protected under the *Species at Risk Act* (Schedule 1) and *Migratory Birds Convention Act* -The Species at Risk Public Registry shows the entire coast of Nova Scotia as Barrow's goldeneye habitat, though they prefer alkaline to freshwater lakes - During the non-breeding season, they frequent coastal waters along the St. Lawrence Estuary and Gulf, feeding on molluscs and crustaceans
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 *Species at Risk Act* (Schedule 1) and the *Migratory Birds Convention Act, 1994* -Considered threatened by the *Nova Scotia Endangered Species Act*

Eastern wood peewee	*Contopus virens*	-Last COSEWIC designation (Nov 2012): special concern -Considered vulnerable under the Nova Scotia *Endangered Species Act* -Birds Canada (2023b) has a probable occurrence of breeding in Aspotogan Harbour
Evening grosbeak	*Coccothraustes vespertinus*	-Last COSEWIC designation (Nov 2016): special concern -A year-round resident of Nova Scotia, breeds in mature and second-growth coniferous forests (The Cornell Lab 2023a)
Fin whale (Atlantic population)	*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 -Protected under the federal *Species at Risk Act* (Schedule 1)
Harbour porpoise	*Phocoena phocoena*	-Last COSEWIC designation (May 2022): special concern -Sometimes frequents bays and harbours, particularly during the summer -Protected from certain activities under the *Marine Mammal Regulations* of the *Fisheries Act*
Harlequin duck	*Histrionicus histrionicus*	-Last COSEWIC designation (November 2013): special concern -Inhabits rocky, coastal, marine areas most of the year, moving once a year into fast turbulent rivers -Protected under the federal *Species at Risk Act* (Schedule 1) and the federal *Migratory Birds Convention Act* -Considered endangered under the Nova Scotia *Endangered Species Act* -No known sightings in the vicinity of the site
Horned grebe	*Podiceps auritus*	-Last COSEWIC designation (April 2009): special concern -Most of the North American population winters along the coasts of the continent

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 federal *Species at Risk Act* (Schedule 1) and the *Migratory Birds Convention Act, 1994* -Considered threatened under the Nova Scotia *Endangered Species Act* -Possible evidence of breeding in the vicinity of the proposed project (Birds Canada 2023b)
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 federal *Species at Risk Act* (Schedule 1) -Considered endangered under the Nova Scotia *Endangered Species Act*
Savannah sparrow princeps subspecies	*Passerculus sandwichensis princeps*	-Last COSEWIC designation (Nov 2009): special concern -Breeds on Sable Island and a few beaches in Nova Scotia and nests in coastal dunes and upper beaches -Population levels have increased in recent decades -Confirmed evidence of breeding in the Saddle Island area (Birds Canada 2023b)
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 -Probable evidence of breeding near the proposed site (Birds Canada 2023b)
Sowerby's beaked whale	*Mesoplodon bidens*	-Last COSEWIC designation (May 2019): special concern -This species is most often sighted in deep water, along the continental shelf edge and slope; only rarely seen in coastal waters -Protected under the *Marine Mammal Regulations* of the *Fisheries Act*

Table 15. Species with no SARA Status but with Other 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 2021f)

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, estuarine, 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 incompletely understood changes to the marine ecosystem -Protected under the federal *Species at Risk Act* (Schedule 1)
Atlantic sturgeon (Maritimes population)	*Acipenser oxyrinchus*	-Last COSEWIC designation (May 2011): threatened -Occur 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 (COSEWIC 2009d) -Mortality caused by fishing by-catch and boat strikes are cited as the major threats to the species
Hudsonian godwit	*Limosa haemastica*	-Last COSEWIC designation (May 2019): threatened -An Arctic-nesting shorebird that is often found flying over Atlantic coastlines during their flight to their staging areas in 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, 1994*, in Canada and the *Migratory Bird Treaty Act* within the United States.
Killer whale (Northwest Atlantic/Eastern Arctic population)	*Orcinus orca*	-Last COSEWIC designation (Nov 2008): special concern -Northwest Atlantic distribution includes Nova Scotian waters
Leach's storm-petrel (Atlantic population)	*Oceanodroma leucorhoa*	-Last COSEWIC designation (Nov 2020): threatened -Confirmed evidence of breeding in the Saddle Island are (Birds Canada 2023b)
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* -Migrates through Nova Scotia (The Cornell Lab 2023b)

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
Peregrine falcon	*Falco peregrinus anatum*	-Last COSEWIC designation (Nov 2017): not at risk -Prefer open habitats, such as seacoasts, for hunting -Protected under the *Nova Scotia Endangered Species Act* [Government of Nova Scotia (no date)]
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 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 and found along the Scotian Slope and Shelf, particularly during the summer months. Individuals belonging to the Atlantic population are observed to follow 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 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 (Lauranian-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 captured 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 on the Scotian Shelf migrate south in the fall, returning in the spring (Government of Canada 2018c) -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 direct fisheries in Atlantic Canada, but the fishery is currently inactive (Government of Canada 2020b)
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 2018d) -Both a target of directed fisheries and caught as by-catch, although directed fisheries along the Scotian Shelf stopped in 2005 (Government of Canada 2018d) -Regarded as over-fished and landing of this species is prohibited throughout the Gulf of Maine (Government of Canada 2018d)
White hake	*Urophycis tenuis*	-Last COSEWIC designation (Nov 2013): threatened -Adjust their depth distribution to find temperatures in the range of 4 - 8°C

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>Atlantic Whitefish</u>

Atlantic whitefish are protected under the federal *Species at Risk Act* (Schedule 1). The Nova Scotia *Fishery Regulations* under the *Fisheries Act* prohibit the taking of Atlantic whitefish from all provincial waters by any method at any time of the year. This species is also protected under the Nova Scotia *Endangered Species Act*. Under this Act, it is prohibited to kill, harm, or collect this species. Atlantic whitefish have only been reported in the Tusket River and Petite Riviére watersheds in southern Nova Scotia, but the Tusket River system population has been considered extirpated since 1982 (Fisheries and Oceans 2006). The Petite Rivière watershed in Lunenburg County is approximately 40 km southwest of the proposed aquaculture site.

Mitigation: While interaction with this species is unlikely, neither KCS nor any of its employees will attempt to harm or capture Atlantic whitefish.

<u>Leatherback Sea Turtle</u>

Threats to the leatherback sea turtle in Atlantic Canadian waters include entanglement in commercial fishing gear, vessel collisions, marine pollution, acoustic disturbance, and climate change (Government of Canada 2021g). The threat of highest concern in Atlantic Canada is entanglement in fishing gear, which can affect its ability to swim and cause lethal or sublethal damage.

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.

<u>Migratory Birds</u>

Most species of birds in Canada are protected under the *Migratory Birds Convention Act, 1994*. Under the *Migratory Birds Regulations* (C.R.C, c. 1035; Environment and Climate Change Canada 2017a), 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 2021h).

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

<u>Piping Plover</u>

In general, piping plovers use sand, gravel, or cobble-dominated open ocean-front beaches, pocket beaches, and barriers (islands, beaches, spits, and bars) in marine coastal areas for most life processes (Environment and Climate Change Canada 2021). For nesting, piping plovers generally select the widest part of a beach, choosing sandy areas with sparse vegetation, or gravel, pebble, cobble, shell fragments, wrack, or other debris to provide camouflage (Environment and Climate Change Canada 2021). Several sites in Nova Scotia have been identified as piping-plover critical habitat; the closest is Kingsburg (Environment and Climate Change Canada 2021). There is no known piping-plover beach near the proposed aquaculture site, and no sightings have been documented in the area (Birds Canada 2023b).

Mitigation: The piping plover is protected under the Canadian *Species at Risk Act* and the federal *Migratory Birds Convention Act*. KCS employees will not kill, harm, or collect adults, young, or eggs of the piping plover.

<u>Roseate Terns</u>
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. Historically, there were confirmed sightings of roseate terns on Grassy Island in 1997 (~10 km southwest of the aquaculture site) and on Wedge Island in 1999 (~13 km northeast of the site) (COSEWIC 2009b).

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 of shorebirds (i.e., mid-April to mid-August). KCS employees will not kill, harm, or collect adults, young, or eggs of the roseate tern.

<u>Sharks</u>
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 2020c). 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 2020b). 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 2020b).

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

<u>Whales</u>
The blue whale remains listed under the *Species at Risk Act* as an endangered species throughout the Atlantic. A recent science advisory report (DFO 2018) has 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 Saddle Island aquaculture site.

North Atlantic right whales have occurred throughout history in the coastal waters of the Northwest Atlantic, ranging from lower latitudes throughout winter for calving, and higher latitudes for feeding during the spring, summer, and autumn months (Government of Canada 2021i). Throughout these migrations, areas of high use include Coastal Florida and Georgia, the Great South Channel, Massachusetts Bay, Cape Cod Bay, the Bay of Fundy, and the southern Gulf of St. Lawrence (Government of Canada 2021i, NOAA Fisheries 2023).

Mitigation: 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 2023).

5.3.2 Impacts to Other Users

5.3.2.1 Right to Navigation

Figure 44 provides information regarding the navigation route used by KCS while servicing the Saddle Island aquaculture site. The layout of on-site equipment is provided in Figures 45 - 47. Please refer to **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 Saddle Island aquaculture site.

Figure 44. Marine Chart Showing KCS Vessel Route from Saddle Island to the Private Wharf Located in Aspotogan

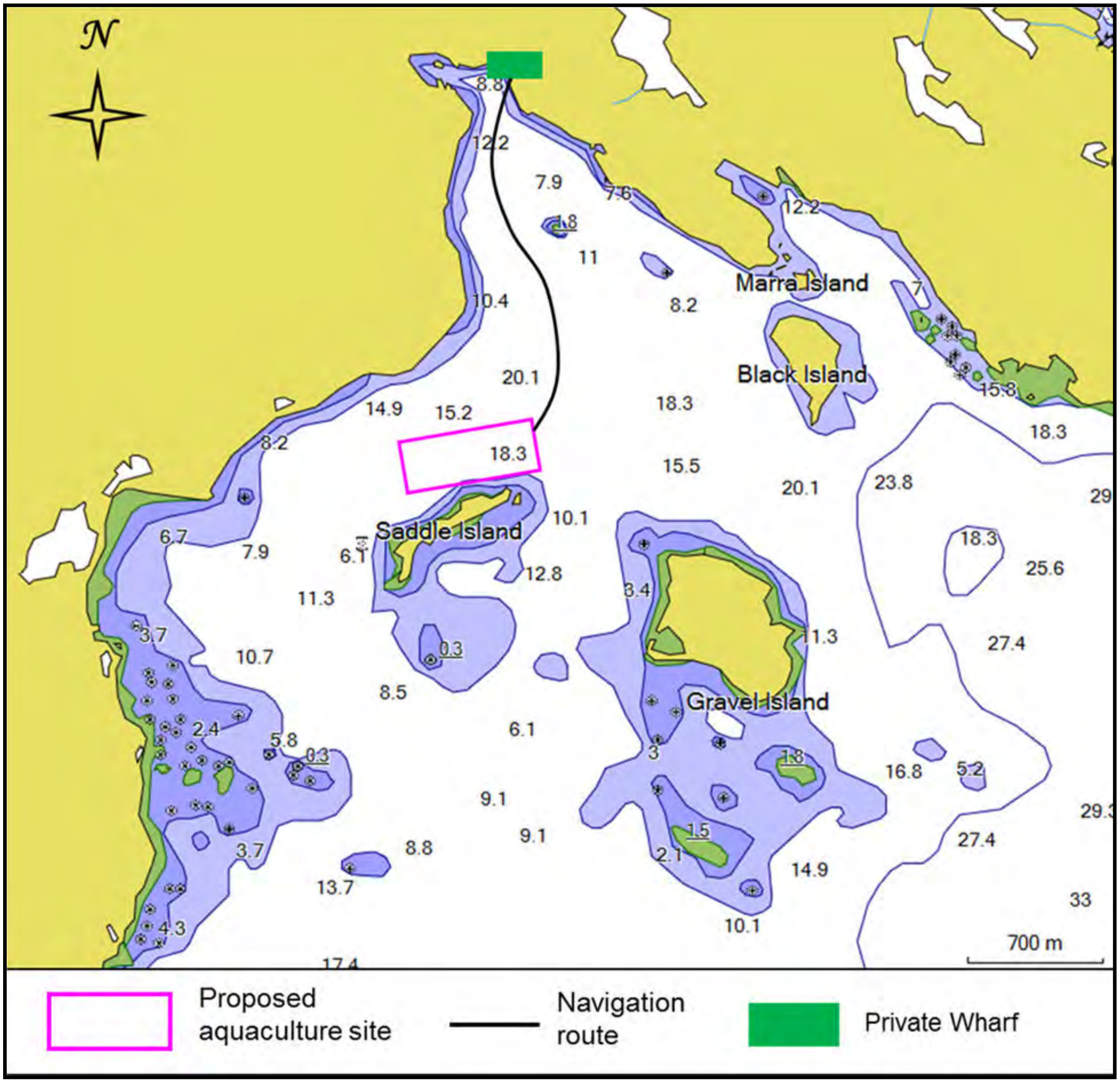


Figure 45. Saddle Island Site Development Plan Showing Cage Configuration

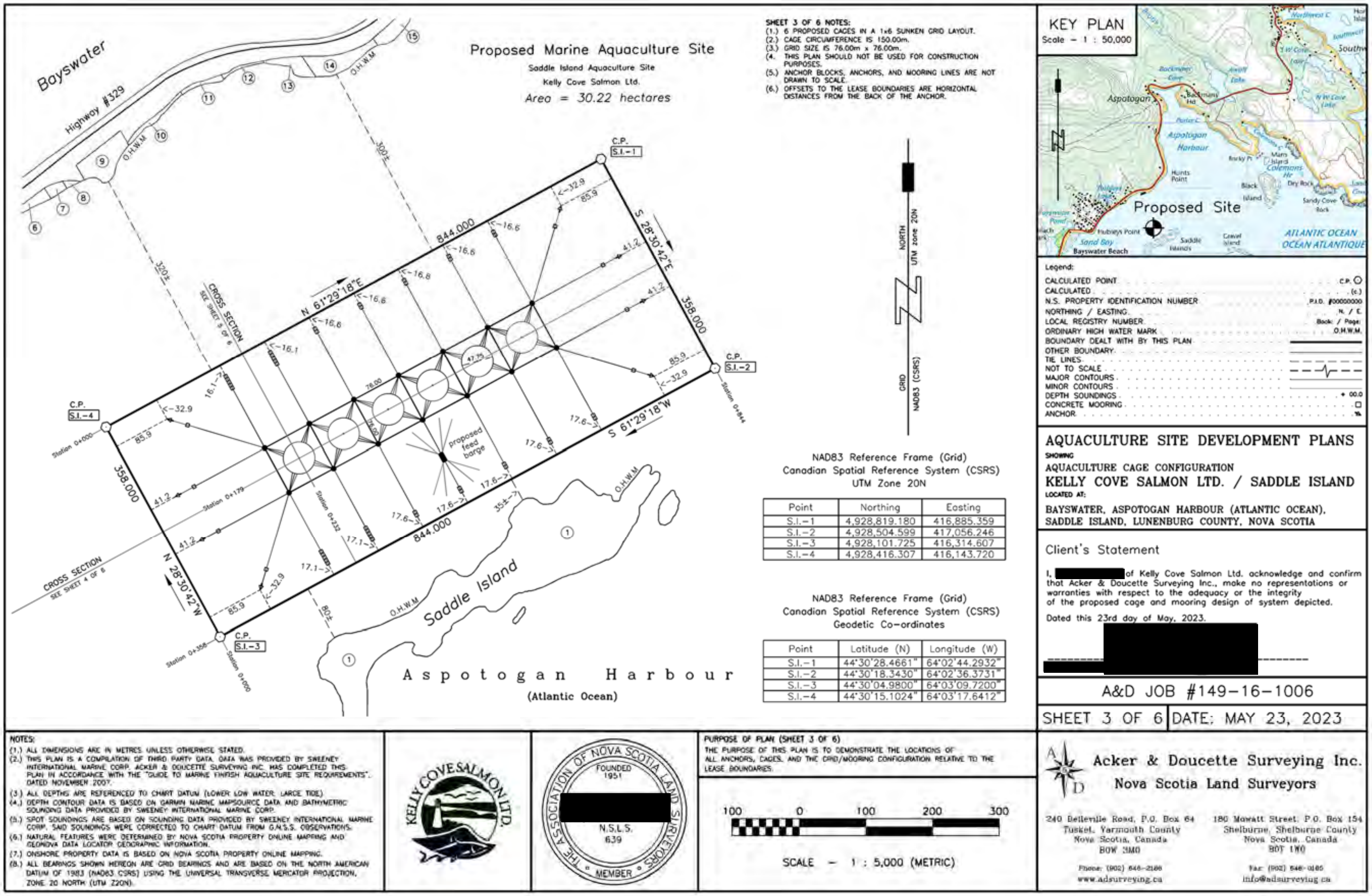


Figure 46. Saddle Island Cross-Sectional Plan A

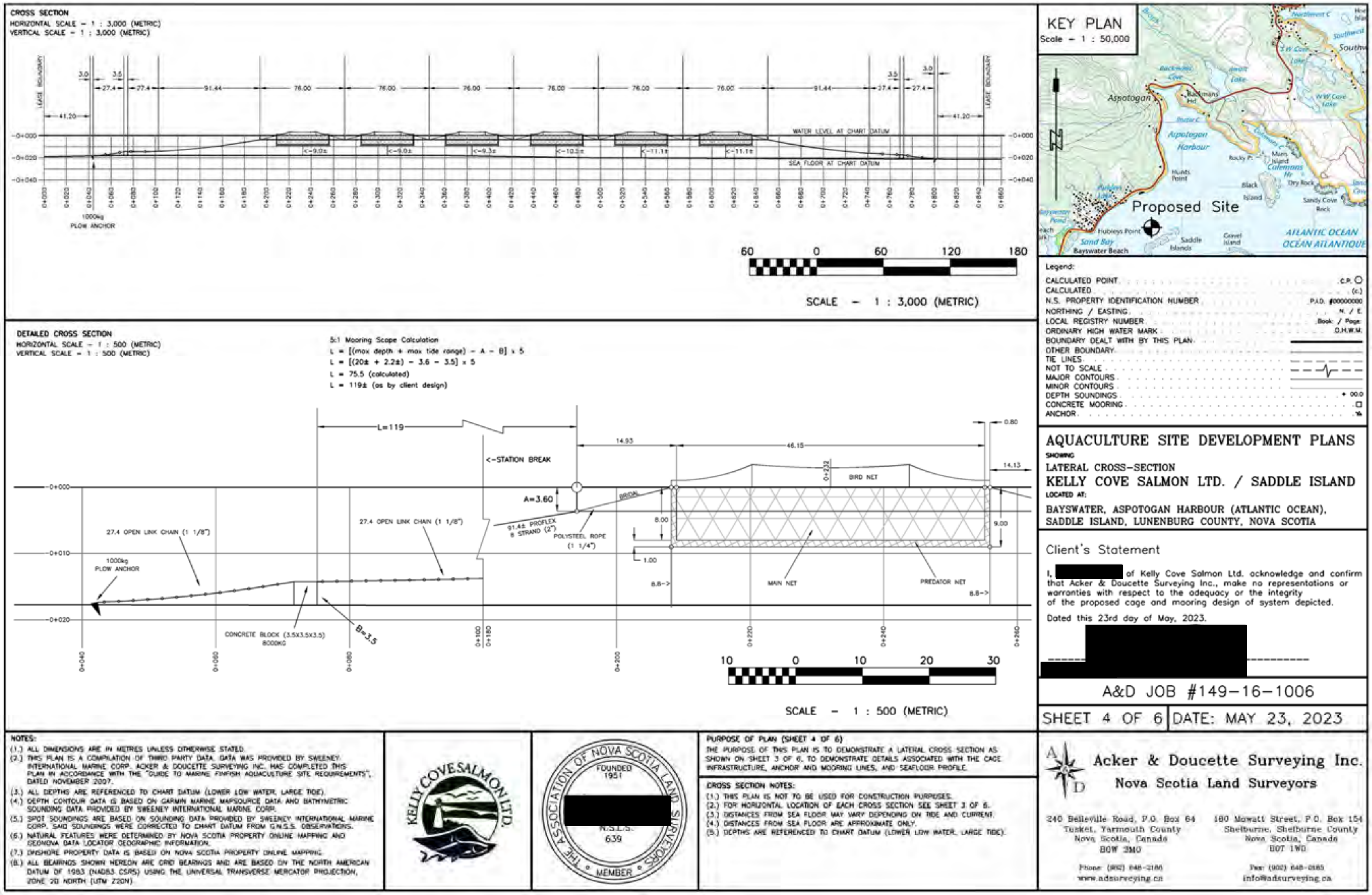
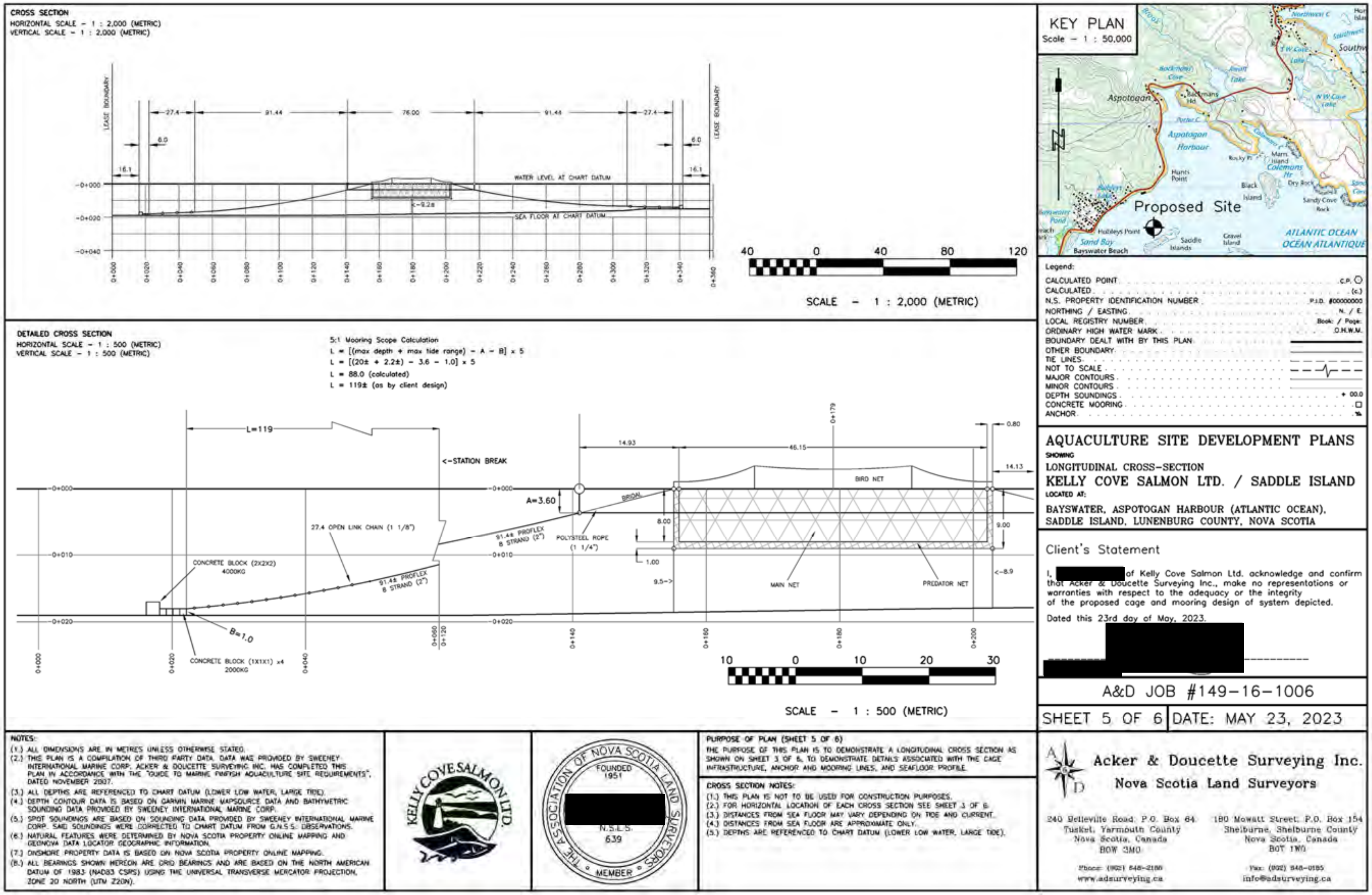


Figure 47. Saddle Island Cross-Sectional Plan B



5.3.2.2 Esthetics

The Saddle Island site is an existing site. The requested boundary amendment will not affect the visual appearance of the site. 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

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. Routine, daily examinations of dead and live fish are conducted to inspect for signs of predator attack and 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 private wharf in Aspotogan as well as the proximity of the site to the villages on the Aspotogan Peninsula contribute to this. Interactions with people and organizations outside of KCS can raise concerns for biosecurity, pollution, and safety of 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; however, the primary wharf used to service the Saddle Island site is private wharf which is not used by any other aquaculture operation. Therefore, biosecurity concerns are limited.

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 Saddle Island 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 Management 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 a PFD while travelling to 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 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 Act* 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 or existing work in navigable waters. An application for approval has been filed via the online portal for the proposed boundary amendment of Saddle Island. 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-aid limits to demonstrate the extent of the marine aquaculture site as well as adjacent parcels of land to the north and south of the lease. Property identification number (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 and 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 marking plan.

Each plan indicates the exact location of the proposed lease, legal lease number, and position 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 Saddle Island marine aquaculture site is in the range of the Nova Scotia Southern Upland population of Atlantic salmon. The Southern Upland region of Nova Scotia is divided into three salmon fishing areas: SFA 20, SFA 21, and part of SFA 22 (Fig. 48). The marine aquaculture site in Aspotogan Harbour is in SFA 21. Notable rivers of SFA 21 include Medway River, LaHave River, West River (Sheet Harbour), and St. Mary's River (ASF 2019). Of these, the LaHave River is the closet at ~34 km SW of the Saddle Island aquaculture site (Fig. 49). Historically, the Gold, Mushamush, Middle, East (Chester), and Ingram Rivers contained salmon (Clair et al. 2004), all of which are closer to the Saddle Island site than the LaHave River. The closest of these rivers to the Saddle Island aquaculture site are the East and Ingram Rivers. The East River is approximately 13 km from the Saddle Island aquaculture site, and the Ingram River is approximately 19 km away. The Gold River has a remnant population of salmon. It is approximately 21 km from the Saddle Island site. The associated watersheds are depicted in Figure 50 (DFO 2013b).

Historically, the rivers of SFA 21 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 Advisory Secretariat Science Response 2012/014 (2012), all commercial fisheries of wild salmon, due to reduced catches, were closed by 1985. Beginning in 2010, all rivers within SFA 21 were closed to recreational fishing for Atlantic salmon, and there were no FSC allocations (DFO 2020f). 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 2011). The salmon index population of the La Have River was assessed to be below conservation egg requirements in 2019 with egg depositions ranging between 4 and 5% of conservation requirements (DFO 2020f).

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). Clair et al. (2004) found that rivers of SFA 21 were sensitive to acidification from acid rain emissions, and recovery, even with reductions in acid deposition, would be long and slow due to the underlying geology. MacMillan et al. (2008) reported Atlantic salmon were absent in acidic streams that were less than 5.5 on the pH scale, whereas Clair et al. (2004) considered rivers with pH between 5.1 and 5.4 to have threatened populations of Atlantic salmon and rivers with pH between 4.7 and 5.1 to have endangered populations. Clair et al. (2004) considered salmon extirpated from rivers less than pH 4.7. Of the Gold, East, Middle, and Ingram rivers, the Gold River maintained the highest pH values throughout modelling exercises (Clair et al. 2004). Given the long timelines predicted for natural recovery of acid-impacted streams, mitigation methods have been considered. One such method includes liming. Terrestrial liming involves the addition of a buffering material to the catchment of an acidified river. Geddes (2015) identified a couple of catchments on the Gold River as areas that may be successfully mitigated by terrestrial liming. The Maria Brook of the Gold River watershed was treated from 2012 to 2014 with hand application of crushed limestone. Thirty tonnes of powdered limestone were applied in 2012, 60 tonnes were added in 2013, and another 30 tonnes in 2014 (Coastal Action 2020). However, five years later, subsequent monitoring did not reveal a significant increase in pH (5.18 post treatment), decrease in toxic aluminium ions (remained well above the toxic threshold of 15 ug/L), or increase in beneficial calcium ions (remained below the 2.0 mg/L threshold for aquatic health) (Sterling 2022).

In November 2010, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) designated the Outer Bay of Fundy, Nova Scotia Southern Upland, and Eastern Cape Breton population assemblages as endangered (Government of Canada 2021f). However, the SARA status remains as “no status, no schedule”.

Figure 48. Atlantic Salmon Fishing Areas of Atlantic Canada
Note: Figure was sourced from DFO (2015). White, numbered circles identify designated Salmon Fishing Areas.

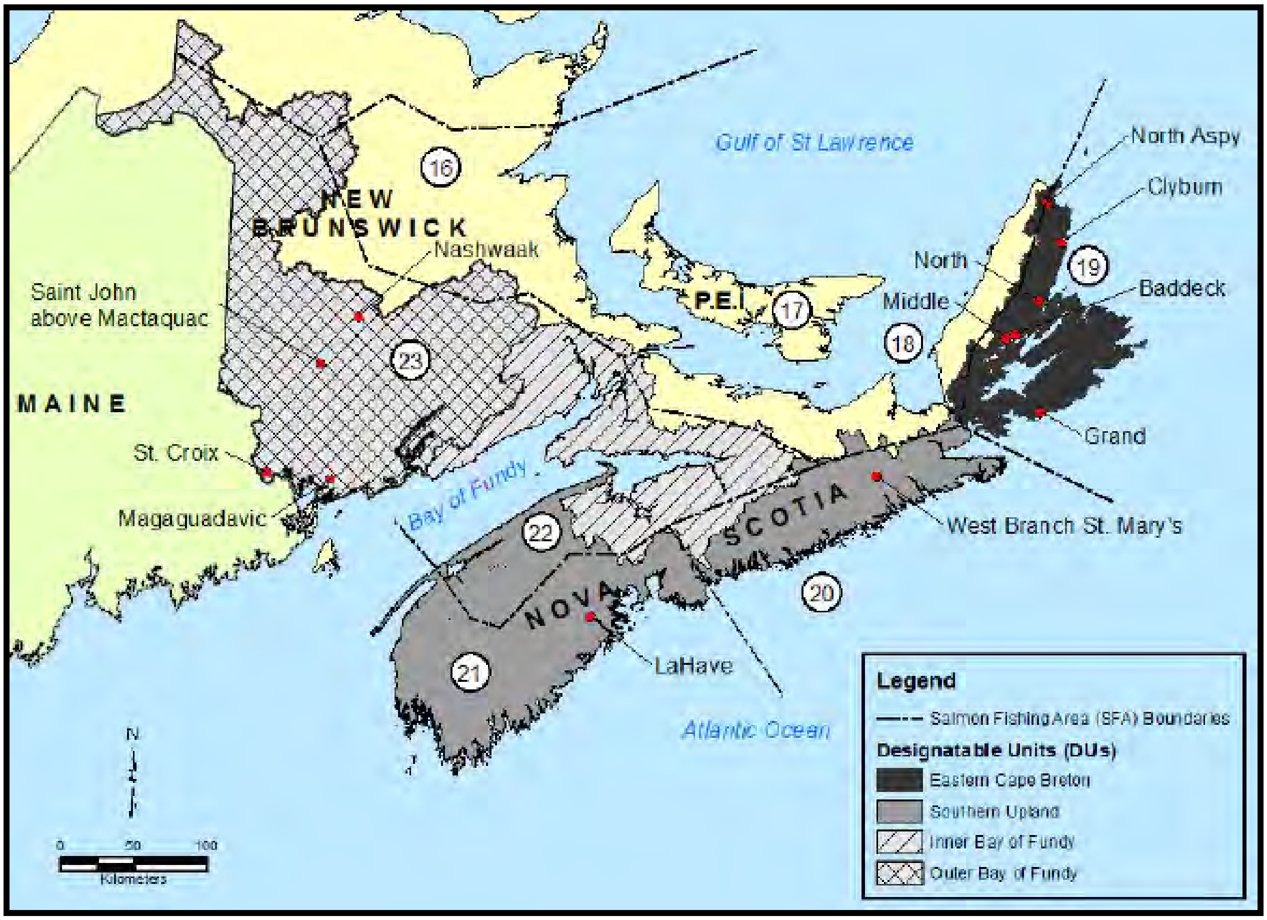
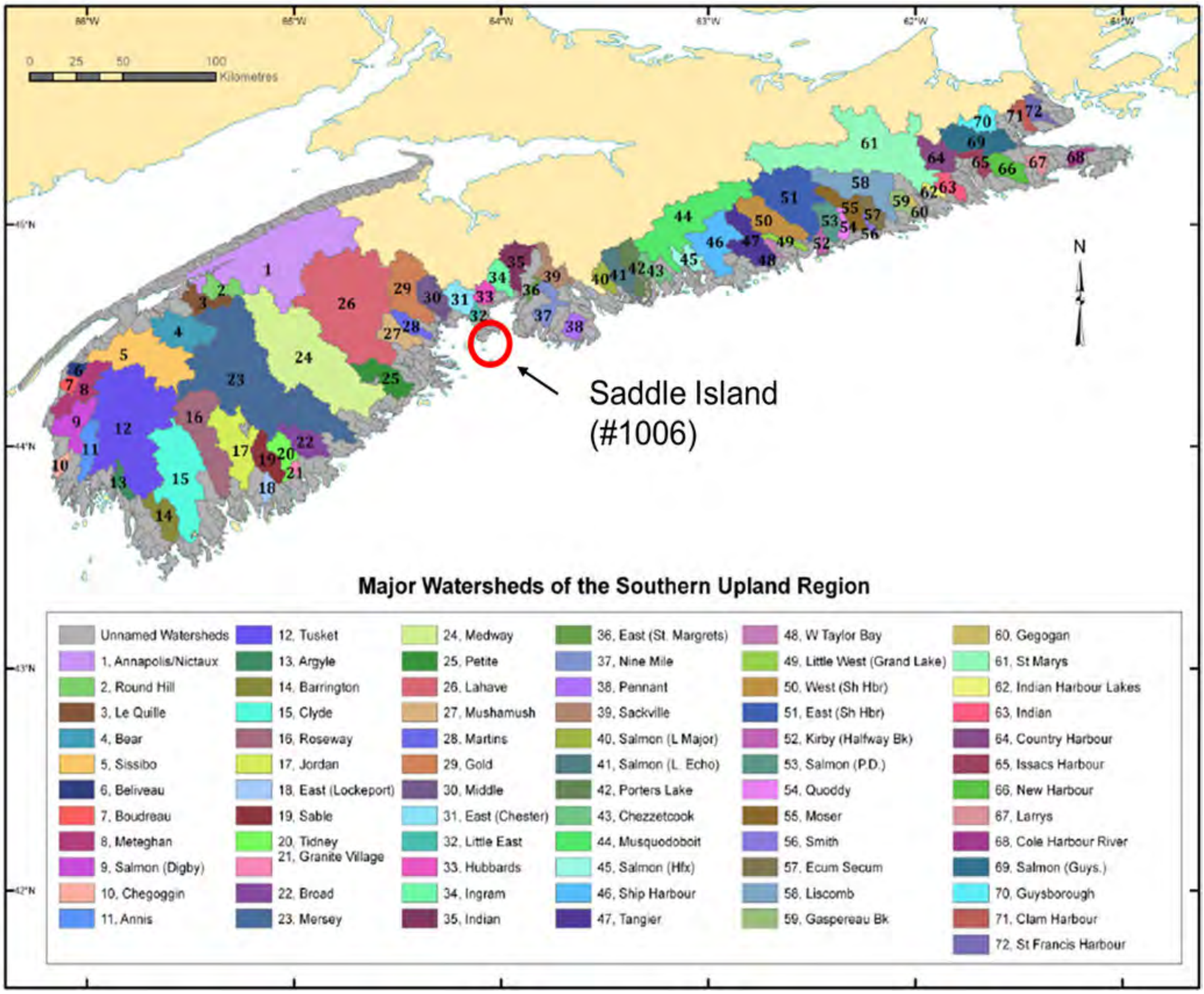


Figure 49. Potential Atlantic Salmon Rivers around the Aspotogan Peninsula, Nova Scotia

Figure 50. Major Watersheds of the Southern Upland Region
Note: Figure was sourced from the DFO (2013b)



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 Saddle Island site, distant from all known/potential wild salmon rivers, is located ~13 km from the mouth of the East River, ~19 km from the Ingram River, and ~21 km from the Gold River. 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. Lacroix (2005b) found no evidence to support the hypothesis that parasites or diseases found in salmon farms or hatcheries were affecting post-smolts leaving the Bay of Fundy. Recent telemetry research in the Bay of Fundy has shown that post-smolts tend to rapidly migrate past aquaculture sites, typically spending less than an hour in proximity to an aquaculture cage. As such, the risk of disease transmission (e.g., infectious salmon anemia) from domesticated to wild fish is greatly reduced (M. Trudel, DFO, unpublished). 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. A study by Lacroix (2005b) did not find any *Lepeophtheirus salmonis* (the species of sea lice of concern), on any of the 288 post-smolts sampled across three years (127 sampled in 2001; 229 sampled in 2002, and 42 sampled in 2003). The sea louse *C. elongatus*, a non-salmon specific species about half the size of *L. salmonis*, was found infrequently on post-smolts (2.4% in 2001, 4.4% in 2002, and 2.4% in 2003), with no more than one sea louse per fish ever recorded on post-smolts. 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 the Saddle Island 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). In agreement, recent summarized findings by Fisheries and Oceans Canada (DFO) scientists concluded that from all existing data sets and research articles, no statistical association exists between sea-lice numbers found on Atlantic salmon farms and those found on wild juvenile Pacific salmon, across all salmon farming regions (6) of British Columbia, and across most recent (2015-2021) farming years (DFO 2023). This report strongly suggests that modern salmon farming practices are not negatively impacting wild salmon populations regarding sea lice. 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 2013b) 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 interactions with wild salmon. 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. All smolt stocked into marine farms are able to be tracked back to the operator via DNA as per the enhanced regulations in NS. 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. Similarly, KCS is also supporting the University of New Brunswick's development of an AI image-analysis tool for fish scales to distinguish a wild salmon from a suspected farmed salmon. The contemplated deployment of this tool to portable smart phone platforms would not only accelerate origin determination in the field, but greatly improve accuracy, enhancing overall conservation efforts and outcomes. 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.

The Gold River is the only river near the Saddle Island site with documented restoration efforts to benefit wild salmon. It is approximately 21 km away. Coastal Action and Dalhousie University conducted an experimental liming project at Maria Brook, located within the Gold River Watershed. The effects of terrestrial liming on water quality were investigated. In the springs of 2012 through to 2014, the catchment was treated by spreading calcium carbonate on the soil in attempts to neutralize the acidic water. Unfortunately, the project didn’t significantly improve water quality with respect to restoring salmon habitat (Sterling 2022).

NSSA Adopt a Stream has completed projects to remove debris, install digger logs, step pools, sills, and silt curtains on the Indian River (NSSA Adopt a Stream 2020).

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. Marine-reared adult salmon from the Marine Conservation Farm produce four times more offspring than freshwater-reared adults from a typical conservation hatchery program (K. Samways, University of New Brunswick/Fundy Salmon Recovery). Salmon that come from eggs hatched in the wild (as through this program) produce 1.5 times more offspring than adults that were stocked as fry (as is typical with traditional hatchery programs) (K. Samways, University of New Brunswick/Fundy Salmon Recovery). Finally, with 116 adult salmon returning to Fundy National Park, this marked the largest natural salmon returns in over three decades (K. Samways, 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
8) Improved feed delivery systems to reduce food waste. Reducing food waste has positive cascading ecological health effects to the marine environment.

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 45 to 47 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 Saddle Island aquaculture site.

Mooring and Grid

GMG Fish Services Ltd (GMG), a sister company to KCS, provides the moorings for installation. The moorings and materials were chosen based on modelling completed by KCS Professional 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 Saddle Island 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 Saddle Island 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 Saddle Island 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 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 determined 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 Saddle Island include high winds more than 40 knots from a southerly direction, cold water temperatures below 1.5°C, warm water above 18°C, and dissolved oxygen below 6.2 mg/L.

The Site and Area Managers will track forecasts to predict 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 the 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 Saddle Island 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 Saddle Island 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 Saddle Island 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.

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	Cannot be controlled during production. Reduced risk with predator deterrence and predator netting; approved by NSDFA
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. This 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 no aquaculture sites less than 5 km from the Saddle Island site. Within 15 km, four (4) marine shellfish aquaculture sites exist (Fig. 51). The nearest shellfish aquaculture site is owned by Bay Tender Shellfish Ltd. - licenced for blue mussel and sea scallops. Blaine Bond owns a lease for blue mussel, sea scallop, and European oyster and another lease approved for only blue mussel. [redacted] lease is approved for culture of blue mussels, bay scallop, sea scallop, and American oyster (Table 22). The nearest finfish farm is #0074, located approximately 25 km west-southwest of the Saddle Island site, in Princes Inlet. This site is owned and operated by Royal Stevens and is approved for Atlantic salmon and rainbow trout.

Figure 51. Marine Chart Showing Other Aquaculture Operations within 5 and 15 km from Saddle Island #1006
Note: Figure was sourced from NSDFA (https://novascotia.ca/fish/aquaculture/site-mapping-tool/)

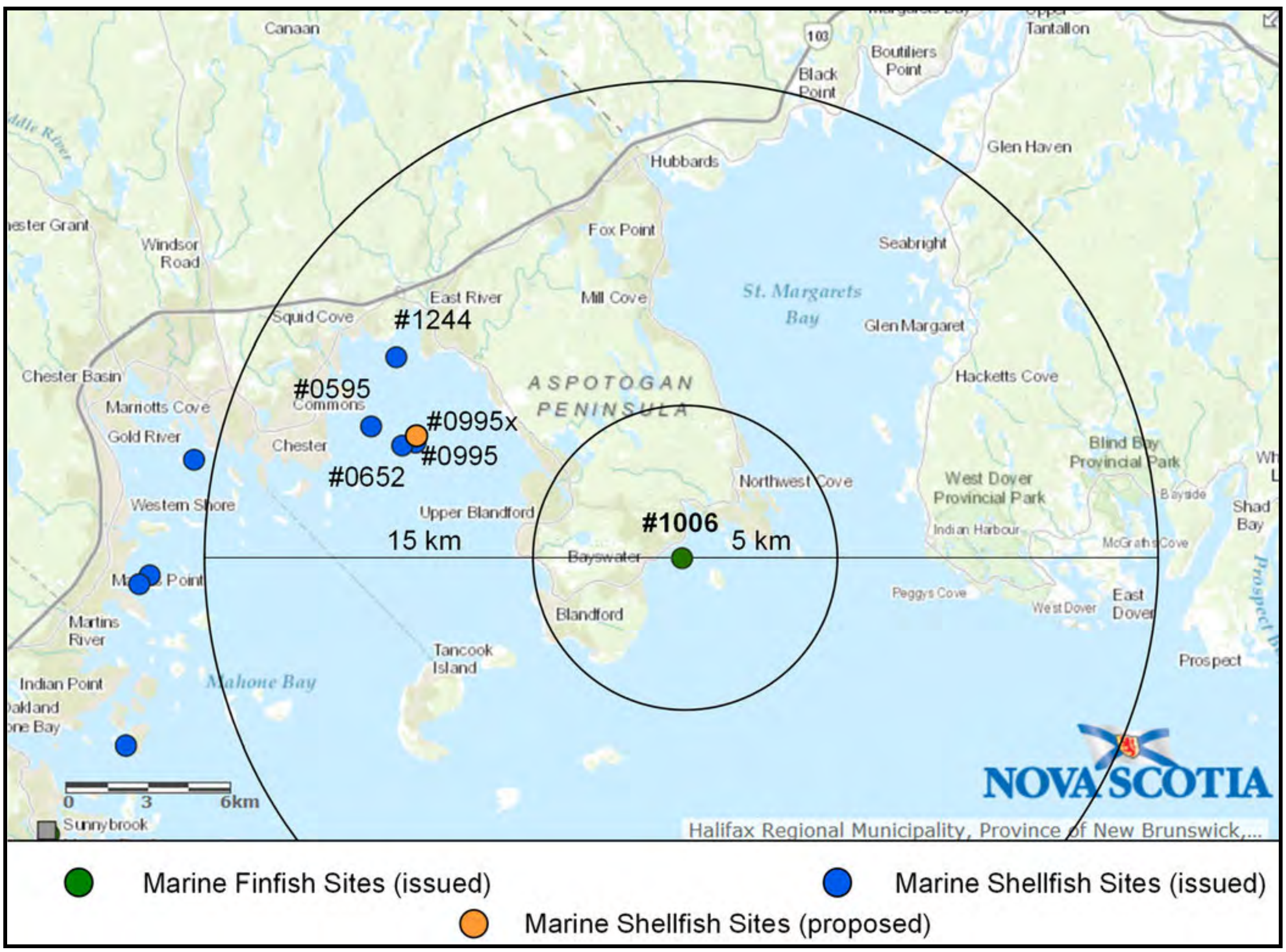


Table 22. Straight-line Distance to Nearby Aquaculture Sites from Saddle Island #1006 within a 15-km Radius

Site #	Distance from Saddle Island (km)	Species	Owner
0995/0995x	10.7	Blue mussel, sea scallop	Bay Tender Shellfish Ltd.
0652	11.1	Blue mussel, sea scallop, European oyster	Blaine E. Bond
0595	12.4	Blue mussel, bay scallop, sea scallop, American oyster	[redacted]
1244	12.9	Blue mussel	Blain E. Bond

8.2 Interactions with Other Aquaculture Operations

This site 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 2023b) tide tables for Owl's Head (Station #473), the highest high tide for 2023 was 1.9 m and the lowest low tide was -0.1 m, giving a maximum tidal range of 2.0 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 performed using a 600-kHz Teledyne RDI Workhorse Sentinel (ADCP) deployed by NSDFA. The current meter was located near the center of the proposed lease at coordinates (N44° 30.281' W64° 02.897).

At depths 2 – 15 m above the seafloor, the most common directions of flow were between 55 and 75°. The depth-averaged current speed of all recorded profiles at this site was 3.1 cm/s. The maximum recorded speed was 18.8 cm/s occurring 14.5 m from the bottom; however, the most frequently observed speeds were between 2.0 and 4.0 cm/s. The minimum current speed observed was 0 cm/s, which was recorded in most depth bins. Overall, current speeds < 10 cm/s occurred 98.7% of the time. Refer to section **4.1.5 Currents** and **Appendix B Saddle Island Baseline Assessment Report** for additional information on currents.

There are no aquaculture farms within a 5-km radius of the Saddle Island site, and it is unlikely that the Saddle Island site will have a significant effect on other aquaculture operations in adjacent Mahone Bay.

Annual environmental monitoring of Saddle Island is conducted in accordance with the NSDFA Standard Operating Procedures for Environmental Monitoring of Marine Aquaculture Sites in Nova Scotia. Based on previous sampling events, the seafloor at the site consists of fine-grained material often overlain with algal debris. KCS will continue to comply with the provincial environmental monitoring program.

8.2.2 Boat Traffic and Wharves

Site #1006 is in Aspotogan Harbour, between the Aspotogan Peninsula and the north side of Saddle Island. This site does not pose a navigation 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 only wharf used by this operation is a private wharf owned by [redacted] located in Backman's Cove, Aspotogan. Only [redacted] and KCS have access to this wharf, which will not be used to access other aquaculture farms (Fig. 45).

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 Saddle Island 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 Saddle Island site must follow KCS' biosecurity and health and safety rules. The Site Manager will 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

Shellfish aquaculture is present in Mahone Bay, a water body adjacent to Aspotogan Harbour. The establishment of a future shellfish farm near Saddle Island 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	Alex.Campbell@dfo-mpo.gc.ca	(902) 399-8507	April 28, 2021	Landings data (Fisheries)
Dave Eberhard	DFO – Commercial Data, Policy & Economics	XMARComData@dfo-mpo.gc.ca	(902) 440-0392	March 24, 2023	Landings data Fisheries
Andrew Hicks	Environment Canada	Andrew.Hicks@ec.gc.ca	(506) 364-5138	April 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
Colin O’Neil	DFO – Policy & Economics	Colin.ONeil@dfo-mpo.gc.ca	(902) 426-6296	Oct 18, 2016	Fisheries
Wendy Vissers	NSDFA	Wendy.Vissers@novascotia.ca	(902) 526-3617	June 8, 2021	Rockweed licences

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APPENDIX A
Public Engagement Materials

Cooke Aquaculture

Boundary Amendment: Saddle Island, Aspotogan

Report on Saddle Island Public Engagement July 21, 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 Saddle Island marine farm #1006. 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 Blandford Community Center on July 21, 2021, to engage stakeholders and provide information on KCS's 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 p.m.– 8:00 p.m., with time slots given each hour for a 45-minute period with a maximum of 20 people in 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 Wednesday, July 21, 2021, KCS held a public open house meeting at the Blandford Community Centre located in the community of Blandford. The open house took place from 1:00-8:00 pm. There were sixty-five participants, 33 who preregistered and 32 walk-in's who attended the event. Kelly Cove Salmon was able to safely accommodate everyone who wished to attend.

There was a political rally in the field next to the community center during the open house.

2.1 Community Open House Advertising

The open house was publicized by radio broadcasting CKBW, Country 100.7, FX 101.9 Nova Scotia. Kelly Cove Salmon purchased four 30 second advertising spots each day during the period of July 12th-18th, 2021. There were newsprint ads published in the South Shore Breaker on July 14th and the Chronicle Herald on July 10th, 14th and 17th.

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 community of Blandford detailing the Cooke Aquaculture Community Open House. These notices were posted at the local post offices, general stores, and gas stations. (See appendix A for illustrations).

2.2 Open House Structure

Kelly Cove Salmon had representatives from Saltwater Operations, Environmental Monitoring, Public Relations, Compliance, Human Resources, and Business Development departments. Tables were set up with plaque cards illustrating the proposed boundary amendment, a model cage was on site and reading materials on salmon farming were available to take home. Also included was the recent study completed by the Nova Scotia Department of Fisheries and Aquaculture called "Investigating Concerns of Marine Finfish Aquaculture Impacts at Bayswater Beach Provincial Park.

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 tables 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
How do you count sea lice?	c,d,g	Although sea lice numbers in Southern Nova Scotia are very low, and we do not see the Lep. species which is the one of concern. We monitor the fish on a weekly basis as is required by regulation, and we have various tools available that we use in New Brunswick such as in-feed, well boat treatments and alternative removal methods that use only water that could be used in Nova Scotia if necessary.
Where do you report sea lice to?	c, g	Sea lice sampling data are inputted into an iTrends program created by the Atlantic Veterinary Collage. All provincial veterinarians and industry have access to the review the data.
Have you used antibiotics?	C & g	Very rarely, and much less than terrestrial farmed animals. We treat with antibiotics when we know, through diagnostic testing, that there is a bacterial infection that needs to be treated with. Antibiotics are not used as part of the production cycle like they are with some terrestrial farmed animals. Unlike agriculture, antibiotics can only be administered under a prescription by a certified veterinarian.
What diseases have you had to treat for?	C & G	We rely on vaccinations and good fish husbandry to minimize the amount of antibiotic treatments that we give the fish. On rare incidences when we must medicate the fish it is done so by the direction and guidance of a licence veterinarian with provincial oversite.

Are you changing the size of the site?	C & E	No, the site will remain as it looks today. The boundary amendment is taken in the moorings and anchors. No additional cages or fish will be added to this site at this time.
Are you adding more fish?	A - H	No there will be no additional production added to this site.
How much feed & feces are collected on the bottom under the cages?	c, d	Every cage has a camera which is used during feeding to monitor fish behavior and to ensure the fish are not overfed, leading to wasted feed. The bottom under the cages is monitored regularly to ensure there is no buildup under the cages. This is also monitored by both Provincial and Federal Governments.
Why don't Cooke do a study on Lobster larvae?	C	We farm in multiple areas in Atlantic Canada. Lobster catches have not gone down in these areas. There has been aquaculture in Liverpool Bay since 2002 and it doesn't appear to have hurt catches. There are also many scientific papers on lobster/aquaculture interactions.
Salmon enhancement? What was it about and what is Cooke's involvement?	G	Cooke Aquaculture has been involved in the Fort Folly Salmon recovery project in NB from the start and we are currently working with the MRSA as thy try and develop their program.
What are you going to do about noise pollution?	E	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 where we operate. We are a food production business there will be noise associated with the production.
How do we recycle equipment? Nets, ETC??	NA	We are currently working on innovative recycling options and all materials are recycled when possible.
With ocean water temperature high is Saddle Island still a suitable area to farm fish?	NA	Saddle Island has been a successful location to farm Atlantic salmon and it continues to be.
Why are we regulated by the province and no regulations from the Federal level?	NA	There are regulations at the Federal level. There are multiple regulations from multiple federal compartments that we must adhere to. There is

		an MOU between the federal Gov and PNS that the PNS oversees leasing and licensing aquaculture sites
Did we get government approval to operate outside the lease for all these years?	NA	The cages were outside of the lease when we purchased it. Anchors and moorings did not have to be within the lease. In 2015 the regulations changed, and operators were given until 2016 to either a. apply for a boundary amendment or b. move the site within the lease. KCS applied in 2016 for a boundary amendment.
How do the nets get cleaned?	D	We have remote net washer units that are placed in the cage and use high pressure water to remove any build up that may occur along the netting. Net washing typically occurs between June - November on a two-week rotation depending on bio-fouling levels.
How do you monitor the temperature and O2 on the sites?	D	Each cage is equipped with sensors that detect oxygen and temperature in real time. All site managers have an app on their phone and if something drops below the acceptable limit an alarm will be triggered.
Will Saddle Island have an O2 barge this year?	NA	Yes, we anticipate it being operational in August/September.
Do you have any Salmon for sale? Recipes?	NA	Salmon can be purchased at Sobeys, AC Coverts in Dartmouth. Our website has many recipes you can enjoy
How did the lease come out of compliance?	NA	The cages were outside of the lease when we purchased it. Anchors and moorings did not have to be within the lease. In 2015 the regulations changed, and operators were given until 2016 to either a. apply for a boundary amendment or b. move the site within the lease. KCS applied in 2016 for a boundary amendment.

How do you remove the mortalities?	G	As per the Farm Management Plan we have trained divers enter the cages weekly to remove any mortality. Divers also inspect the health of the fish as well as the nets during this dive to ensure no damage has occurred.
Where do the mortalities go?	NA	The mortalities can be sent for composting or rendering.
Can you do land based instead of marine?	NA	We are the largest landbased salmon farmer in Canada. Right now, it doesn't make sense economically and environmentally to do it on a large scale. We are in the process of building a $70 million dollar facility in Centreville, NS to raise smolt to 350 g which will eliminate one winter in marine water.

Comments	• Don't like format of community meeting-public forum. • Liked the format and low crowds to better listen and discuss. • Not enough science done on lobster larvae in Liverpool Bay. • Debris can sometimes be found on the shoreline although, much less then fishermen gear. • Industry and province have not done a good job on educating people. • Province of NS created a process and is not managing the process. • I live by Bayswater beach for 50 years and I feel the beach has been degraded.

3.0 Aquaculture Grows Nova Scotia

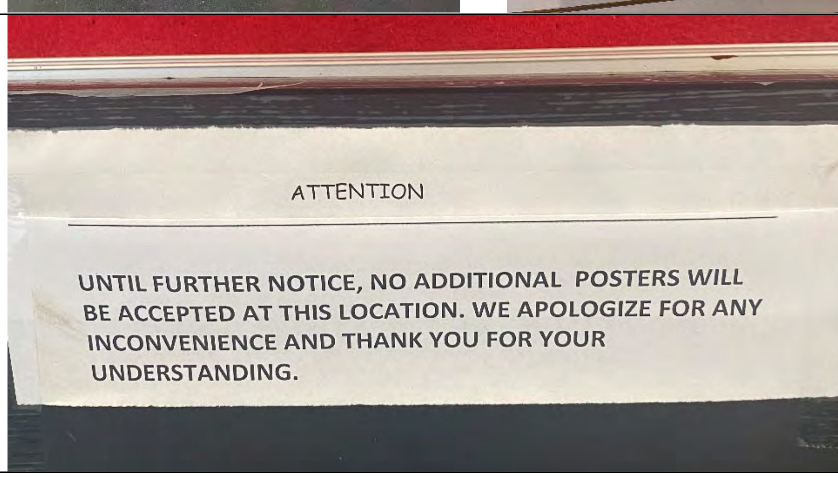
October 11, 2018, Cooke Aquaculture activated www.aquaculturegrowsns.ca as a means of making information about expansions, boundary amendments and upcoming open houses available to the public. The site includes background information on Cooke Aquaculture, maps of the proposed expansions, boundary amendments, and an FAQ question 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 revied on this link concerning the Brier Island boundary amendment.

Appendix A

Cooke Aquaculture Inc.

Location	Public Notice	
Independent Grocer **Chester, NS**		
Irving **Chester, NS**		
The Deck Convenience Store and Restaurant, Blandford, NS		

Location	Public Notice
Pharmasave **Chester, NS**	 
Independent **Hubbards, NS**	 
Canada Post **Chester – no posters accepted (Covid-19)**	

APPENDIX B
Baseline Assessment Report

Baseline Assessment Report

Site #1006
Saddle Island

Aspotogan Harbour
Lunenburg County
Nova Scotia

August 21, 2023

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

SIMCorp File #SW2016-061

Sweeney International Marine Corp.
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Canada
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Tel: (506) 467-9014
Fax: (506) 467-9503
www.simcorp.ca

August 21, 2023

SIMCorp File #SW2016-061

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

Dear [redacted],

Reference: **Saddle Island (#1006) Baseline Report**

Please find enclosed the above noted report and attached video footage for the baseline assessment of site #1006 in Aspotogan Harbour, 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 902-830-2676.
Sincerely,

[redacted]

[redacted] BSc, EP
Senior Environmental Project Manager
Senior Marine Environmental Biologist
Sweeney International Marine Corp.
[redacted]

cc: [redacted] (SIMCorp)
[redacted] (SIMCorp)
Gretchen Wagner (NSDFA)
Jessica Feindel (NSDFA)
Jennifer Hewitt (KCS)
[redacted] (KCS)

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 12
	Use of an aquaculture waste depositional model	AAR Paragraph 8(1)(a)	6.1
	Model inputs of food and fecal waste as accepted international 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 14
	Species ≥ 1 cm in length are identified	AAR Paragraph 8(1)(b)	7.3
	All fish habitat and substrate 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	3.1
	Samples meet all quality criteria	AAR Paragraph 8(1)(d); NSDFA SOP's Section 5.0 & Section 2	3.2, Appendix A, Appendix C
	Information concerning seabed and sediment samples is recorded	AAR Paragraph 8(1)(d); NSDFA SOP's Section 2	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 19
	Subsamples were kept cool until analysis	AAR Paragraph 8(1)(d); NSDFA SOP's Section 2	3.2, Appendix B
	A designated meter and probe combination were selected for sulphide measurements	NSDFA SOP's Section 2	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	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	3.2, Appendix F
	Redox measurements conducted as specified	AAR Paragraph 8(1)(d); NSDFA SOP's Section 2	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	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	3.5, Appendix A, Appendix H
	A 150-meter video transect required by NSDFA was omitted after communications with NSDFA deemed it unnecessary when a fish habitat survey is also conducted.	NSDFA SOP's Section 2	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	Table 3, 3.5, 7.2
ADCP Measurements	Tidal current measurements were collected for a minimum of 30 days as close to the lease center as possible	NSDFA SOP's Section 2	5..1, Appendix I

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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. (KCS) to summarize the findings of a formal baseline environmental survey of Saddle Island (#1006). Marine aquaculture site #1006 is in Aspotogan Harbour, between the Aspotogan Peninsula and the north and northwest area of Saddle Island, in Lunenburg County (Fig. 1). This area is shown on CHS chart #4386. The current lease has dimensions of approximately 310 x 250 x 290 x 260 m with an area of approximately 7.61 ha (Table 1). At the time of this report Saddle Island is currently fallow. The purpose of this baseline assessment is to support a boundary amendment application, which will bring all above-water and below-water gear into the lease boundaries.

Figure 1. Current Saddle Island (#1006) location in Aspotogan Harbour

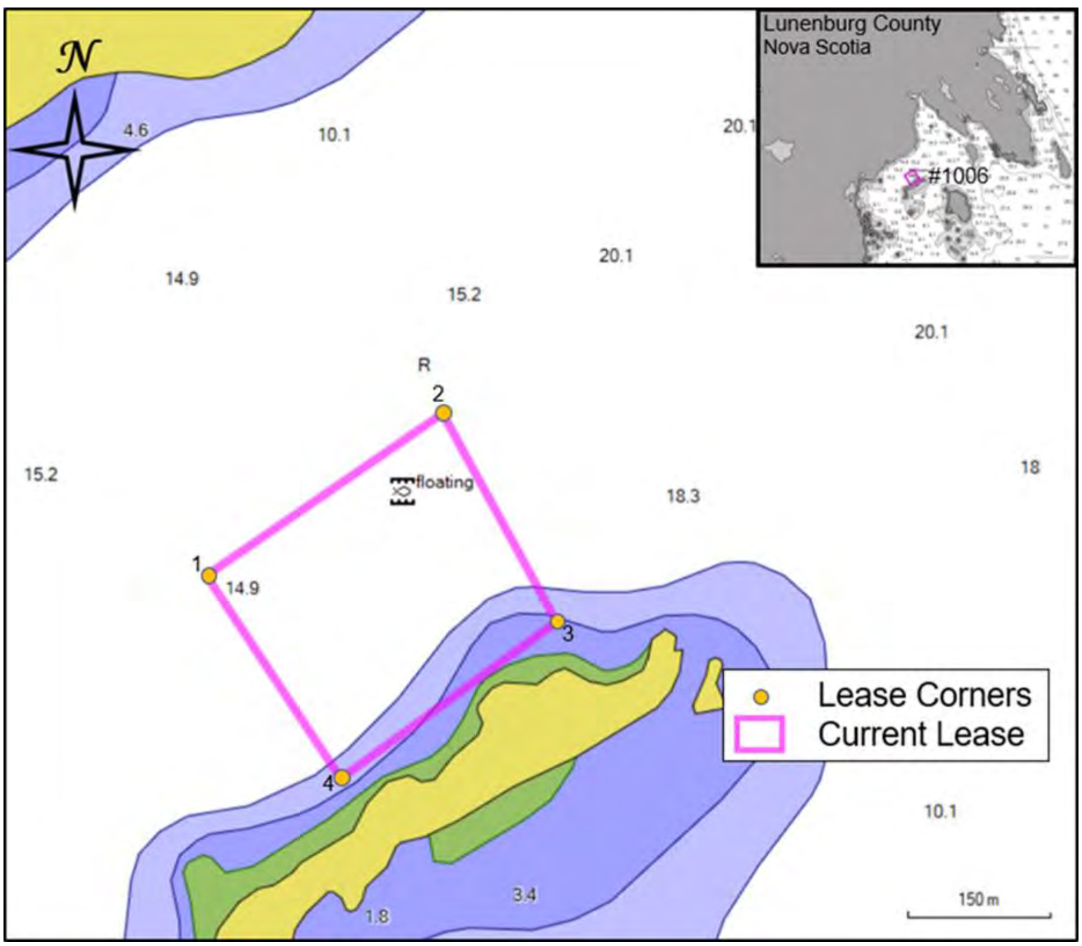


Table 1. Current boundary and center coordinates of Saddle Island (#1006)

SITE COORDINATES (NAD 83)		
Corner	**Latitude**	**Longitude**
1	44° 30’ 16.1”	64° 03’ 04.6”
2	44° 30’ 21.5”	64° 02’ 52.8”
3	44° 30’ 14.5”	64° 02’ 47.1”
4	44° 30’ 09.2”	64° 02’ 57.9”
Site Center	44° 30’ 15.1”	64° 02’ 55.3”

The proposed boundary amendment extends the lease boundaries to accommodate all below-surface gear. The dimensions of the proposed lease are approximately 844 x 358 m, with an area of approximately 30.22 ha. (Fig. 2, Table 2).

Figure 2. Proposed boundary location for Saddle Island (#1006)

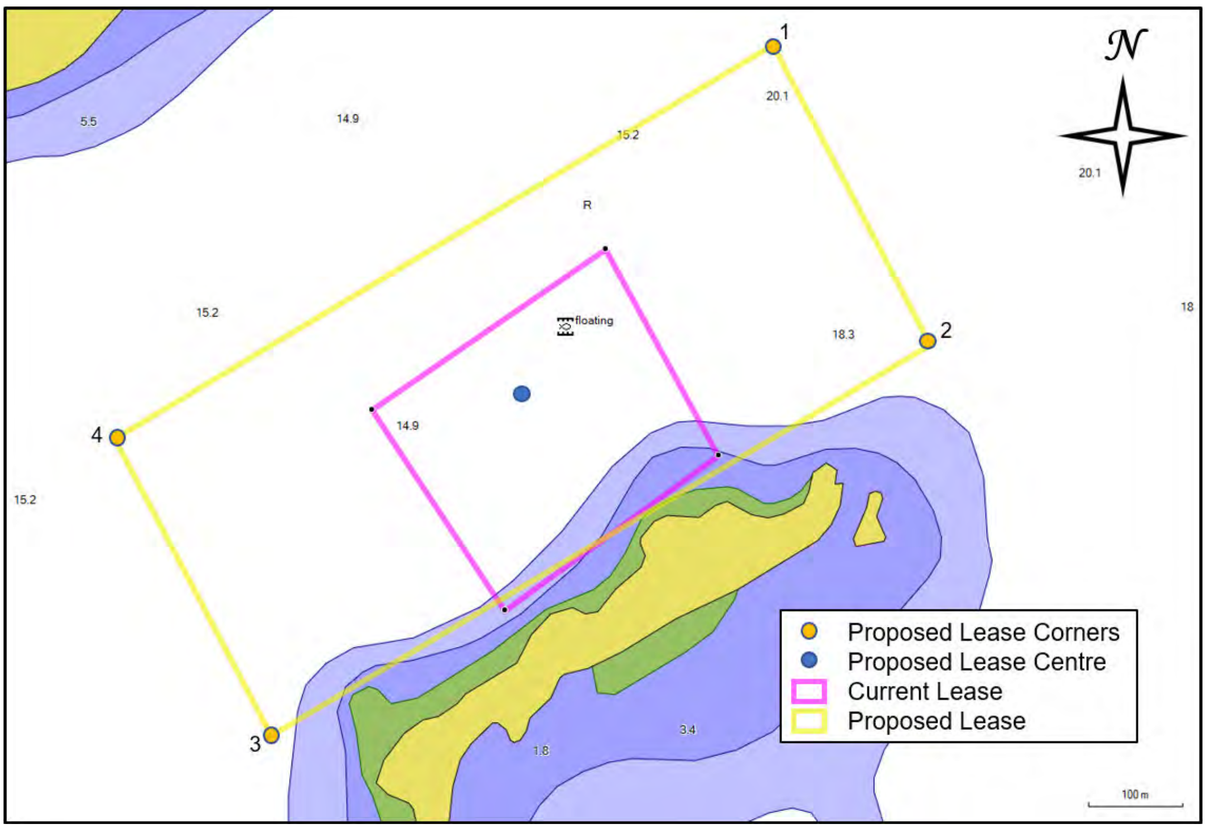


Table 2. Proposed boundary and center coordinates of Saddle Island (#1006)

SITE COORDINATES (NAD 83)		
Corner	**Latitude**	**Longitude**
1	44° 30’ 28.5”	64° 02’ 44.3”
2	44° 30’ 18.3”	64° 02’ 36.4”
3	44° 30’ 05.0”	64° 03’ 09.7”
4	44° 30’ 15.1”	64° 03’ 17.6”
Site Center	44° 30’ 16.7”	64° 02’ 57.1”

2.0 CONTACT INFORMATION

Proponent:

Company Name: Kelly Cove Salmon Ltd.
Principal Contact: [redacted]
Mailing Address: P.O. Box 33
Bridgewater, Nova Scotia
B4V 2W6
E-mail: [redacted]

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, section 2 of the NSDFA *Standard Operating Procedures for the Environmental Monitoring of Marine Aquaculture in Nova Scotia* (NSDFA 2021a), 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). Further details are available in the subsequent sections of this report.

To satisfy the NSDFA and the AAR benthic substrate sampling criteria, a total of six (6) stations were investigated for the purpose of this baseline survey (Fig. 3). The six (6) stations represent four (4) stations at the corners of the proposed lease, one (1) at the site center, and one (1) reference station. A baseline video transect running through the center of the proposed lease was omitted in lieu of a fish and fish habitat survey (referenced in section 7.0) which provides a greater coverage of video stations throughout the entire lease. The sampling station coordinates are present in Table 3. Seafloor characteristics for each station are presented in Tables 5 – 10.

Figure 3. Baseline sampling stations at Saddle Island (#1006)

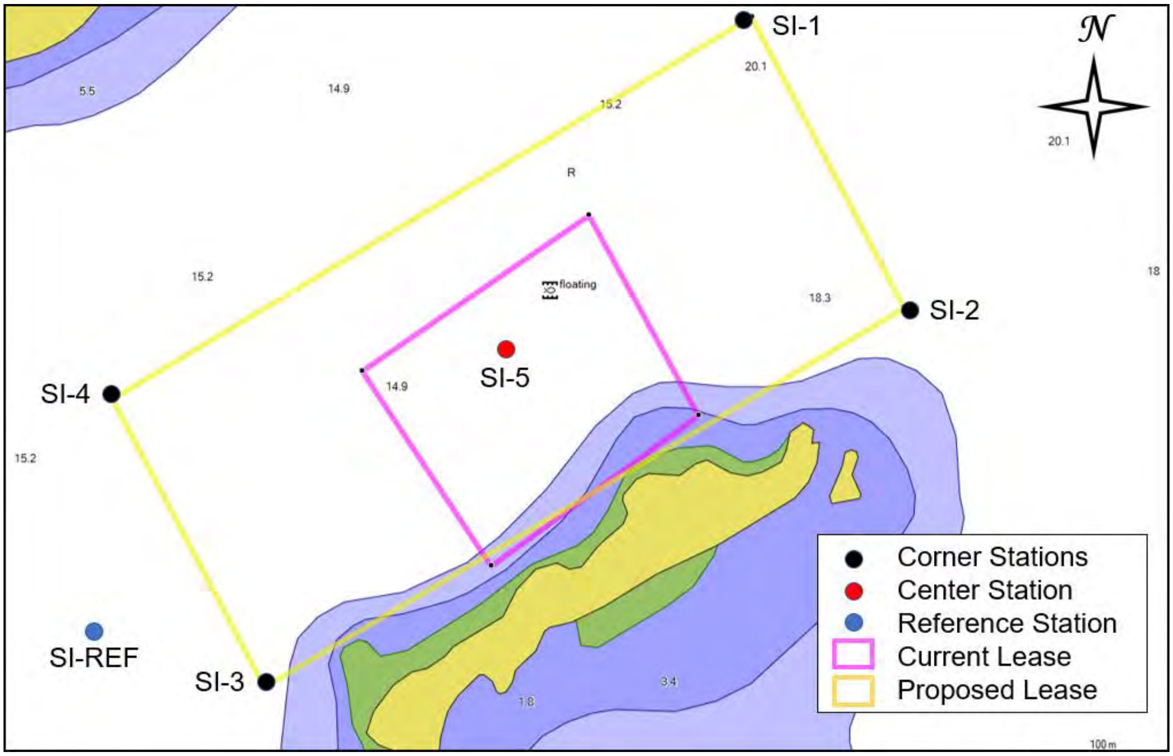


Table 3. Baseline Sampling Coordinates at Site #1006, Aspotogan Harbour

BASELINE COORDINATES (NAD 83)		
Station	**Latitude**	**Longitude**
SI-1	44° 30’ 28.5”	64° 02’ 44.5”
SI-2	44° 30’ 18.2”	64° 02’ 36.2”
SI-3	44° 30’ 05.1”	64° 03’ 09.6”
SI-4	44° 30’ 15.3”	64° 03’ 17.8”
SI-5	44° 30’ 16.9”	64° 02’ 57.2”
SI-REF	44° 30’ 06.9”	64° 03’ 18.8”

3.2 *Sediment Sample Collection*

Benthic field data to satisfy the benthic substrate sampling component of the Saddle Island (#1006) baseline assessment was carried out by SIMCorp Marine Environmental Biologist [redacted], BSc, EPt, with assistance from field technicians [redacted], [redacted], and [redacted] on June 8, 2023. Low tide was at 6:41 (0.1 m), and high tide was at 12:31 (1.6 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 decent 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.

An error occurred during grain size analysis of SI-1 (1) in which the sample was dry sieved with a smaller mesh size causing for extra sediment to be included in the final sieve carrying very fine sand. This should only mildly affect the final data but is noted, nevertheless. This error was immediately addressed and was not repeated for any other replicate or station.

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, to 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*

Sample temperatures were recorded using HOBO ProV2 temperature loggers. Temperatures recorded from inside the sample cooler are presented graphically in Appendix B.

All sediment samples were analyzed within 31 hours of collection for redox potential and sulphide ion concentration (Table 11, 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 for analysis of porosity, total organic content, and grain size. The results of these analyses are presented in Table 12 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. Redox readings were taken according to the NSDFA Standard Operating Procedures (SOP) and immediately followed by sulphide measurements (NSDFA 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 13:00 and 14:36 on June 9, 2023. Two probes were calibrated and used to analyze the samples. The results of the five-point calibrations are in Appendix G. The calibration temperatures were 21.2°C and 21.3°C.

3.5 *Video Surveillance Methods*

Video footage was recorded using a J.W. Fisher Camera System, which was mounted perpendicular to the seafloor in an aluminum frame. A 0.25-m^2 quadrat was visible in the field of view as a size reference. 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 continued with 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 a 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. SI-1 Benthic Log

Sampling Date:	June 8th, 2023
Water Body:	Aspotogan Harbour
Lease Name and Number:	Saddle Island #1006
Water Temperature (°C)	7.7°C
Wind Direction and Speed:	Light
Wave Action:	Calm
Current Direction & Speed:	Light
Tide Schedule:	Low @ 6:41 (0.1m); High @ 12:31 (1.6m)
Vessel:	Carolina Skiff

Lease # or Reference Site:	#1006						**Station Comments:** All samples collected came from acceptable grabs.
Video Start Time:	8:40 AM						
Recorder Name(s):	[redacted]						
Sample Collector's Name(s)	**Sediment Sampler:** [redacted] **Syringe Sampler:** [redacted]						**Video Notes:** Hard packed brown sand; insignificant *Beggiatoa*-like bacteria (<5%); shells; detritus; low visibility
Sampling Station ID:	SI-1						
Gear Present on Bottom	N/A						
Dist. and Dir. from Waypoint:	3 m @ 256°						
Sampling Coordinates:	N44.50791 W64.04569						**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):	20.9						
Video (Y/N):	Y						
Number of Collection Attempts:	3						
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	SI-1 (1)	Brown sand, shell debris	None	11	Shrimp
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab	0.38	Y	SI-1 (2)	Brown sand, shell debris	None	6	Shrimp
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab	0.44	Y	SI-1 (3)	Brown sand, shell debris	None	9.5	Shrimp

Table 6. SI-2 Benthic Log

Lease # or Reference Site:	#1006						**Station Comments:** All samples collected came from acceptable grabs.
Video Start Time:	9:16 AM						
Recorder Name(s):	[redacted]						
Sample Collector's Name(s)	**Sediment Sampler:** [redacted] **Syringe Sampler:** [redacted]						**Video Notes:** Hard packed brown sand, shells; winter flounder (rare); jonah crab (rare); sea raven (rare); ctenophore (rare); detritus
Sampling Station ID:	SI-2						
Gear Present on Bottom	Sunken tag buoy						
Dist. and Dir. from Waypoint:	5 m @ 124°						
Sampling Coordinates:	N44.50506 W64.04339						**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):	21.7						
Video (Y/N):	Y						
Number of Collection Attempts:	3						
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	0.47	Y	SI-2 (1)	Brown sand, shell debris	None	11	Quahog (rare)
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab	0.54	Y	SI-2 (2)	Brown sand, shell debris	None	9	Artemia (some)
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab	0.48	Y	SI-2 (3)	Brown sand, shell debris	None	10	Artemia (some), worm tube (rare)

Table 7. SI-3 Benthic Log

Lease # or Reference Site:	#1006						**Station Comments:** All samples collected came from acceptable grabs.
Video Start Time:	9:49 AM						
Recorder Name(s):	[redacted]						
Sample Collector's Name(s)	**Sediment Sampler:** [redacted] **Syringe Sampler:** [redacted]						**Video Notes:** Hard packed brown sand, gravel, shells; sand dollar (common), detritus
Sampling Station ID:	SI-3						
Gear Present on Bottom	N/A						
Dist. and Dir. from Waypoint:	3 m @ 44°						
Sampling Coordinates:	N44.50141 W64.05267						**Benthic Descriptor Key:**
Station Depth (m):	13.7						[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:	4						[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	0.52	Y	SI-3 (1)	Brown sand, gravel, shell debris	None	7	Sand dollar (rare), detritus
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab	0.48	Y	SI-3 (2)	Brown sand, gravel, shell debris	None	7	Sand dollar (rare)
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab	0.5	Y	SI-3 (3)	Brown sand, gravel, shell debris	None	7.5	Jonah crab (rare), Ascophyllum (rare)

Table 8. SI-4 Benthic Log

Lease # or Reference Site:	#1006
Video Start Time:	10:22 AM
Recorder Name(s):	[redacted]
Sample Collector's Name(s)	**Sediment Sampler:** [redacted] **Syringe Sampler:** [redacted]
Sampling Station ID:	SI-4
Gear Present on Bottom	N/A
Dist. and Dir. from Waypoint:	6 m @ 339°
Sampling Coordinates:	N44.50430 W64.05483
Station Depth (m):	17.8
Video (Y/N):	Y
Number of Collection Attempts:	3

Station Comments: All samples collected came from acceptable grabs.

Video Notes:
Hard packed brown sand, shells; winter flounder (rare); insignificant *Beggiatoa* -like bacteria (<5%); 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	0.42	Y	SI-4 (1)	Brown sand, shell debris	None	11	Detritus
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab	0.48	Y	SI-4 (2)	Brown sand, shell debris	None	9	
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab	0.48	Y	SI-4 (3)	Brown sand, shell debris	None	12.5	Artemia (rare)

Table 9. SI-REF Benthic Log

Lease # or Reference Site:	Reference	**Station Comments:** All samples collected came from acceptable grabs.Station coordinates on the placard were adjusted to when the camera went into the water. [redacted]
Video Start Time:	10:56 AM	
Recorder Name(s):	[redacted]	
Sample Collector's Name(s)	**Sediment Sampler:** [redacted] **Syringe Sampler:** [redacted]	**Video Notes:**
Sampling Station ID:	SI-REF	Hard packed brown sand, shells; ctenophore (rare); detritus [redacted]
Gear Present on Bottom	None	
Dist. and Dir. from Waypoint:	N/A	
Sampling Coordinates:	N44.50192 W64.05523	**Benthic Descriptor Key:** [redacted]
Station Depth (m):	17.6	[1] *e.g.* Gas bubbles, feed, faeces, sediment: col[redacted]cy
Video (Y/N):	Y	[2] *e.g.* Strong, slight, none
Number of Collection Attempts:	4	[3] *e.g.* Eel grass, kelp, lobster, starfish, *Beggiatoa*, po[redacted]tes, 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] [redacted]
Benthic Replicate 1 (10 mL) 12 L Van Veen Grab	0.48	Y	SI-REF (1)	Brown sand, shell debris	None	5	Artemia (some), detritus
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab	0.48	Y	SI-REF (2)	Brown sand, shell debris	None	5	Artemia (some)
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab	0.46	Y	SI-REF (3)	Brown sand, shell debris	None	6	Skeleton shrimp (rare)

Table 10. SI-5 Benthic Log

Lease # or Reference Site:	#1006						**Station Comments:** All samples collected came from acceptable grabs.
Video Start Time:	11:39 AM						
Recorder Name(s):	[redacted]						
Sample Collector's Name(s)	**Sediment Sampler:** [redacted]			**Syringe Sampler:** [redacted]			**Video Notes:** Moderately packed brown sand, shells; winter flounder (some); detritus
Sampling Station ID:	SI-5						
Gear Present on Bottom	Rope drubber						
Dist. and Dir. from Waypoint:	6 m @ 339°						
Sampling Coordinates:	N44.50469 W64.04922						**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):	19						
Video (Y/N):	Y						
Number of Collection Attempts:	3						
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	0.56	Y	SI-5 (1)	Brown sand, shell debris	None	11	Bryozoan (rare), detritus
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab	0.63	Y	SI-5 (2)	Brown sand, shell debris	None	12.5	Bryozoan (rare), whelk (rare), coil worms (some), detritus
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab	0.56	Y	SI-5 (3)	Brown sand, shell debris	None	11	Bryozoan (rare), detritus

Table 11. 2023 redox and sulphide results for baseline sampling from site #1006

Site #1006 – Saddle Island

Sample Collection: June 8, 2023 08:40 – 12:10
Sample Analysis: Redox: June 9, 2023 13:20 - 15:05
Sulphides: June 9, 2023 13:26 - 15:21

Sample I.D.		Sample Temp	Redox	Redox	Sulphide	
Station	ID #	°C	mV	mVNHE	µM	mV
SI-1	1	12.8	38.0	249	103	-855.9
	2	12.0	272.2	484	32.7	-840.9
	3	8.2	242.7	459	145	-860.2
Means		11.0	184.3	**397**	**93.6**	-852.3
SI-2	1	6.6	88.8	306	130	-858.8
	2	7.0	249.6	467	68.0	-850.4
	3	10.1	156.5	370	66.0	-850.0
Means		7.9	165.0	**381**	**88.0**	-853.1
SI-3	1	5.9	66.8	285	41.2	-843.9
	2	10.1	136.4	350	8.31	-822.5
	3	8.6	223.5	439	83.8	-853.2
Means		8.2	142.2	**358**	**44.4**	-839.9
SI-4	1	9.5	75.4	290	35.9	-842.2
	2	6.8	165.3	383	143	-859.8
	3	7.3	72.5	289	137	-859.4
Means		7.9	104.4	**321**	**105**	-853.8
SI-REF	1	7.9	62.8	279	75.8	-851.8
	2	6.9	149.5	367	48.5	-846.0
	3	7.3	45.8	263	104	-855.9
Means		7.4	86.0	**303**	**76.1**	-851.2
SI-5	1	7.1	393.3	610	118	-854.9
	2	4.8	360.4	580	261	-865.4
	3	6.5	150.4	368	280	-866.3
Means		6.1	301.4	**519**	**220**	
			Site Means	**395** mVNHE	**110** µM	

Redox Test Solution (1 & 2 respectively)
Prior to analysis: 221.6 mV & 221.5 mV @ 25°C (13:19 & 14:56)
Post analysis: 222.0 mV & 221.6 mV @ 25°C (14:34 & 15:07)

Sulphide Probe Calibration Temperatures: 21.2 & 21.3°C

Sulphide Probe 1 Calibration (AX1-22299):

Standard	mV
100	-855.4
500	-876.3
1000	-884.1
5000	-902.4
10000	-911.1

Sulphide Probe 2 Calibration: (AX1-22300)

Standard	mV
100	-852.8
500	-873.9
1000	-881.3
5000	-900.4
10000	-909.3

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

Figure 4. Graph of mean redox and sulphide values for baseline sampling at site #1006

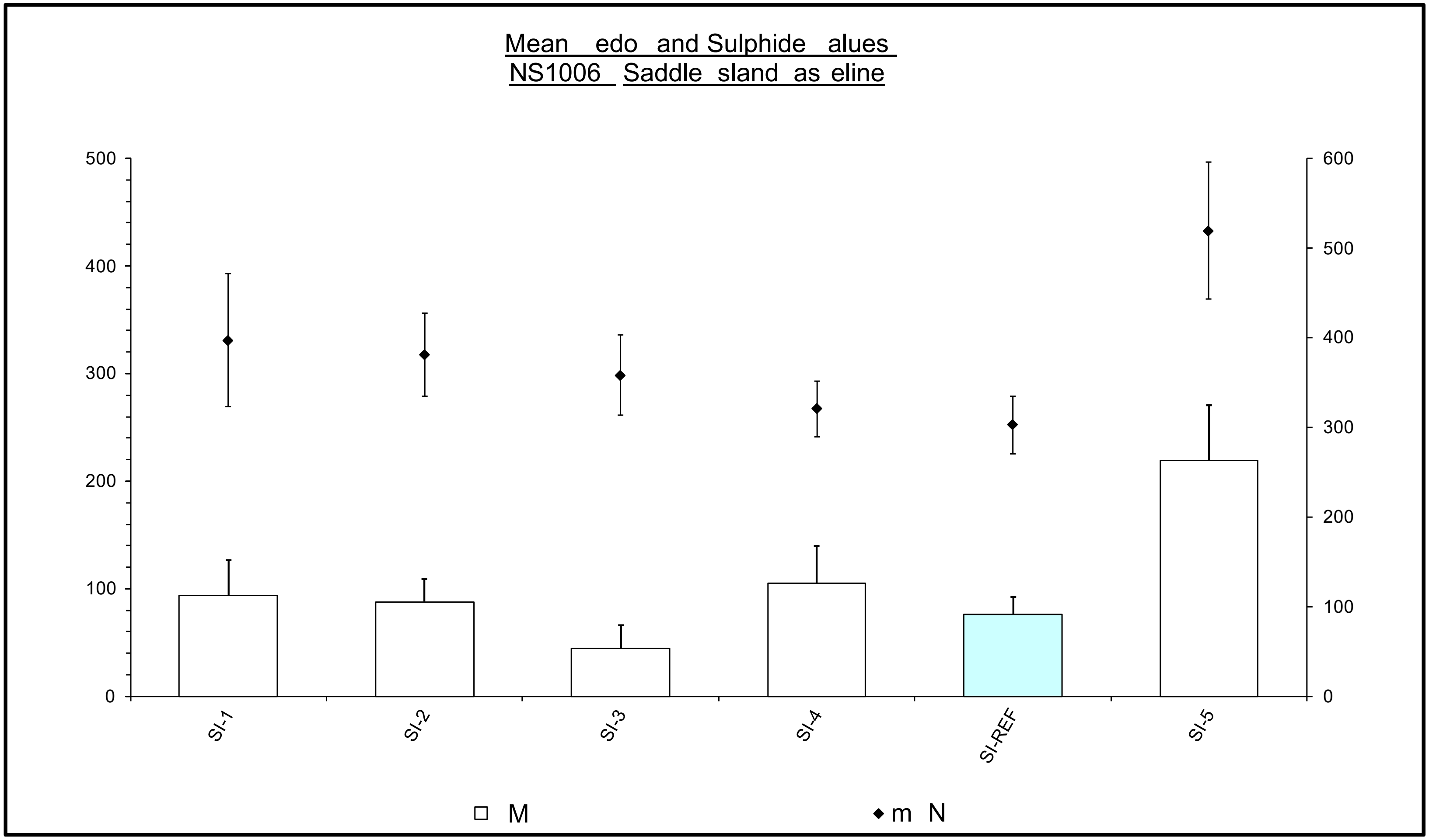


Table 12. 2023 porosity and percent organic matter results for baseline sampling from site #1006

Station	Sample #	Porosity Value (%)	% Organic Matter
SI-1	1	35.49	2.99
SI-1	2	24.74	1.41
SI-1	3	33.54	2.58
SI-2	1	34.50	2.48
SI-2	2	35.84	3.02
SI-2	3	42.97	3.86
SI-3	1	21.98	1.07
SI-3	2	20.71	1.59
SI-3	3	24.24	1.49
SI-4	1	29.06	1.82
SI-4	2	41.88	3.56
SI-4	3	27.74	1.42
SI-REF	1	30.42	1.40
SI-REF	2	29.13	1.80
SI-REF	3	33.82	1.98
SI-5	1	33.65	3.19
SI-5	2	34.05	2.73
SI-5	3	38.26	3.31

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 Saddle Island #1006 lease area in Aspotogan Harbour revealed substrate consisting of mainly hard packed sand and shell debris with some gravel. Grain size analysis results are presented in Appendix F and further support these observations.

Flora and fauna observed in the video footage and in collected grab samples included shrimp, winter flounder, Jonah crab, sea raven, ctenophore, quahog, artemia, worm tube, sand dollar, Ascophyllum, skeleton shrimp, whelk, bryozoan, and coil worm. It is possible that additional macroalgae was present at the site, however most appeared to exist as unattached detritus. *Beggiatoa*-like bacteria was observed in insignificant quantities at stations SI-1, and SI-4. Shell debris was common.

The baseline sampling at site #1006 allowed for a full compliment of sediment samples to be collected and analyzed. Analysis of the sulphide concentration and redox potential of the sediment samples from these stations revealed oxic conditions at each station. The highest sulphide concentration obtained during the baseline assessment was 220 µM at station SI-5, located at the center of the proposed lease. The sulphide concentration at the reference station (SI-REF) was 110 µM.

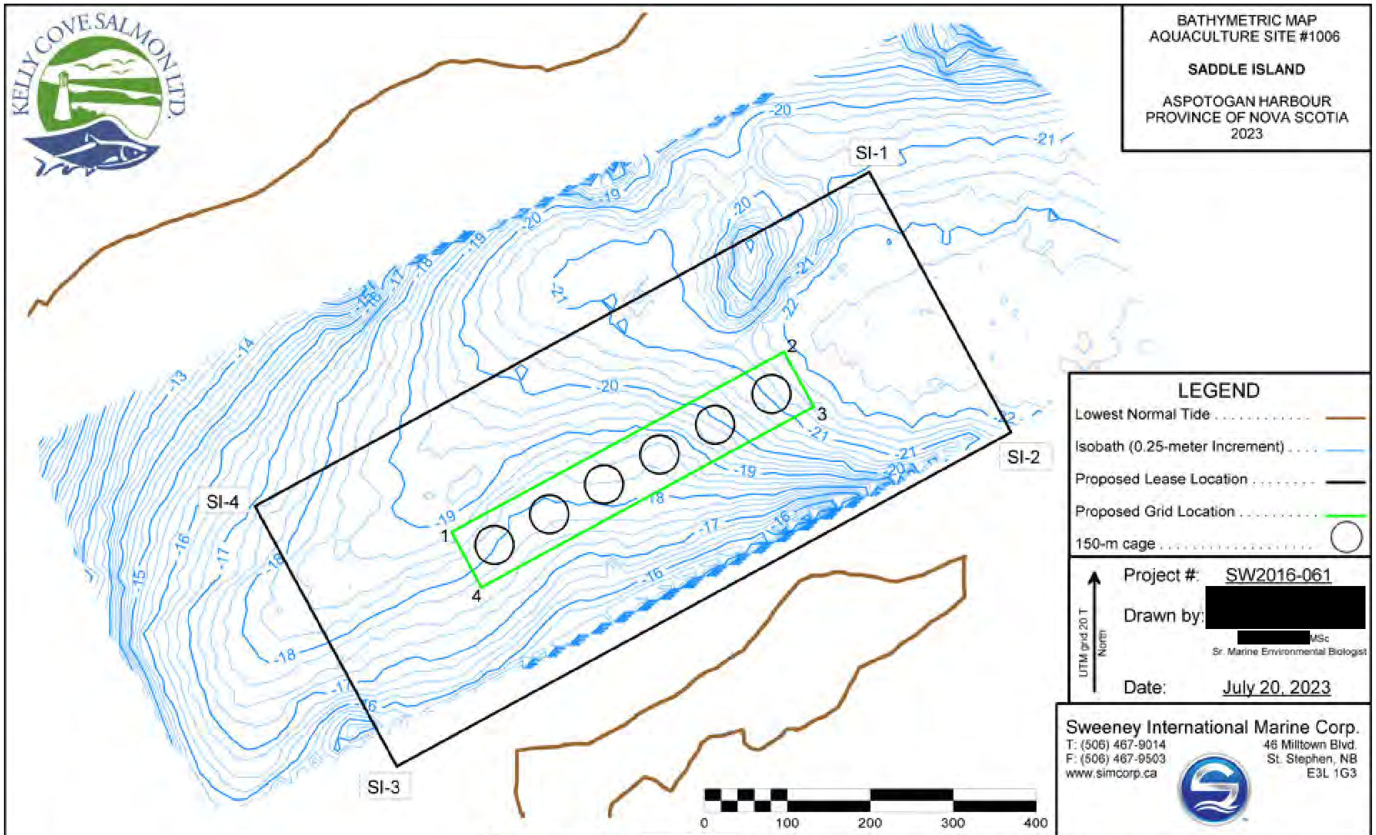
4.0 BATHYMETRIC PROFILING

Bathymetric profiling of the proposed lease area was carried out on April 26, 2023. The data gathered during the scanning was then compiled and a three-dimensional surface map (Fig. 6) and a two-dimensional contour diagram (Fig. 5) were produced by interpolation. Scanning of the Saddle Island area began at the northwest boundary of the proposed lease. Parallel transects were run the length of the proposed lease area, separated by approximately 20 m. 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.*"

A Garmin GPSMAP 7x3/9x3/12x3 and Garmin GT54UHD ultra high-definition sonar combination unit mounted to the vessel and installed as per the manufacturer's specifications was used to collect bathymetric data. Weather, wind, and wave conditions are always taken into consideration when selecting dates for bathymetric data collection as, light winds and low wave height are necessary for accurate data collection. Vessel speed was also kept below 10 knots to ensure accurate data collection throughout the survey.

Figure 5. Interpolated 2-D bathymetric profile of site #1006 at Saddle Island



Proposed Grid Approximate Coordinates (NAD83)		
1	47° 46.655'	55° 52.655'
2	47° 46.769'	55° 52.352'
3	47° 46.721'	55° 52.311'
4	47° 46.603'	55° 52.614'

Proposed Lease Approximate Coordinates (NAD83)		
SI-1	44° 30.464'	64° 02.748'
SI-2	44° 30.303'	64° 02.613'
SI-3	44° 30.083'	64° 03.162'
SI-4	44° 30.250'	64° 03.297'

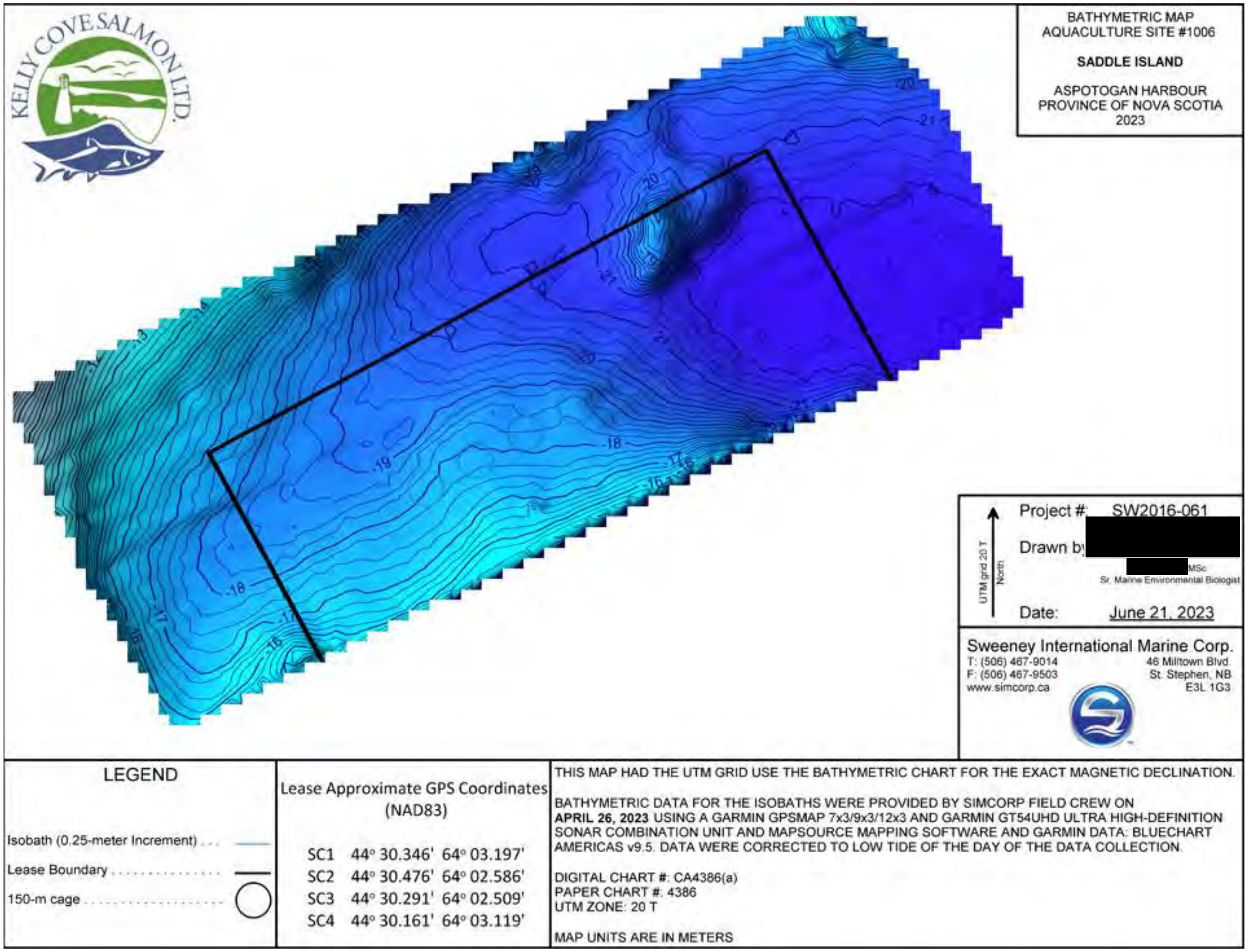
THIS MAP HAD THE UTM GRID USE THE BATHYMETRIC CHART FOR THE EXACT MAGNETIC DECLINATION.

BATHYMETRIC DATA FOR THE ISOBATHS WERE PROVIDED BY SIMCORP FIELD CREW ON **APRIL 26, 2023** USING A GARMIN GPSMAP 7x3/9x3/12x3 AND GARMIN GT54UHD ULTRA HIGH-DEFINITION SONAR COMBINATION UNIT AND MAPSOURCE MAPPING SOFTWARE AND GARMIN DATA: BLUECHART AMERICAS v9.5. DATA WERE CORRECTED TO LOW TIDE OF THE DAY OF THE DATA COLLECTION.

DIGITAL CHART #: CA4386(a)
PAPER CHART #: 4386
UTM ZONE: 20 T

MAP UNITS ARE IN METERS.

Figure 6. Interpolated 3-D bathymetric profile of site #1006 at Saddle Island

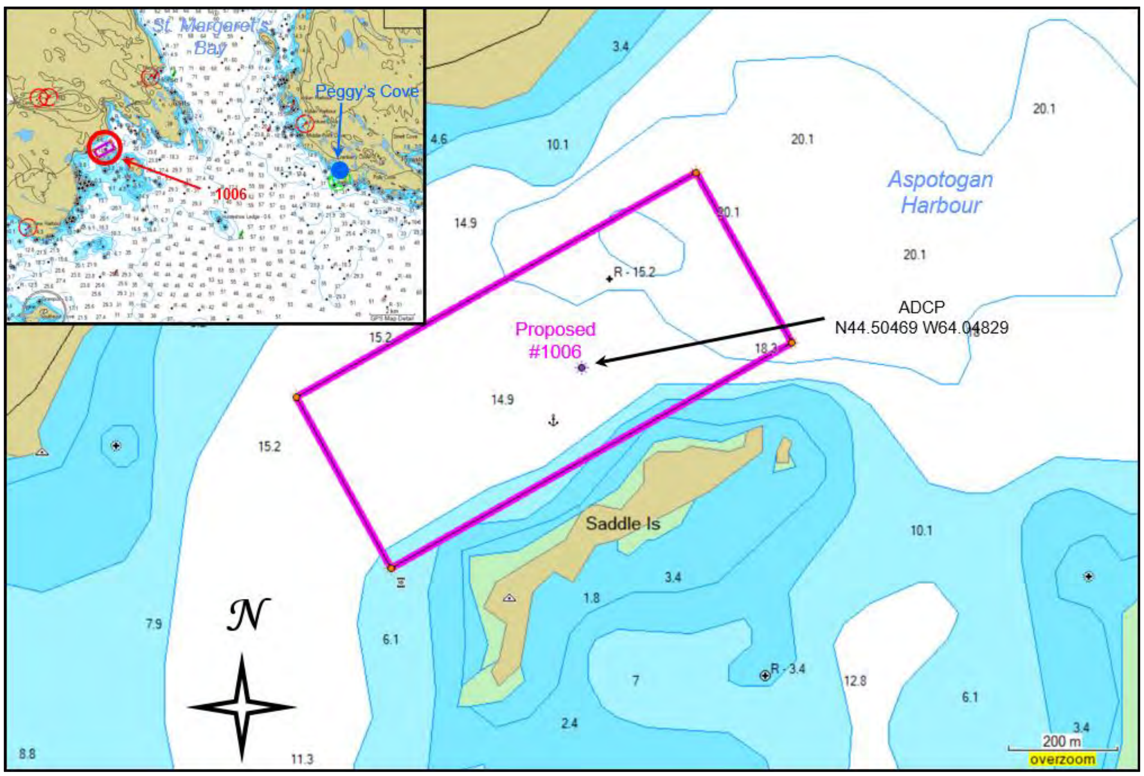


5.0 ACCOUSTIC DOPPLER CURRENT PROFILER

5.1 *Deployment Location*

Measurements of the current speed and direction were collected at Saddle Island (#1006) using a 600-kHz Teledyne RDI Workhorse Sentinel Acoustic Doppler Current Profiler (ADCP) unit deployed by NSDFA (Fig. 7). The meter was deployed in Aspotogan Harbour in approximately 15 m of water. The current meter was deployed at coordinates N44° 30’ 16.884” W64° 02’ 53.844”, which was approximately 40 m away from the nearest aquaculture site gear to avoid distortion of data.

Figure 7. Location of ADCP Deployment at Saddle Island #1006, Aspotogan Harbour, 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 2018a) by following I. Survey for Baseline Information for New Sites and Expansion of Existing Sites to satisfy conditions under “Predicted Contours” in the AA Monitoring Standard (DFO 2018b).

The ADCP unit was deployed on May 10 and retrieved on June 22 of 2023 for a total deployment period of 43 days (Fig. 7). The data set was then trimmed down to represent one full lunar cycle.

5.3 *Deployment Setup and Procedures*

The ADCP was configured to record the current speed and direction of the water column in 0.5-m bins, collecting a profile every ten (10) minutes. Once the unit was recovered, the data was downloaded and assessed for quality by NSDFA and post-processed by SIMCorp Senior Marine Environmental Biologist Tara Daggett. 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 are included in the supplementary material submitted with this report (*Raw Saddle Island.xlsx*).

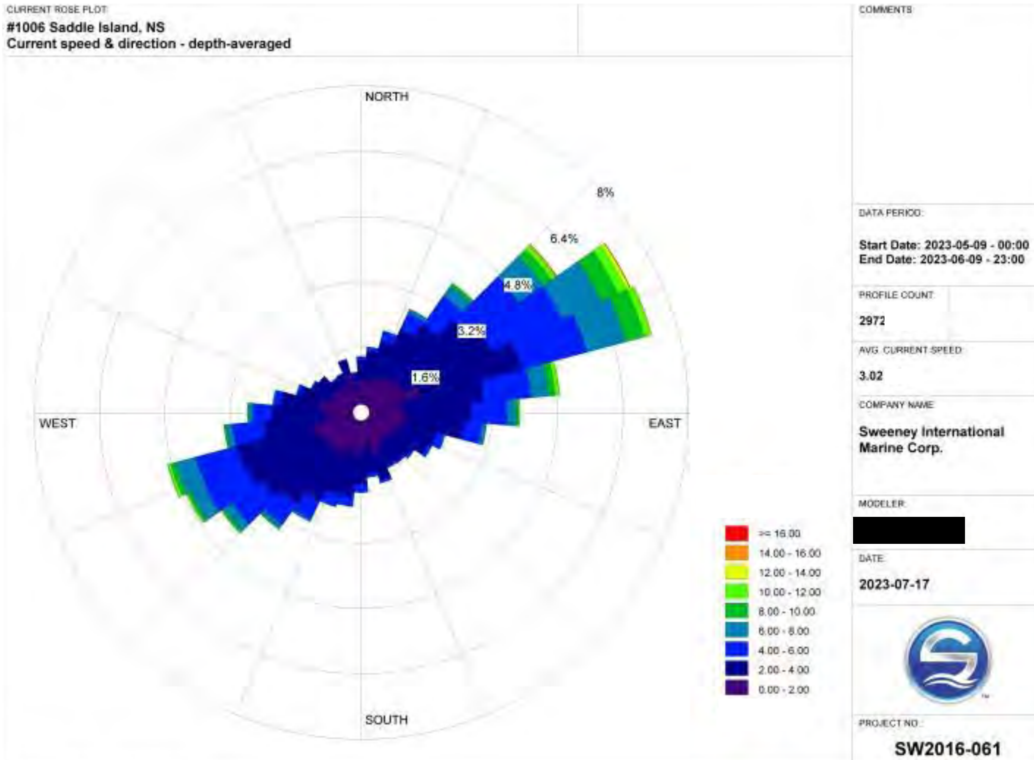
5.4 *Current Speed and Direction Results*

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). The primary directions of water movements displayed by the current roses for all available depths at the Saddle Island location were like the depth-averaged current. Throughout the entire water column, the most common directions of flow were in east to northeast directions, with the most-common categorical mode being 65 to 75 degrees (Table 13).

The depth-averaged current speed was 3.1 cm/s (Fig. 8). Mean current speeds were 2.7 cm/s near bottom and 4.0 cm/s near the surface. The most frequently observed speed class, throughout the water column, was 2.0 - 4.0 cm/s. Current velocities below 5.0 cm/s were observed 84.5% of the time. Current velocities above 10.0 cm/s were only observed 1.3% of the time, with the highest maximum recorded current speeds of 18.7 cm/s present at 15 m above the seafloor (Appendix I, Table 13). Average and maximum current velocities recorded in each depth cell are illustrated in Figure 9. Figure 10 gives a view of the overall current profile 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 14; 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 Saddle Island class the site as a very low energy system, with average current speeds slightly below the minimum recommendation and few measurements at the ideal range. However, near surface currents are generally greater than 2 cm/s (Table 13).

Figure 8. Depth-averaged frequency distribution of current speed and direction at Saddle Island #1006, Aspotogan Harbour, NS



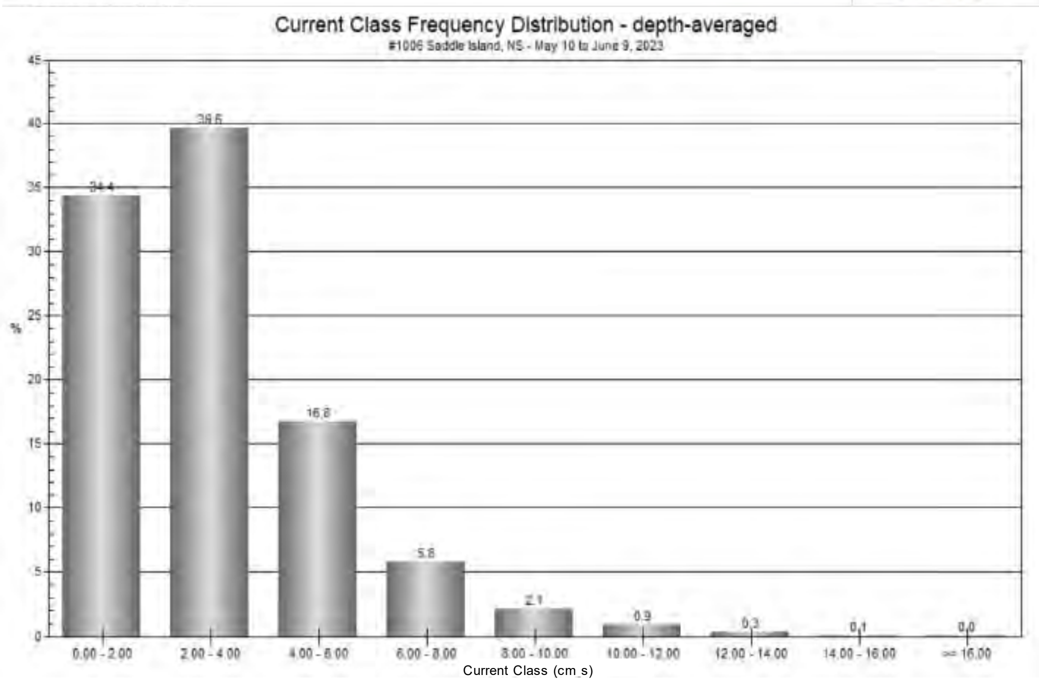


Table 13. Summary of current velocities and directions recorded in each depth cell throughout the water column at Saddle Island #1006, Aspotogan Harbour, NS

		Speed							Direction	Misc.
Distance from Bottom (m)	Distance from Surface (m)	Most Frequent (cm/s)	Minimum (cm/s)	Average (cm/s)	Maximum (cm/s)	< 5.0 cm/s (%)	< 10.0 cm/s (%)	> 15.0 cm/s (%)	Highest Frequency (°)	Data Availibility (%)
2	**16**	2.0 - 4.0	0.1	2.7	10.5	89.3	100.0	0.0	55 - 65	100.0
3	**15**	0.0 - 2.0	0.0	2.6	10.7	90.4	99.9	0.0	55 - 65	100.0
4	**14**	0.0 - 2.0	0.1	2.5	11.0	92.5	99.9	0.0	55 - 65	100.0
5	**13**	0.0 - 2.0	0.0	2.6	12.1	92.3	99.7	0.0	55 - 65	100.0
6	**12**	2.0 - 4.0	0.0	2.7	12.4	91.3	99.6	0.0	65 - 75	100.0
7	**11**	2.0 - 4.0	0.0	2.8	14.4	87.7	99.5	0.0	55 - 65/65 - 75	100.0
8	**10**	2.0 - 4.0	0.0	2.9	13.3	86.7	99.4	0.0	65 - 75	100.0
9	**9**	2.0 - 4.0	0.0	3.0	13.3	85.8	99.3	0.0	65 - 75	100.0
10	**8**	2.0 - 4.0	0.0	3.1	16.5	83.5	99.2	0.02	65 - 75	100.0
11	**7**	2.0 - 4.0	0.0	3.4	14.4	79.3	98.5	0.0	65 - 75	100.0
12	**6**	2.0 - 4.0	0.0	3.5	15.5	77.3	97.6	0.05	55 - 65	100.0
13	**5**	2.0 - 4.0	0.0	3.6	17.0	77.4	97.2	0.1	65 - 75	100.0
14	**4**	2.0 - 4.0	0.0	3.7	16.7	76.1	97.0	0.2	65 - 75	100.0
15	**3**	2.0 - 4.0	0.0	4.0	18.7	72.5	94.6	0.3	55 - 65	100.0
Depth Averaged		**2.0 - 4.0**	**0.0**	**3.1**	**18.8**	**84.5**	**98.7**	**0.05**	**65 - 75**	**100.00**

Figure 9. Average and maximum current velocities recorded in each depth cell throughout the water column at Saddle Island #1006, Aspotogan Harbour, NS

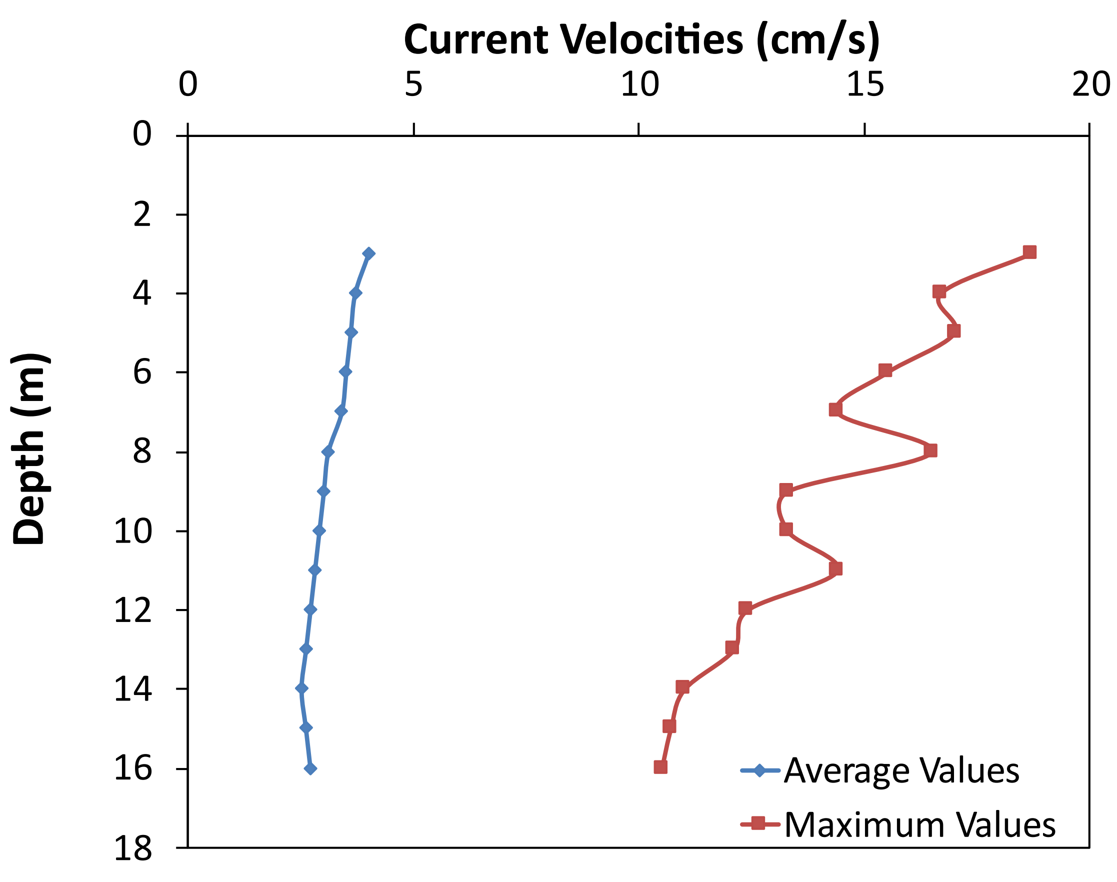


Figure 10. Summary of depth-averaged current speeds and directions at Saddle Island #1006, Aspotogan Harbour, NS

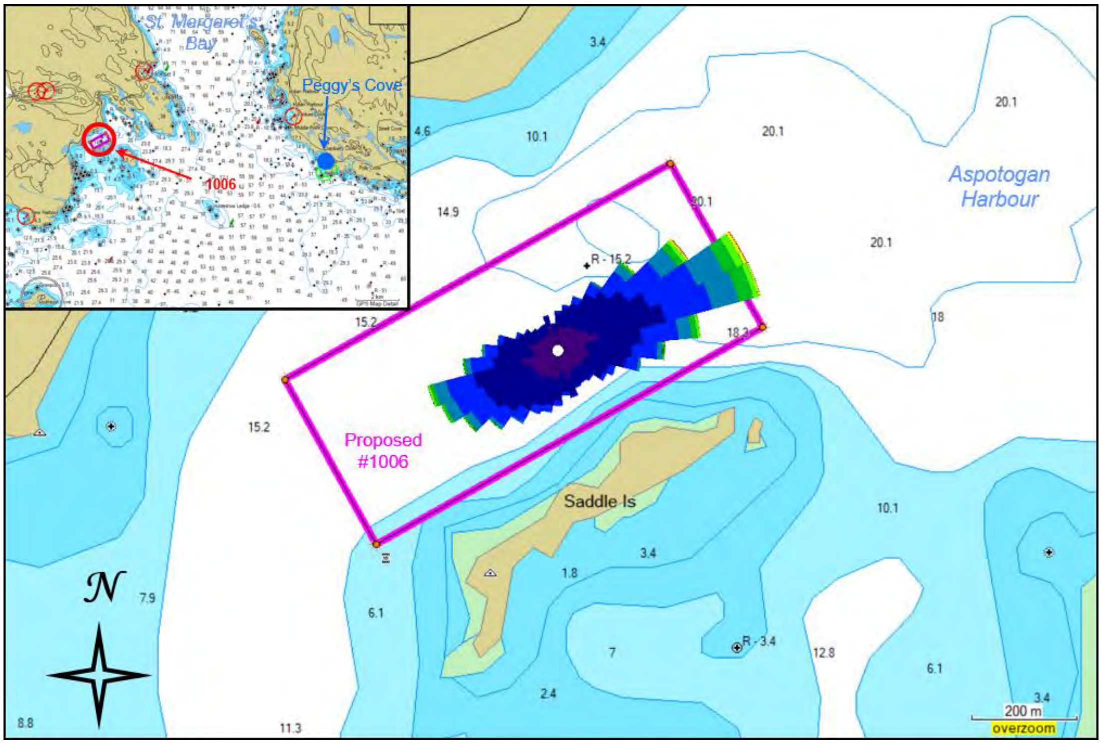


Table 14. Current speed ranges and designations for salmon farming

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

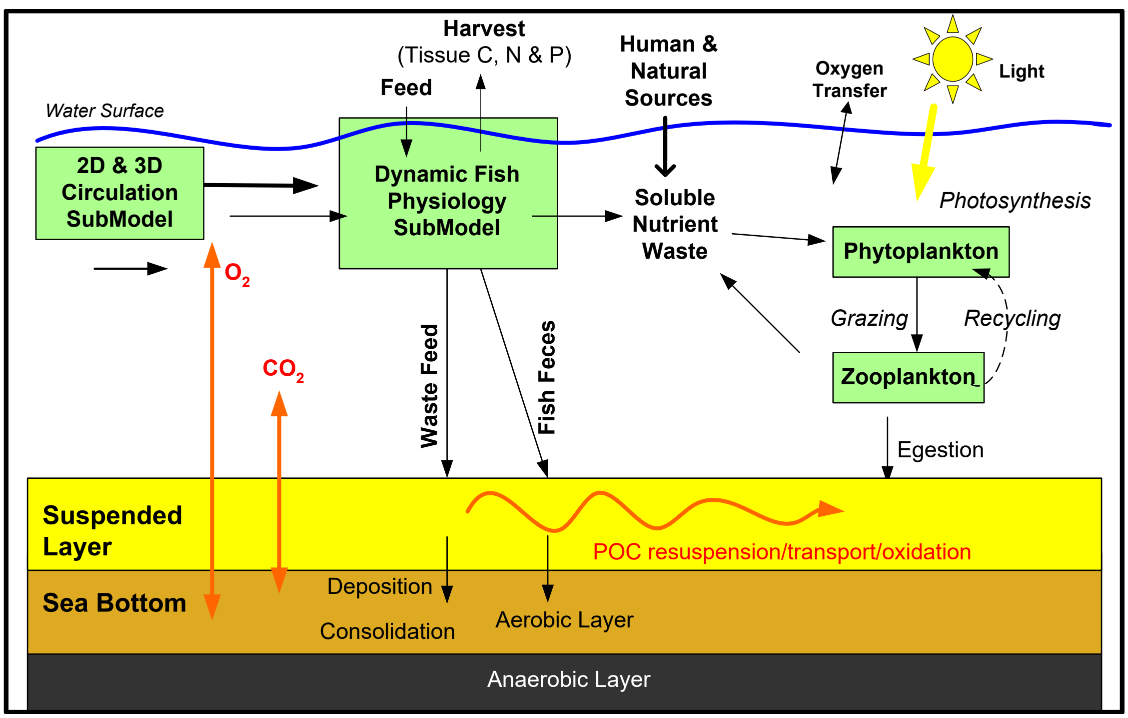
6.0 DEPOSITIONAL MODELING

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 11. 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 Saddle Island #1006 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 (Saddle 2023 bathy.txt) with longitude, latitude, and depth arranged in x, y, z format (i.e., three columns of data). Detailed bathymetry is available in section **4.0 Bathymetric Profiling** of this report. Bathymetry was collected by a vessel mounted transducer. 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 (2023SaddleCurrentsV1.xlsx). One lunar cycle (i.e., 29.5 days) of ADCP data was used to inform the model.

6.2.4 Events Files

For operational effects, an events Excel file (2023SaddleEventsV1.xlsx) was compiled for inputs of estimated mortality and harvesting. Mortalities were based on a 10% loss throughout the production cycle. Beginning in March of the final year of production, harvests were simulated. Approximately 15,000 fish were removed per harvest with 25 harvest events between March 1 and April 30.

Temperature and dissolved oxygen data from the Saddle Island #1006 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 (2023SaddleDO+TempV1.xlsx), which was from May 1, 2024, to April 30, 2026.

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., 200 g) and stocking density (i.e., 0.9102 kg m^{-3}) were specified. Circular cages with a length and width of 42.31 m (i.e., the square root of the cage area) were entered. This is equivalent to a cage with a circumference of 150 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 faecal 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 0.005 (fraction dry weight = 0.5%), which assumes a seafloor composition of predominantly medium-coarse sand. 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.

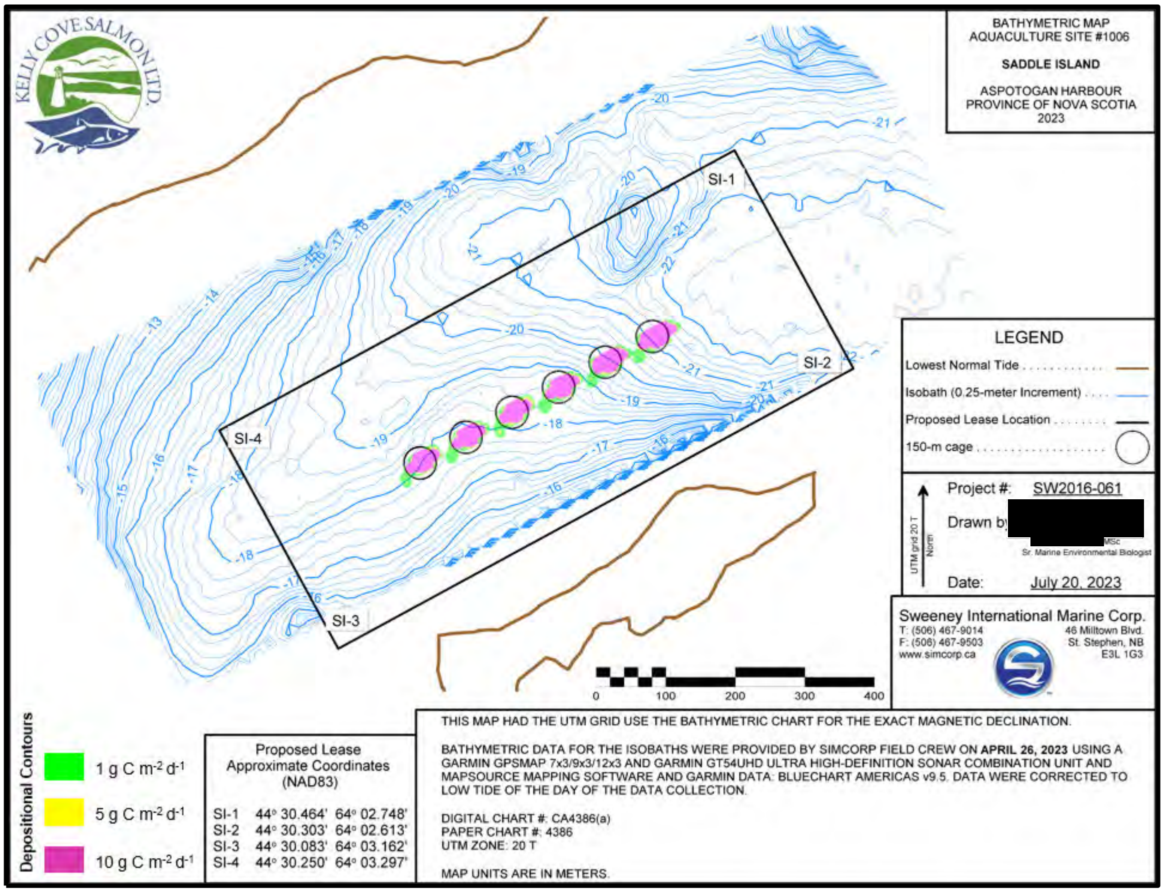
Under the Conditions menu tab, the ambient value of dissolved oxygen was set to 8.0 mg L^{-1} and the surface (mixed) layer depth was set to 40 m for both winter and summer. This depth is greater than the actual water depth, so assumes no stratification of the water column.

6.3 *Model Output*

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

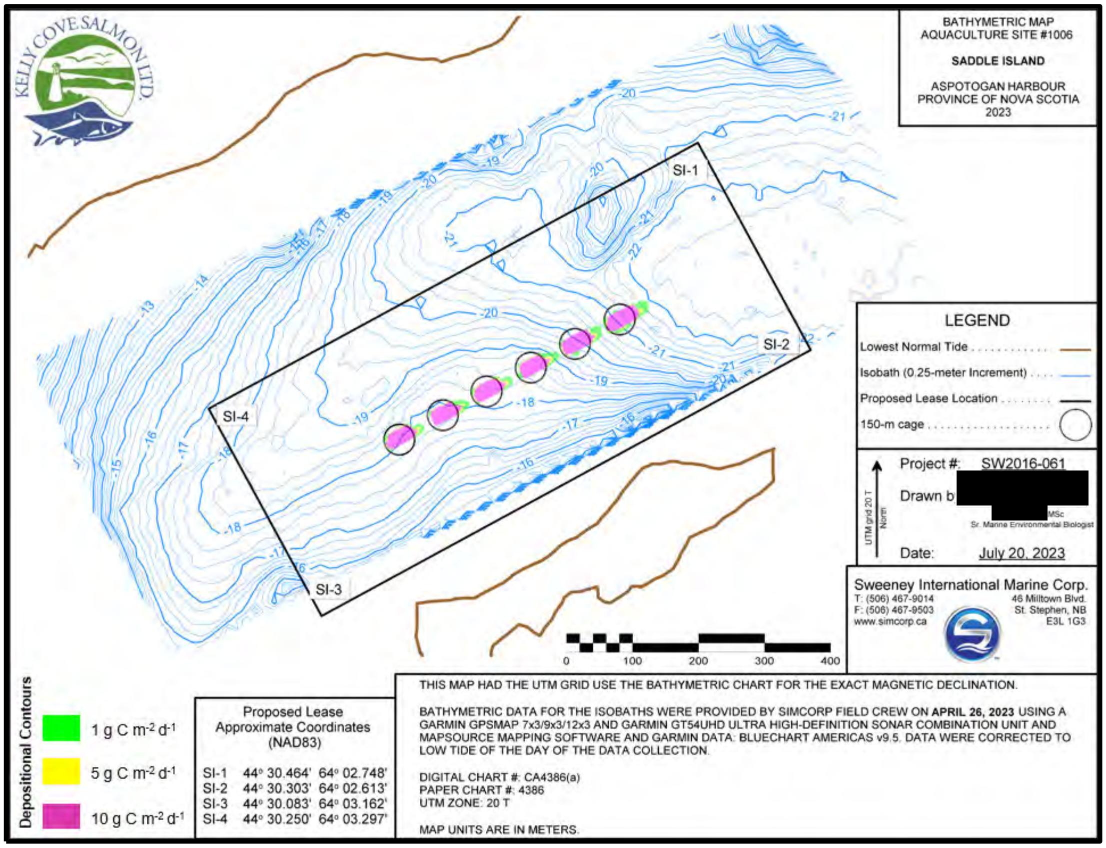
The model was run with a start date of May 1, 2024, and the first harvest occurring March 1, 2026. The date of highest feed use was calculated to occur in September of the second year of production (i.e., 2025). The map of the contours showing the predicted sediment TOC rate of deposition (1, 5, and 10 g C m^{-2} d^{-1}) was captured for this time and is included in Figure 12 below. The 1 g C m^{-2} d^{-1} contour (green) falls directly under and around the cage array, with the highest rate of deposition (pink) occurring to the southeast in the direction of the dominant current. The model shows the contour to extend slightly beyond the lease's northern boundary. Cage positions are represented by black circles.

Figure 12. Predicted TOC rate of deposition for September 15, 2025 (peak feeding)



For comparison, November 11, 2024, was selected to represent the TOC deposition rate during a period of mean feed usage. A map of the depositional contours for this time is shown in Figure 13. The 1 g C m^{-2} d^{-1} contour falls under and around the cage array, as for the peak-feed scenario. The depositional contours remained within the lease at the time of mean feed usage. The biggest difference between peak and mean feed usage is the smaller area covered by the 5 and 10 g C m^{-2} d^{-1} contours at the time of mean feed use.

Figure 13. Predicted TOC rate of deposition for November 11, 2024 (time of mean feed usage)



6.4 *Aquamodel Settings*

The screen shots of Appendix J illustrate the inputs and settings used to run the model for Saddle Island aquaculture site #1006. 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 Saddle Island (#1006) 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 data to satisfy the fish and fish habitat component of the baseline assessment were collected by SIMCorp Marine Environmental Biologist [redacted], BSc, EPt, with assistance from field technicians [redacted], [redacted], and [redacted] on June 8, 2023, after the benthic substrate sampling was completed.

The fish and fish habitat survey carried out at the proposed Saddle Island #1006 site revealed:

- Shell debris and mussel shells were common
- Beds of unattached macroalgae (detritus) which may be acting as short-term habitat
- No sensitive species were present
- No species at risk were present

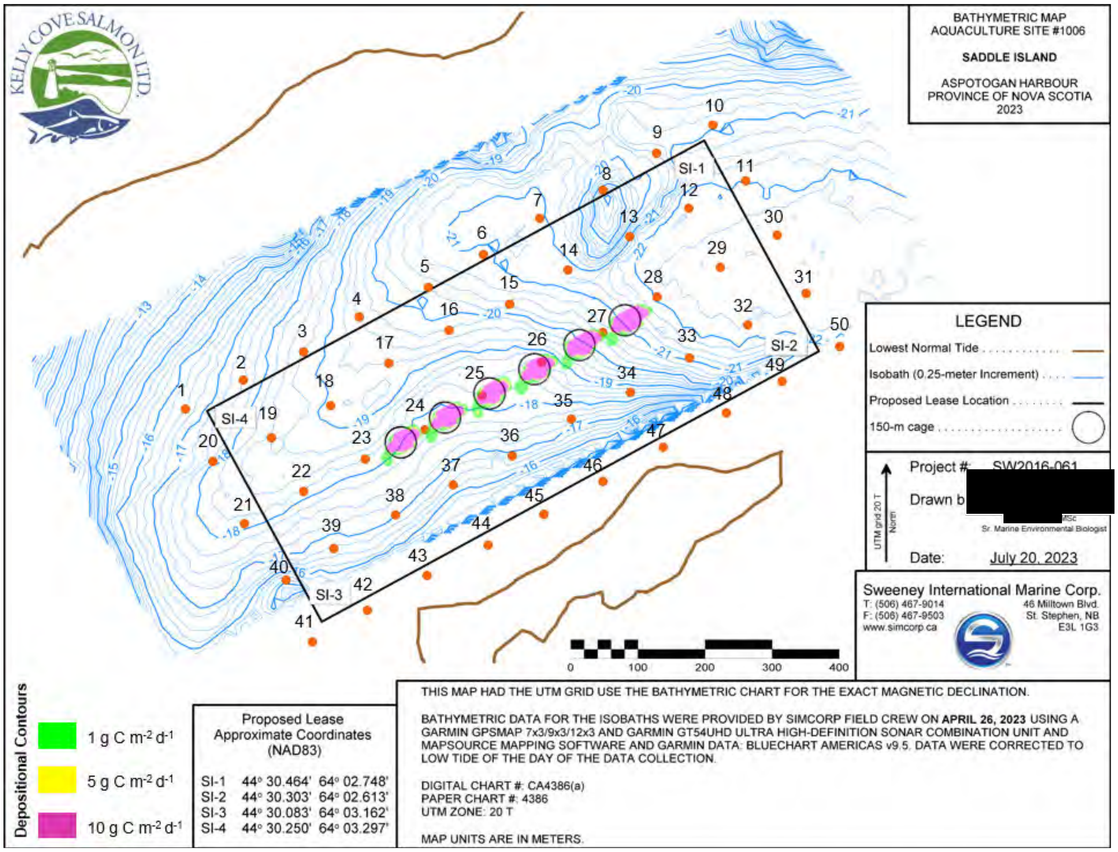
7.2 *Video Surveillance Methods*

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

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. Observations were compiled in pictorial form to produce a habitat map of the seafloor characteristics as required in the AAR for baseline surveys. The habitat map is in Appendix K.

A total of fifty (50) video stations were arranged in a grid pattern for the purpose of the fish and fish habitat survey (Fig. 14) and were recorded for at least 2 minutes of bottom time. The video stations were spaced approximately 100 m apart across the entire proposed Saddle Island (#1006) lease area, which included the 1 g C m^{-2} d^{-1} depositional area as identified by AquaModel (Section 6.0). In addition, a reference station was located 147 m from the proposed lease boundaries. Analyses of the substrate type, benthic indicators, flora, and fauna were conducted. Abundance estimates were recorded as number of individuals, percent coverage, or relative estimates, depending on the organism being assessed.

Figure 14. Saddle Island video station locations surveyed on June 8, 2023



7.3 *Results*

The substrate at the proposed Saddle Island lease area and inside the 1 g C m^{-2} d^{-1} depositional area consisted of soft and fine substrates. Most of the area surveyed (88%) was characterized by finer substrates such as sand, mud and silt. A few stations also had gravel, cobble, rubble, and boulders in smaller amounts. Shell debris and mussel shells were common.

Large amounts of detritus beds were noted throughout the proposed lease which may be acting as short-term habitat for some species. The detritus beds make it challenging to determine substrate characteristics at some stations.

Screen shots of the seafloor at each station are available in Appendix L. Table 15 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 16 and 17 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 15. List of species (or higher taxonomic level) observed during the fish and fish habitat survey of Saddle Island (#1006)

List of Species Observed		
Algae (Brown)	Encrusting Sponge	Sculpin
Algae (Crustose)	*Fish (Unidentified)*	Sea Colander
Algae (Green)	Lobster	Shrimp
Broadleaf Kelp	*Northern Cerianthid*	Summer Flounder
Common Seastar	Rhodophyta	Winter Flounder
Ctenophore	Sand Dollar	

Table 16. Baseline video observations of substrate type from the Saddle Island survey on June 8, 2023

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	
SBFH1	44 30.253	64 3.318	17.8	12:13	4	K-1	Soft							100%				Detritus bed
SBFH2	44 30.277	64 3.254	18.6	12:17	4	K-1	Soft					5%		95%				Detritus
SBFH3	44 30.300	64 3.186	19.6	12:23	4	K-1	Soft							100%				Detritus bed - much of sediment covered
SBFH4	44 30.329	64 3.124	20.0	12:29	4	K-1	Soft							100%				Substrate characteristics assumed based on previous video - detritus bed covers 100%
SBFH5	44 30.353	64 3.047	21.3	12:38	1	K-1	Soft							100%				Very low visibility due to particulate matter in water column
SBFH6	44 30.380	64 2.986	21.9	12:44	2	K-1	Soft							100%				Low visibility due to particulate in the water column
SBFH7	44 30.410	64 2.922	22.1	12:50	3	K-1	Soft							100%				Slightly low visibility due to particulate in the water column; substrate characteristics assumed based on previous video - detritus bed covers 100%
SBFH8	44 30.433	64 2.852	20.3	12:55	4	K-1	Soft			10%	5%	5%	5%	75%				Detritus
SBFH9	44 30.464	64 2.792	21.5	13:01	4	K-2	Hard			10%	5%	25%	15%	40%	5%			Detritus
SBFH10	44 30.487	64 2.729	22.0	13:33	3	K-2	Soft							100%				Substrate characteristics assumed based on previous video - detritus bed covers nearly 100%; low visibility
SBFH11	44 30.443	64 2.691	22.7	13:38	3	K-2	Soft							100%				Substrate characteristics assumed based on previous video - detritus bed covers 100%; low visibility
SBFH12	44 30.420	64 2.755	22.9	13:45	3	K-2	Soft							100%				Substrate characteristics assumed based on previous video - detritus bed covers 100%; low visibility
SBFH13	44 30.397	64 2.821	21.7	13:50	3	K-2	Hard			40%	20%	10%	10%	15%	5%			Detritus
SBFH14	44 30.369	64 2.890	22.0	13:56	3	K-2	Soft							100%				Detritus; unknown plastic object and rope
SBFH15	44 30.340	64 2.955	21.2	14:04	4	K-2	Soft							90%	10%			Detritus
SBFH16	44 30.319	64 3.022	20.4	14:11	4	K-2	Soft							100%				Detritus
SBFH17	44 30.292	64 3.090	20.0	14:16	4	K-3	Soft							100%				Detritus bed
SBFH18	44 30.257	64 3.155	19.6	14:21	4	K-3	Soft							100%				Substrate characteristics assumed based on previous video - detritus bed covers nearly 100%
SBFH19	44 30.231	64 3.221	19.2	14:26	4	K-3	Soft							100%				Detritus bed - much of sediment covered
SBFH20	44 30.211	64 3.286	18.5	14:31	4	K-3	Soft							100%				Detritus
SBFH21	44 30.161	64 3.250	18.4	14:38	4	K-3	Soft							100%				Detritus
SBFH22	44 30.188	64 3.184	18.6	14:43	4	K-3	Soft							100%				Detritus
SBFH23	44 30.214	64 3.115	18.5	14:48	4	K-3	Soft							100%				Detritus
SBFH24	44 30.239	64 3.048	18.1	14:53	4	K-3	Soft							100%				Detritus bed - much of sediment covered
SBFH25	44 30.267	64 3.984	18.5	14:58	4	K-4	Soft							100%				Detritus bed - much of sediment covered; cage mooring

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 16. Baseline video observations of substrate type from the Saddle Island survey on June 8, 2023 (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	
SBFH26	44	30.294	64	2.918	18.5	15:03	4	K-4	Soft			15%	10%	5%	5%	65%				Detritus; rope
SBFH27	44	30.319	64	2.850	20.8	15:10	4	K-4	Soft							90%	10%			Detritus
SBFH28	44	30.348	64	2.789	22.2	15:15	2	K-4	Soft							100%				Substrate characteristics assumed based on previous video - detritus bed covers 100%; very low visibility
SBFH29	44	30.372	64	2.719	22.7	15:22	1	K-4	Soft							100%				Substrate characteristics assumed based on previous video - detritus bed covers 100%; extremely low visibility
SBFH30	44	30.399	64	2.655	22.4	15:28	1	K-4	Soft							100%				Substrate characteristics assumed based on previous video - detritus bed covers 100%; extremely low visibility
SBFH31	44	30.352	64	2.622	22.6	15:34	1	K-4	Soft							100%				Substrate characteristics assumed based on previous video - detritus bed covers 100%; extremely low visibility
SBFH32	44	30.326	64	2.687	22.2	15:39	2	K-4	Soft							70%	30%			Detritus; very low visibility
SBFH33	44	30.299	64	2.752	21.2	15:44	3	K-5	Soft							60%	40%			
SBFH34	44	30.271	64	2.818	18.8	15:49	4	K-5	Soft							80%	20%			Detritus; chain
SBFH35	44	30.249	64	2.884	17.5	15:54	4	K-5	Soft							100%				
SBFH36	44	30.219	64	2.950	17.0	15:59	4	K-5	Soft							100%				Substrate characteristics assumed based on previous video - detritus bed covers nearly 100%
SBFH37	44	30.195	64	3.016	16.3	16:04	4	K-5	Soft							100%				Detritus
SBFH38	44	30.170	64	3.080	17.0	16:10	4	K-5	Soft							100%				Detritus
SBFH39	44	30.142	64	3.149	16.8	16:15	4	K-5	Hard				5%	25%	20%	50%				Detritus; rope leading to lobster cage
SBFH40	44	30.117	64	3.202	15.8	16:20	4	K-5	Hard				30%	20%	10%	40%				Detritus
SBFH41	44	30.067	64	3.172	12.7	16:25	4	K-6	Soft					25%	10%	65%				Detritus
SBFH42	44	30.093	64	3.110	13.2	16:30	4	K-6	Soft						10%	90%				Detritus
SBFH43	44	30.122	64	3.044	2.5	16:35	4	K-6	Hard		40%	25%	15%	10%	5%	5%				Rope
SBFH44	44	30.147	64	2.975	10.3	16:39	4	K-6	Soft						5%	95%				Mess of ropes, tire, and pipe
SBFH45	44	30.172	64	2.914	12.0	16:43	4	K-6	Soft							80%	20%			Detritus
SBFH46	44	30.199	64	2.848	9.4	16:48	4	K-6	Soft					20%	10%	70%				Detritus; cement block
SBFH47	44	30.227	64	2.780	7.9	16:53	4	K-6	Hard			10%	40%	20%	5%	25%				
SBFH48	44	30.255	64	2.709	13.5	16:56	4	K-6	Soft							100%				Detritus
SBFH49	44	30.281	64	2.647	15.3	17:00	4	K-7	Hard		10%	60%	5%	5%	5%	15%				
SBFH50	44	30.310	64	2.583	21.9	17:07	4	K-7	Soft							100%				Substrate characteristics assumed based on previous video - detritus bed covers nearly 100%
SI-REF	44	30.115	64	2.314	17.6	10:56	4	F-5	Soft							100%				Detritus - covers large portion of bottom

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 17. Baseline video observations of benthic indicators from the Saddle Island survey on June 8, 2023

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 Debris	Mussel Shells	Sed. Color	Flora (%)	Fauna (Abundance) / Flora (% Coverage)	Comments and Observations
SBFH1	44 30.253	64 3.318	17.8	12:13	4	K-1	A		A		A	A	A	P	A	Brown	0%	Winter flounder (1)	Detritus bed, infaunal holes
SBFH2	44 30.277	64 3.254	18.6	12:17	4	K-1	A	<5%	A		A	A	A	P	A	Brown	0%		Detritus, infaunal holes
SBFH3	44 30.300	64 3.186	19.6	12:23	4	K-1	A		A		A	A	A	A	A	Brown	0%		Detirus bed - much of sediment covered
SBFH4	44 30.329	64 3.124	20.0	12:29	4	K-1	A		A		A	A	A	A	A	Brown	0%		Detritus bed covers 100%
SBFH5	44 30.353	64 3.047	21.3	12:38	1	K-1	A		A		A	A	A	P	A	Brown	10%	Rhodophyta (10%)	Very low visibility due to particulate in water column
SBFH6	44 30.380	64 2.986	21.9	12:44	2	K-1	A		A		A	A	A	P	A	Brown	0%		Low visibility due to particulate in the water column
SBFH7	44 30.410	64 2.922	22.1	12:50	3	K-1	A		A		A	A	A	A	A	Brown	0%		Detritus bed covers 100%
SBFH8	44 30.433	64 2.852	20.3	12:55	4	K-1	A		A		A	A	A	P	A	Brown	40%	Broadleaf kelp (20%), Rhodophyta (20%)	Detritus
SBFH9	44 30.464	64 2.792	21.5	13:01	4	K-2	A		A		A	A	A	P	A	Brown	50%	Broadleaf kelp (15%), sea colander (10%), Rhodophyta (25%)	Detritus mixed amongst grounded flora
SBFH10	44 30.487	64 2.729	22.0	13:33	3	K-2	A		A		A	A	A	A	A	Brown	0%		Detritus bed covers nearly 100%; low visibility
SBFH11	44 30.443	64 2.691	22.7	13:38	3	K-2	A		A		A	A	A	A	A	Brown	0%		Detritus bed covers 100%; llow visibility
SBFH12	44 30.420	64 2.755	22.9	13:45	3	K-2	A		A		A	A	A	A	A	Brown	0%		Detritus bed covers 100%; low visibility
SBFH13	44 30.397	64 2.821	21.7	13:50	3	K-2	A		A		A	A	A	P	A	Brown	70%	Shrimp (>100); Brown algae (40%), Rhodophyta (30%)	Detritus
SBFH14	44 30.369	64 2.890	22.0	13:56	3	K-2	A		A		A	A	A	P	A	Brown	0%		Detritus; unknown plastic object and rope
SBFH15	44 30.340	64 2.955	21.2	14:04	4	K-2	A	<5%	A		A	A	A	P	P	Brown	0%		Detritus
SBFH16	44 30.319	64 3.022	20.4	14:11	4	K-2	P	5%	A		A	A	A	P	P	Brown	0%	Shrimp (>20), northern cerianthid (1); Rhodophyta and Brown algae - possibly attached	Detritus
SBFH17	44 30.292	64 3.090	20.0	14:16	4	K-3	P	10%	A		A	A	A	P	P	Brown	0%	Rhodophyta, brown algae, kelp (bullwhip, broadleaf) - possibly attached	Detritus bed
SBFH18	44 30.257	64 3.155	19.6	14:21	4	K-3	A		A		A	A	A	P	A	Brown	0%	Ctenophores (>10)	Detritus bed covers nearly 100%
SBFH19	44 30.231	64 3.221	19.2	14:26	4	K-3	A		A		A	A	A	P	A	Brown	0%		Detritus bed - much of sediment covered
SBFH20	44 30.211	64 3.286	18.5	14:31	4	K-3	A		A		A	A	A	P	P	Brown	0%		Detritus
SBFH21	44 30.161	64 3.250	18.4	14:38	4	K-3	A		A		A	A	A	P	P	Brown	0%		Detritus
SBFH22	44 30.188	64 3.184	18.6	14:43	4	K-3	A		A		A	A	A	P	A	Brown	0%		Detritus, infaunal holes
SBFH23	44 30.214	64 3.115	18.5	14:48	4	K-3	A		A		A	A	A	P	A	Brown	0%		Detritus, infaunal holes
SBFH24	44 30.239	64 3.048	18.1	14:53	4	K-3	P	5%	A		A	A	A	P	A	Brown	0%		Detritus bed - much of sediment covered
SBFH25	44 30.267	64 3.984	18.5	14:58	4	K-4	A		A		A	A	A	P	A	Brown	0%	Winter flounder (3)	Detritus bed - much of sediment covered; cage mooring

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 17. Baseline video observations of benthic indicators from the Saddle Island survey on June 8, 2023

Station (m)	Latitude (dd mm.mmm)	Longitude (dd mm.mmm)	Depth (m)	Time	Video Quality	Figure #	Benthic Indicators					Other Benthic Descriptors or Observations							Comments and Observations
							Bacteria		OPC		Barren (P/A)	Off Gas	Feed	Shell Debris	Mussel Shells	Sed. Color	Flora (%)	Fauna (Abundance) / Flora (% Coverage)	
							P/A	%	P/A	%									
SBFH26	44 30.294	64 2.918	18.5	15:03	4	K-4	A		A		A	A	A	P	A	Brown	15%	Unidentified fish (1); Rhodophyta (5%), Brown algae (10%)	Detritus
SBFH27	44 30.319	64 2.850	20.8	15:10	4	K-4	P	25%	A		A	A	A	P	A	Brown	0%		Detritus
SBFH28	44 30.348	64 2.789	22.2	15:15	2	K-4	A		A		A	A	A	P	P	Brown	0%		Detritus bed covers 100%; very low visibility
SBFH29	44 30.372	64 2.719	22.7	15:22	1	K-4	A		A		A	A	A	P	A	Brown	0%		Detritus bed covers 100%; extremely low visibility
SBFH30	44 30.399	64 2.655	22.4	15:28	1	K-4	A		A		A	A	A	A	A	Brown	0%		Detritus bed covers 100%; extremely low visibility
SBFH31	44 30.352	64 2.622	22.6	15:34	1	K-4	A		A		A	A	A	A	A	Brown	0%		Detritus bed covers 100%; extremely low visibility
SBFH32	44 30.326	64 2.687	22.2	15:39	2	K-4	A		A		A	A	A	P	A	Brown	0%	Shrimp (>20)	Detritus; very low visibility
SBFH33	44 30.299	64 2.752	21.2	15:44	3	K-5	A		A		A	A	A	P	A	Brown	0%		
SBFH34	44 30.271	64 2.818	18.8	15:49	4	K-5	A		A		A	A	A	P	A	Brown	0%		Detritus; chain
SBFH35	44 30.249	64 2.884	17.5	15:54	4	K-5	A	<5%	A		A	A	A	P	A	Brown	0%	Ctenophore (2)	
SBFH36	44 20.219	64 2.950	17.0	15:59	4	K-5	A		A		A	A	A	P	P	Brown	0%		Detritus bed covers nearly 100%
SBFH37	44 30.195	64 3.016	16.3	16:04	4	K-5	A	<5%	A		A	A	A	P	A	Brown	0%		Detritus
SBFH38	44 30.170	64 3.080	17.0	16:10	4	K-5	P	20%	A		A	A	A	P	A	Brown	<5%	Brown algae (<5%)	Detritus
SBFH39	44 30.142	64 3.149	16.8	16:15	4	K-5	A		A		A	A	A	P	A	Brown	10%	Winter flounder (1); Brown algae (5%), crustose algae (5%)	Detritus; rope leading to lobster cage
SBFH40	44 30.117	64 3.202	15.8	16:20	4	K-5	A		A		A	A	A	P	P	Brown	45%	Unidentified fish (1), encrusting sponge (15%); Rhodophyta (5%), crustose algae (25%)	Detritus
SBFH41	44 30.067	64 3.172	12.7	16:25	4	K-6	A		A		A	A	A	P	A	Brown	0%	Winter flounder (1), sand dollar (1)	Detritus
SBFH42	44 30.093	64 3.110	13.2	16:30	4	K-6	A		A		A	A	A	P	P	Brown	0%	Lobster (1), sculpin (1)	Detritus
SBFH43	44 30.122	64 3.044	2.5	16:35	4	K-6	A		A		A	A	A	P	A	Brown	90%	Brown algae (75%), Rhodophyta (5%), Green algae (5%), crustose algae (5%); common seastar (1)	Rope
SBFH44	44 30.147	64 2.975	10.3	16:39	4	K-6	A		A		A	A	A	P	A	Brown	5%	Brown algae (5%)	Mess of ropes, tire, and pipe
SBFH45	44 30.172	64 2.914	12.0	16:43	4	K-6	A		A		A	A	A	P	A	Brown	0%	Winter flounder (1), summer flounder (1)	Detritus
SBFH46	44 30.199	64 2.848	9.4	16:48	4	K-6	A		A		A	A	A	P	A	Brown	0%		Detritus; cement block
SBFH47	44 30.227	64 2.780	7.9	16:53	4	K-6	A		A		A	A	A	P	A	Brown	80%	Brown algae (75%), crustose algae (5%)	
SBFH48	44 30.255	64 2.709	13.5	16:56	4	K-6	A		A		A	A	A	P	A	Brown	0%		Detritus
SBFH49	44 30.281	64 2.647	15.3	17:00	4	K-7	A		A		A	A	A	P	A	Brown	85%	Winter flounder (1); Brown algae (45%), Rhodophyta (40%)	
SBFH50	44 30.310	64 2.583	21.9	17:07	4	K-7	A		A		A	A	A	P	A	Brown	0%		Detritus bed covers nearly 100%
SI-REF	44 30.115	64 2.314	17.6	10:56	4	F-5	A		A		A	A	A	P	A	Brown	0%		Detritus - covers large portion of bottom

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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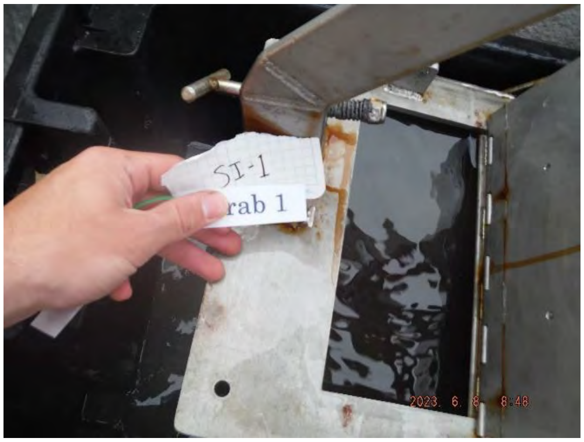
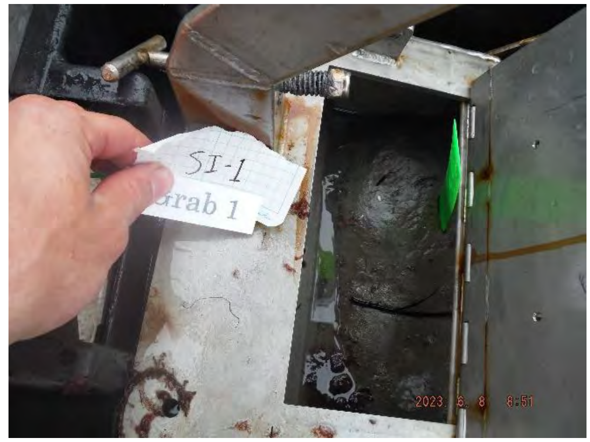
APPENDIX A
Grab Photos

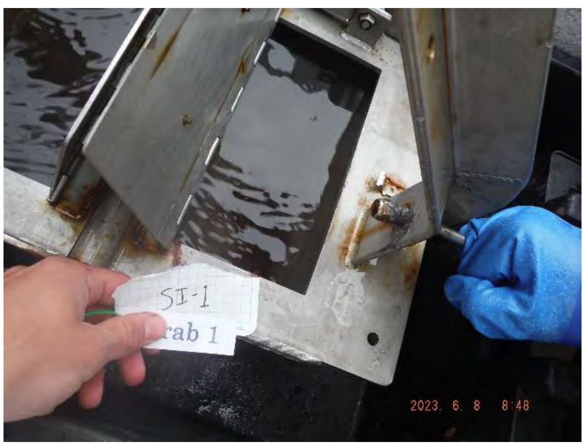
Pre siphon

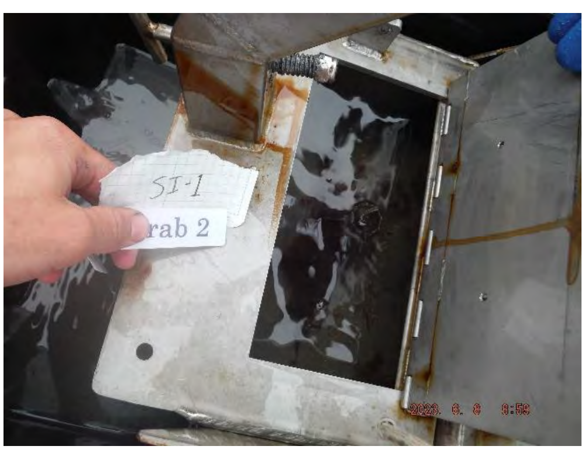
SI-1

Post siphon





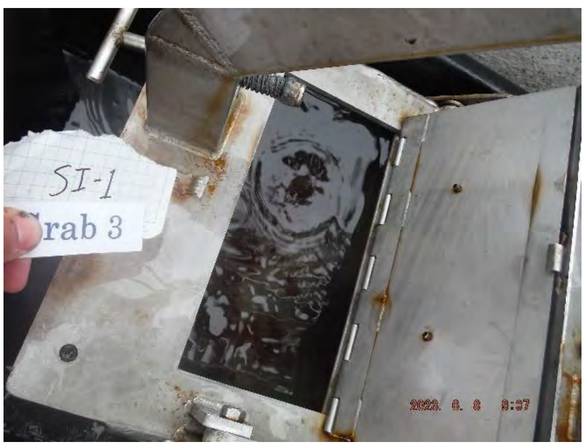


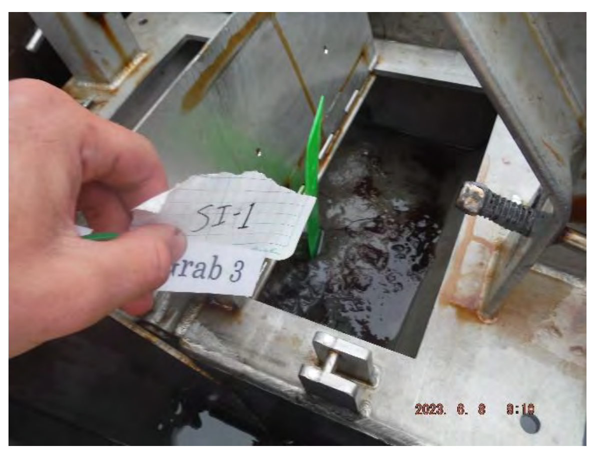


Pre siphon

SI-1 (Continued)

Post siphon

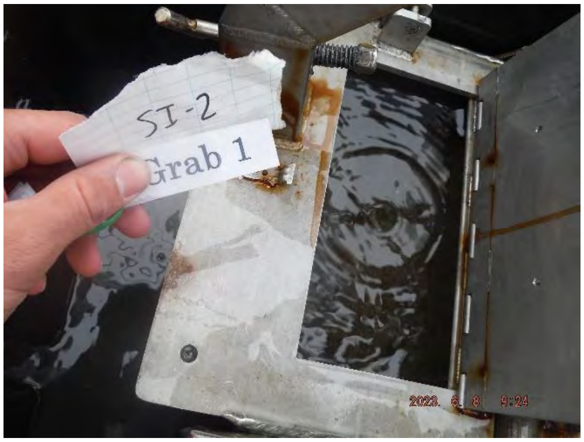




Pre siphon

SI-2

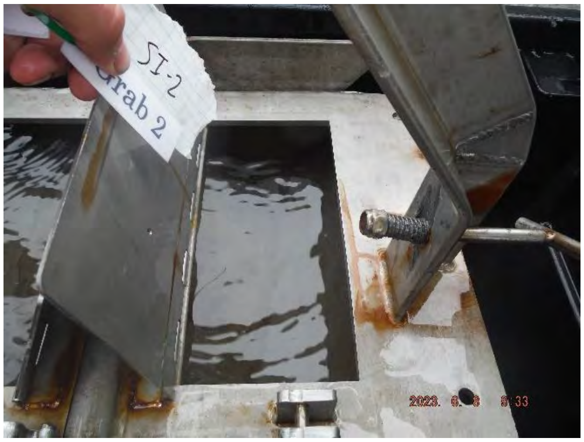
Post siphon



Pre siphon

SI-2 (Continued)

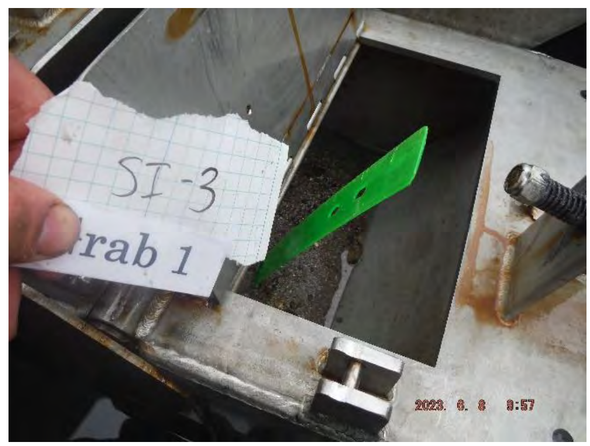
Post siphon



Pre siphon

SI-3

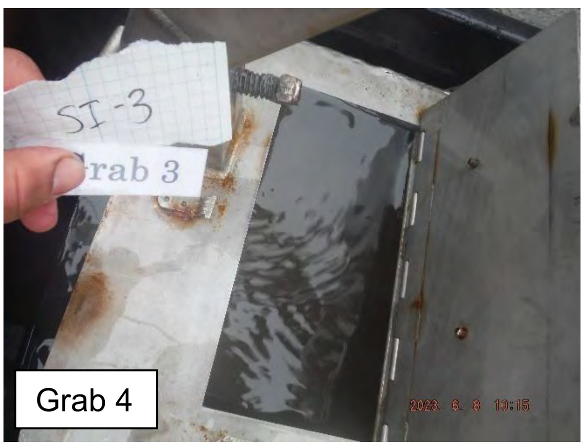
Post siphon



Pre siphon

SI-3 (Continued)

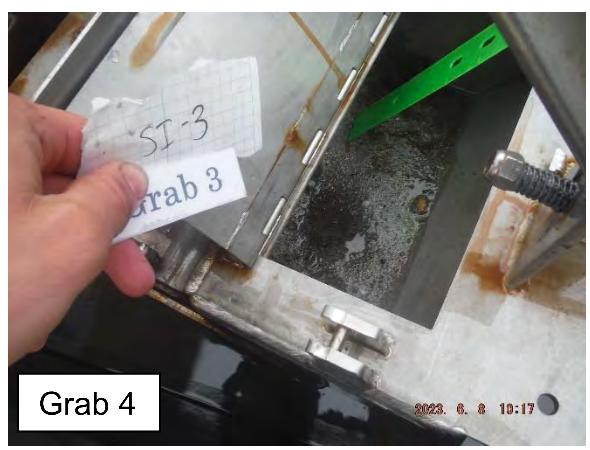
Post siphon



Grab 4

Grab 4

Grab 4

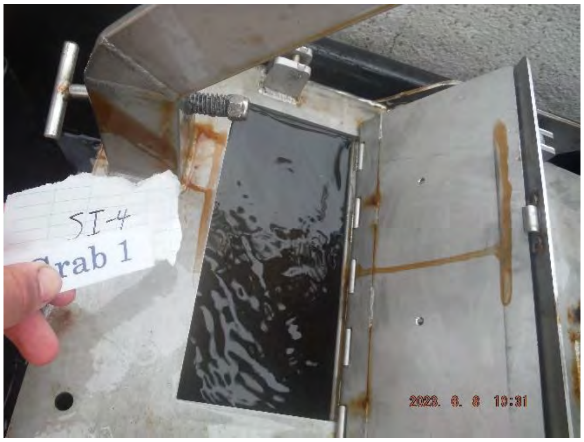


Grab 4

Pre siphon

SI-4

Post siphon



Pre siphon

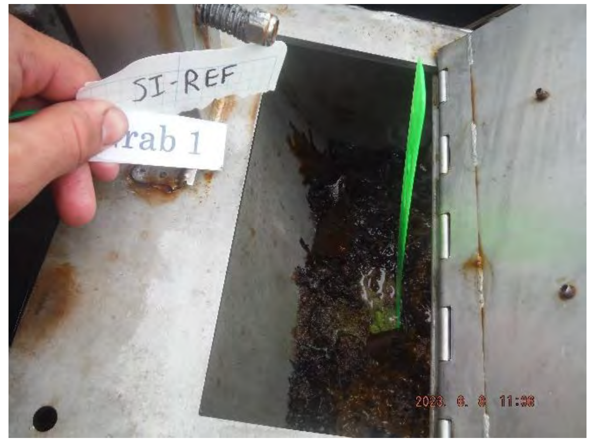
SI-4 (Continued)

Post siphon

Pre siphon

SI-REF

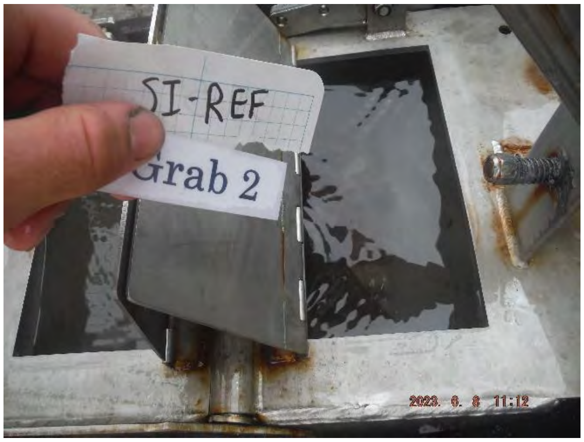
Post siphon

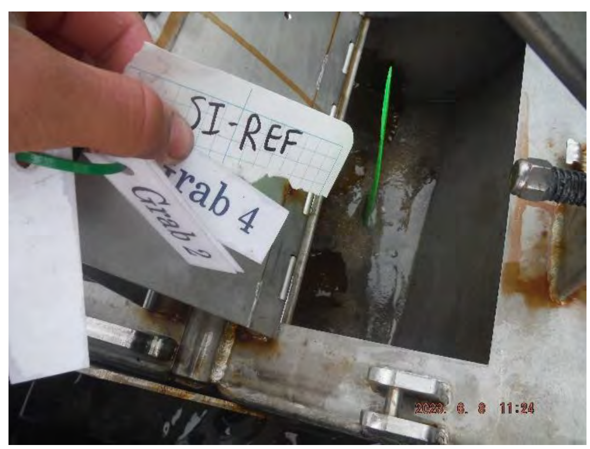


Pre siphon

SI-REF (Continued)

Post siphon

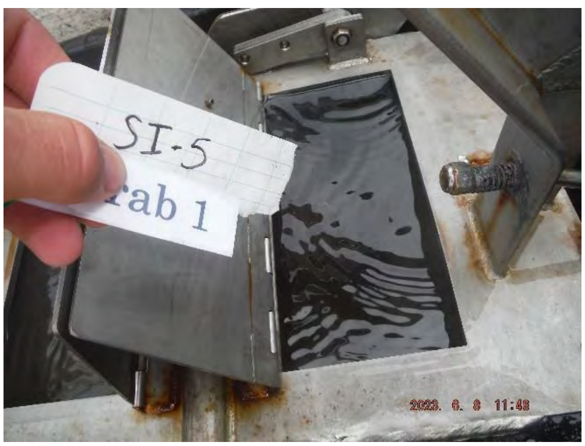




Pre siphon

SI-5

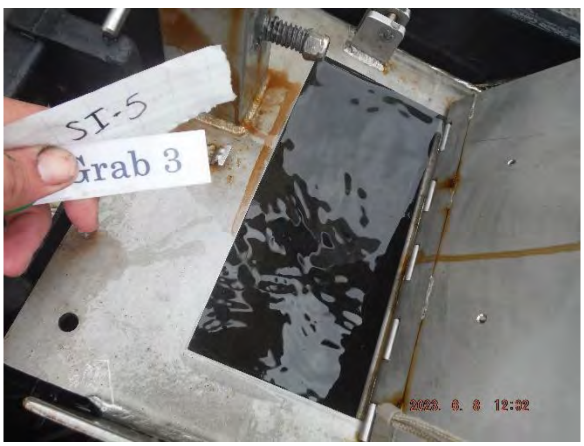
Post siphon



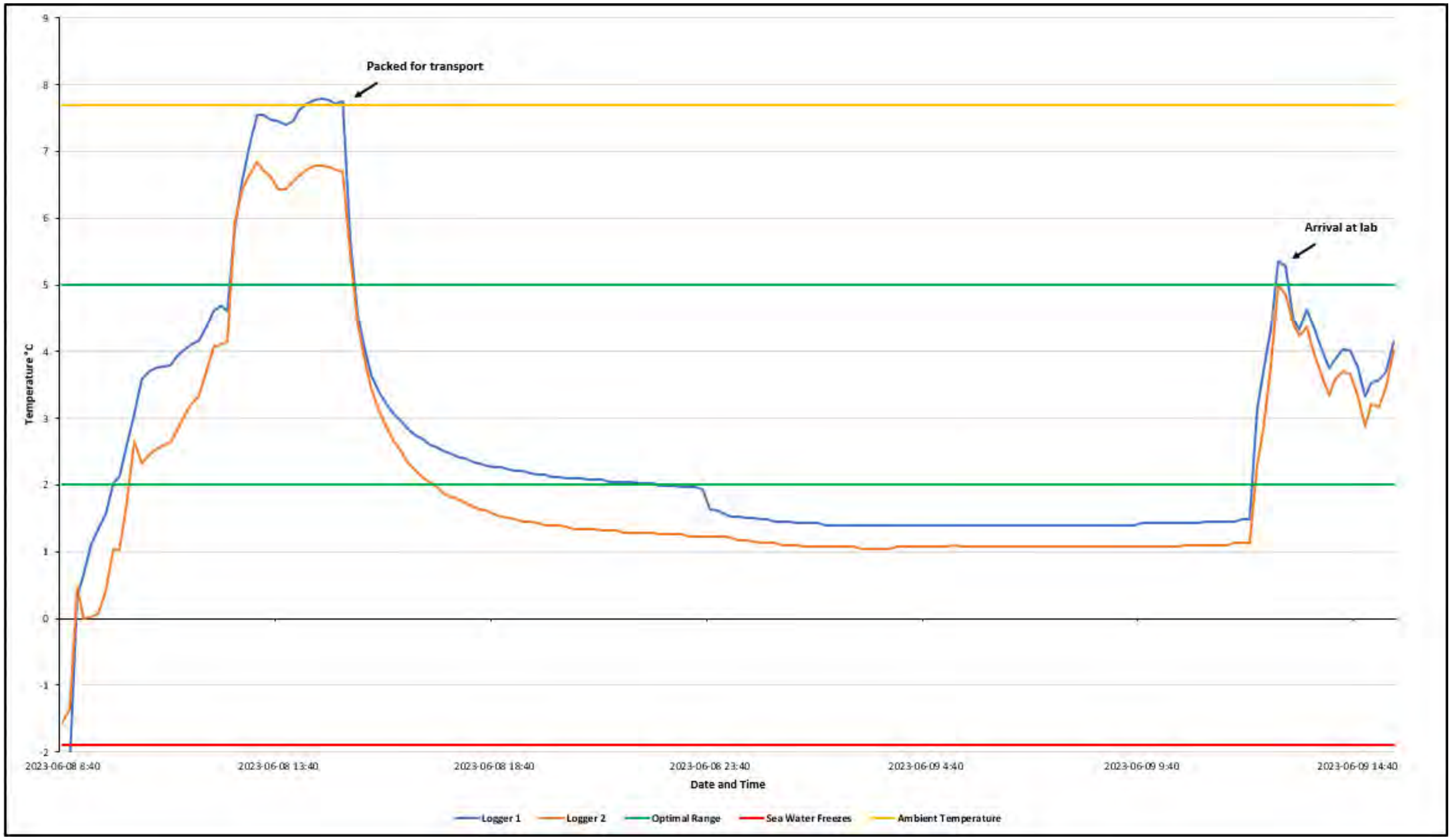
Pre siphon

SI-5 (Continued)

Post siphon



APPENDIX B
Sample Storage Temperatures



Packed for transport
Arrival at lab
Temperature °C
9
8
7
6
5
4
3
2
1
0
-1
-2
2023-06-08 8:40
2023-06-08 13:40
2023-06-08 18:40
2023-06-08 23:40
2023-06-09 4:40
2023-06-09 9:40
2023-06-09 14:40
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)	Flap position	Sediment depths (cm)	Reason for rejecting grab	Free-falls
SI-1	3	1, 2, 3	37, 38, 44	Down	11, 6, 9.5	N/A	No
SI-2	3	1, 2, 3	47, 54, 48	Down	11, 9, 10	N/A	No
SI-3	4	1, 3, 4	52, 48, 50	Down	7, 7, 7.5	2 - grab leaked	No
SI-4	3	1, 2, 3	42, 48, 48	Down	11, 9, 12.5	N/A	No
SI-REF	4	1, 2, 4	48, 48, 46	Down	5, 5, 6	3 - grab leaked	No
SI-5	3	1, 2, 3	56, 63, 56	Down	11, 12.5, 11	N/A	No

Station	Grab Attempt			
	Grab 1	Grab 2	Grab 3	Grab 4
SI-1	VV	VV	VV	-
SI-2	VV	VV	VV	-
SI-3	VV	VV	VV	VV
SI-4	VV	VV	VV	-
SI-REF	VV	VV	VV	VV
SI-5	VV	VV	VV	-

VV = 25 kg Van Veen

Grabs there were subsampled are highlighted in green

APPENDIX D
Redox and Sulphide Data Sheets

SIMCorp Environmental Sciences Lab
A Division of Sweeney International Marine Corp.

120 Milltown Blvd.
St. Stephen, NB
E3L 1G6
Tel: (506) 467-2063
Fax: (506) 467-2101
www.simcorp.ca

Redox and Sulphide Test Report

Site #:	Saddle Island #1006	**Sample Collection:**	08-Jun-23
Redox Start:	1:20pm on 09-Jun-23	**Redox Stop:**	2:32pm on 09-Jun-23
Sulphide Start:	1:26pm on 09-Jun-23	**Sulphide Stop:**	2:50pm on 09-Jun-23

Sample I.D.		Temp	Redox	Sulphide		
Station	ID #	°C	mV	unadjusted µM	mV	adjusted µM
SI-1	1	12.8	38.0	10.3	-855.9	103
	2	12.0	272.2	3.27	-840.9	32.7
	3	8.2	242.7	14.5	-860.2	145
SI-2	1	6.6	88.8	13.0	-858.8	130
	2	7.0	249.6	6.80	-850.4	68.0
	3	10.1	156.5	6.60	-850.0	66.0
SI-3	1	5.9	66.8	4.12	-843.9	41.2
	2	10.1	136.4	0.831	-822.5	8.31
	3	8.6	223.5	8.38	-853.2	83.8
SI-4	1	9.5	75.4	3.59	-842.2	35.9
	2	6.8	165.3	14.3	-859.8	143
	3	7.3	72.5	13.7	-859.4	137
SI-REF	1	7.9	62.8	7.58	-851.8	75.8
	2	6.9	149.5	4.85	-846.0	48.5
	3	7.3	45.8	10.4	-855.9	104

Field Crew: [redacted]

Redox Check (mV):

		Time
Prior to analysis:	221.6 mV @ 25°C	1:19pm
Post analysis:	222.0 mV @ 25°C	2:34pm

Analysis Crew: [redacted]

Sulphide Temp: 21.2°C

Redox reading at 2 minutes
Exceeds calibration limit
Less than Reporting Limit (RL)

Equipment:

Sulphide Analysis

Probe kit:	NSLAB007
Sulphide probe:	AX1-22299
Temperature probe:	T010

Redox Analysis

Meter number:	487142
Redox probe:	R014
Temperature probe:	T007

SAOB + L-AA mixture

Addition: 1:17pm

Expiration: 4:17pm

Signed off by:

[redacted] Dipl. T (Marine Environment), Ept
Laboratory Supervisor

SIMCorp Environmental Sciences Lab
A Division of Sweeney International Marine Corp.

120 Milltown Blvd.
St. Stephen, NB
E3L 1G6
Tel: (506) 467-2063
Fax: (506) 467-2101
www.simcorp.ca

Redox and Sulphide Test Report

Site #:	Saddle Island #1006	**Sample Collection:**	08-Jun-23
Redox Start:	2:57pm on 09-Jun-23	**Redox Stop:**	3:05pm on 09-Jun-23
Sulphide Start:	3:03pm on 09-Jun-23	**Sulphide Stop:**	3:21pm on 09-Jun-23

Sample I.D.		Temp	Redox	Sulphide		
Station	ID #	°C	mV	unadjusted µM	mV	adjusted µM
SI-5	1	7.1	393.3	11.8	-854.9	118
	2	4.8	360.4	26.1	-865.4	261
	3	6.5	150.4	28.0	-866.3	280

Field Crew: [redacted]

Analysis Crew: [redacted]

Redox Check (mV):		**Time**
Prior to analysis:	221.5 mV @ 25°C	2:56pm
Post analysis:	221.6 mV @ 25°C	3:07pm

Sulphide Temp: 21.3°C

Redox reading at 2 minutes
Exceeds calibration limit
Less than Reporting Limit (RL)

Equipment:

Sulphide Analysis		Redox Analysis	
Probe kit:	NSLAB004	**Meter number:**	487142
Sulphide probe:	AX1-22300	**Redox probe:**	R014
Temperature probe:	T009	**Temperature probe:**	T007

SAOB + L-AA mixture

Addition: 2:54pm **Expiration:** 5:54pm

Signed off by:

[redacted] Dipl. T (Marine Environment), Ept
Laboratory Supervisor

APPENDIX E
Porosity and Percent Organic Matter Data Sheets

SIMCorp Environmental Sciences Lab
A Division of Sweeney International Marine Corp.

120 Milltown Blvd.
St. Stephen, NB
E3L 1G6
Tel: (506) 467-2063
Fax: (506) 467-2101
www.simcorp.ca

Porosity and Percent Organic Matter Test Report

Date: 14-Jun-23
File No.: SW2016-061 Saddle Island (#1006)
Site Name/#: Saddle Island #1006
Province: Nova Scotia

Station	Sample Number	% Porosity Value	% Organic Matter
SI-1	1	35.49	2.99
SI-1	2	24.74	1.41
SI-1	3	33.54	2.58
SI-2	1	34.50	2.48
SI-2	2	35.84	3.02
SI-2	3	42.97	3.86
SI-3	1	21.98	1.07
SI-3	2	20.71	1.59
SI-3	3	24.24	1.49
SI-4	1	29.06	1.82
SI-4	2	41.88	3.56
SI-4	3	27.74	1.42
SI-REF	1	30.42	1.40
SI-REF	2	29.13	1.80
SI-REF	3	33.82	1.98
SI-5	1	33.65	3.19
SI-5	2	34.05	2.73
SI-5	3	38.26	3.31

Signed off by:

[redacted]

[redacted] Dipl. T (Marine Environment), Ept
Laboratory Supervisor

APPENDIX F
Sediment Grain-size Analysis

SIMCorp Environmental Sciences Lab
A Division of Sweeney International Marine Corp.

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St. Stephen, NB
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Date: 21-Jun-23
File No.: SW2016-061
Site Name/#: Saddle Island (#1006)
Province: Nova Scotia

Grain Size Analysis

			% Fraction			
		mm	***SI 1-1**	**SI 1-2**	**SI 1-3**	**SI 1 Average**
Gravel	Pebble	>4	0.03	0.003	0.92	0.32
	Granule	2-4	0.14	0.04	0.39	0.19
Sand	Very Coarse	1-2	0.66	0.10	0.52	0.42
	Coarse	0.5-1	0.62	0.27	0.48	0.46
	Medium	0.25-0.5	1.02	1.13	1.02	1.06
	Fine	0.125-0.25	12.05	23.69	18.86	18.20
	Very Fine	0.063-0.125	62.48	67.30	55.17	61.65
Mud	Silt	0.040 - 0.063	11.74	4.03	11.61	9.12
	Clay	0.004 - 0.040	11.26	3.45	11.02	8.58
% Gravel			0.17	0.04	1.32	0.51
% Sand			76.83	92.48	76.05	81.79
% Mud			23.00	7.47	22.63	17.70

***Station SI 1-1** was dry-sieved using pans of grain sizes ranging from 75uM to 1.18mm as well as the lower ranges of 40uM to 75uM (which is not required). This mistake was addressed and did not occur for any other stations or replicates.

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Grain Size Analysis

			% Fraction			
		mm	**SI 2-1**	**SI 2-2**	**SI 2-3**	**SI 2 Average**
Gravel	Pebble	>4	0.10	0.07	0.00	0.06
	Granule	2-4	0.65	0.83	0.15	0.54
Sand	Very Coarse	1-2	0.91	0.58	1.28	0.92
	Coarse	0.5-1	1.43	0.80	1.22	1.15
	Medium	0.25-0.5	5.02	3.38	3.25	3.88
	Fine	0.125-0.25	26.73	31.16	24.81	27.57
	Very Fine	0.063-0.125	46.07	49.67	51.50	49.08
Mud	Silt	0.040 - 0.063	6.88	6.80	8.31	7.33
	Clay	0.004 - 0.040	12.21	6.72	9.47	9.47
% Gravel			0.75	0.90	0.15	0.60
% Sand			80.15	85.58	82.06	82.60
% Mud			19.09	13.52	17.78	16.80

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Grain Size Analysis

			% Fraction			
		mm	**SI 3-1**	**SI 3-2**	**SI 3-3**	**SI 3 Average**
Gravel	Pebble	>4	3.14	6.81	6.99	5.65
	Granule	2-4	5.16	5.94	7.66	6.25
Sand	Very Coarse	1-2	8.20	8.30	8.92	8.47
	Coarse	0.5-1	14.18	17.15	17.44	16.26
	Medium	0.25-0.5	47.41	41.20	40.79	43.14
	Fine	0.125-0.25	13.87	11.32	10.93	12.04
	Very Fine	0.063-0.125	5.35	6.13	4.69	5.39
Mud	Silt	0.040 - 0.063	0.64	0.85	0.47	0.65
	Clay	0.004 - 0.040	2.05	2.30	2.10	2.15
% Gravel			8.30	12.75	14.65	11.90
% Sand			89.00	84.10	82.78	85.29
% Mud			2.70	3.15	2.58	2.81

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Grain Size Analysis

		mm	% Fraction SI 4-1	SI 4-2	SI 4-3	SI 4 Average
Gravel	Pebble	>4	0.12	0.05	0.15	0.11
	Granule	2-4	0.45	0.14	0.21	0.27
Sand	Very Coarse	1-2	0.80	0.52	0.15	0.49
	Coarse	0.5-1	1.26	0.61	0.40	0.76
	Medium	0.25-0.5	2.24	2.26	1.57	2.02
	Fine	0.125-0.25	36.05	38.65	34.93	36.55
	Very Fine	0.063-0.125	50.24	50.21	51.66	50.70
Mud	Silt	0.040 - 0.063	4.78	3.81	5.95	4.84
	Clay	0.004 - 0.040	4.07	3.74	4.98	4.26
% Gravel			0.56	0.20	0.37	0.38
% Sand			90.59	92.26	88.71	90.52
% Mud			8.85	7.54	10.92	9.10

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Grain Size Analysis

			% Fraction			
		mm	**SI REF-1**	**SI REF-2**	**SI REF-3**	**SI REF Average**
Gravel	Pebble	>4	0.03	0.12	0.00	0.05
	Granule	2-4	0.10	0.26	0.11	0.15
Sand	Very Coarse	1-2	0.32	0.37	0.29	0.33
	Coarse	0.5-1	0.80	0.94	0.73	0.82
	Medium	0.25-0.5	2.77	3.46	3.48	3.24
	Fine	0.125-0.25	25.29	30.53	27.49	27.77
	Very Fine	0.063-0.125	61.68	53.54	56.35	57.19
Mud	Silt	0.040 - 0.063	4.76	4.47	4.70	4.64
	Clay	0.004 - 0.040	4.26	6.32	6.84	5.81
% Gravel			0.13	0.38	0.11	0.20
% Sand			90.85	88.84	88.35	89.35
% Mud			9.02	10.79	11.54	10.45

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Grain Size Analysis

			% Fraction			
		mm	**SI 5-1**	**SI 5-2**	**SI 5-3**	**SI 5 Average**
Gravel	Pebble	>4	1.44	0.84	1.44	1.24
	Granule	2-4	1.19	0.83	1.27	1.10
Sand	Very Coarse	1-2	1.01	1.13	1.04	1.06
	Coarse	0.5-1	0.96	1.01	1.24	1.07
	Medium	0.25-0.5	2.48	2.77	2.24	2.50
	Fine	0.125-0.25	21.87	21.47	20.93	21.43
	Very Fine	0.063-0.125	53.66	55.41	52.75	53.94
Mud	Silt	0.040 - 0.063	5.27	5.85	5.37	5.50
	Clay	0.004 - 0.040	12.12	10.69	13.72	12.18
% Gravel			2.63	1.67	2.71	2.34
% Sand			79.98	81.79	78.20	79.99
% Mud			17.39	16.54	19.09	17.67

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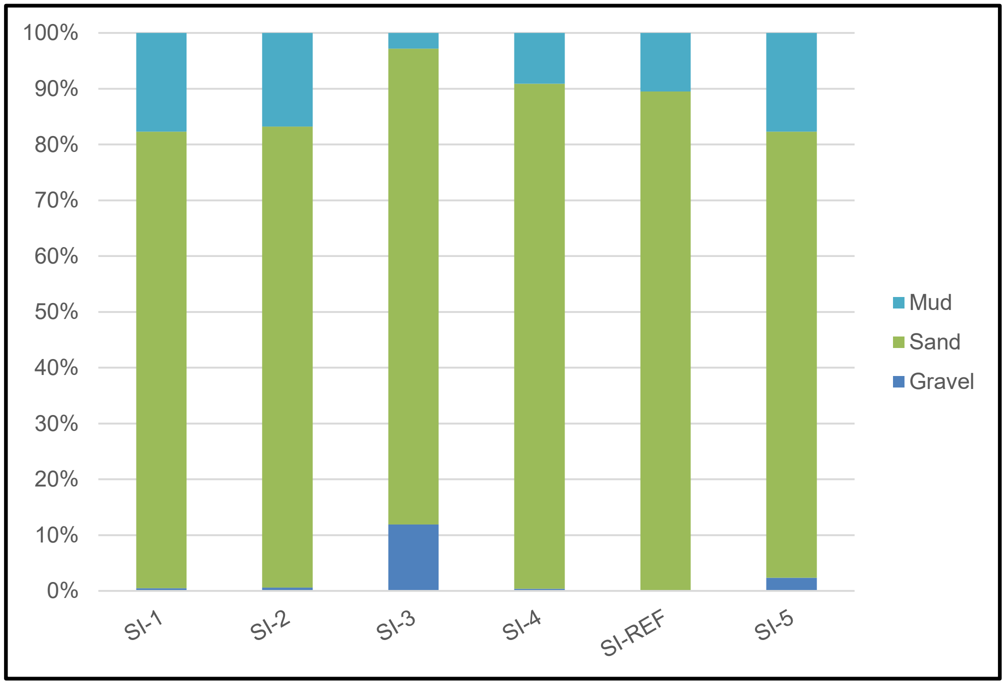

Figure 1: Grain Size Distribution

Signed off by:

[redacted]

[redacted] Dipl. T (Marine Environmental), Ept
Laboratory Supervisor

APPENDIX G
Sulphide Probe Calibration Certificates

SIMCorp Environmental Sciences Lab
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120 Milltown Blvd.
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Calibration Report

Date: 09-Jun-23
Meter: 2059868
Sulfide Probe ID: AX1-22299

Project: SW2016-061 Saddle Island (#1006)

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

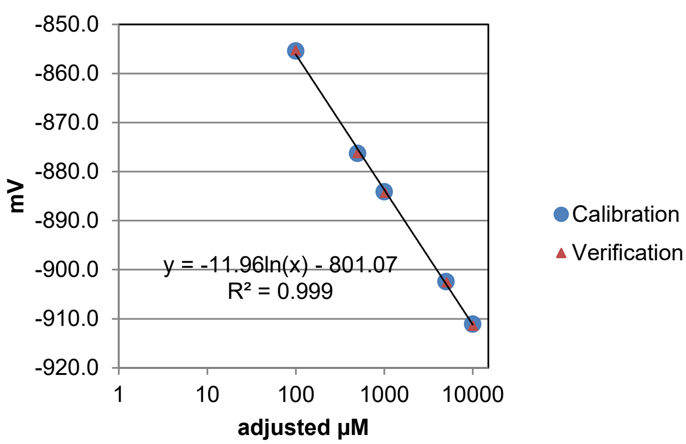
Date calibration performed: 09-Jun-23
Time calibration completed: 1:00pm **Expiration time:** 4:00pm
Calibration performed by: [redacted]

Calibration Temperature: 21.2°C

Calibration -

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

10 µM (really 100 µM)	set at	-855.4 mV	read at	10.0 µM at	-855.3 mV
50 µM (really 500 µM)	set at	-876.3 mV	read at	50.0 µM at	-876.2 mV
100 µM (really 1000 µM)	set at	-884.1 mV	read at	102 µM at	-884.3 mV
500 µM (really 5 000 µM)	set at	-902.4 mV	read at	512 µM at	-902.6 mV
1 000 µM (really 10 000 µM)	set at	-911.1 mV	read at	1010 µM at	-911.4 mV



Final slope (meter) = -29.9 mV

10 fold slope (validation)

500 to 5 000 µM: -26.1 mV
1000 to 10 000 µM: -27.0 mV

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

Signed off by:

[redacted] Dipl. T (Marine Environment), Ept
Laboratory Supervisor

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120 Milltown Blvd.
St. Stephen, NB
E3L 1G6
Tel: (506) 467-2063
Fax: (506) 467-2101
www.simcorp.ca

Calibration Report

Date: 09-Jun-23
Meter: 498090
Sulfide Probe ID: AX1-22300

Project: SW2016-061 Saddle Island (#1006)

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

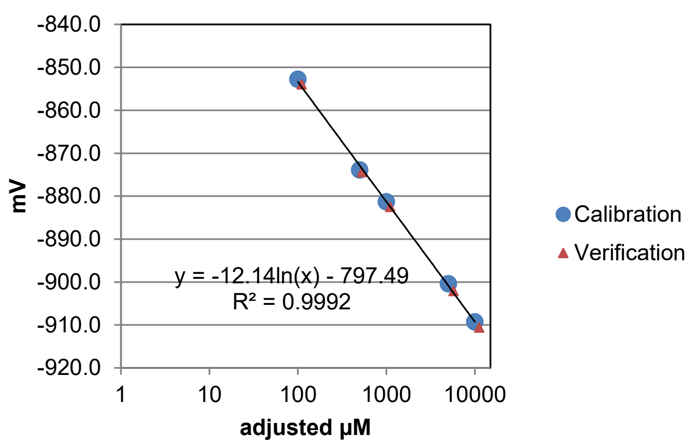
Date calibration performed: 09-Jun-23
Time calibration completed: 2:36pm **Expiration time:** 5:36pm
Calibration performed by: [redacted]

Calibration Temperature: 21.3°C

<u>Calibration -</u>

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

10 µM (really 100 µM)	set at	-852.8 mV	read at	11.0 µM at	-854.0 mV
50 µM (really 500 µM)	set at	-873.9 mV	read at	52.9 µM at	-874.4 mV
100 µM (really 1000 µM)	set at	-881.3 mV	read at	110 µM at	-882.5 mV
500 µM (really 5 000 µM)	set at	-900.4 mV	read at	575 µM at	-902.1 mV
1 000 µM (really 10 000 µM)	set at	-909.3 mV	read at	1120 µM at	-910.6 mV



Final slope (meter) = -30.1 mV

<u>10 fold slope (validation)</u>

500 to 5 000 µM: -26.5 mV
1000 to 10 000 µM: -28.0 mV

`

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

Signed off by:

[redacted] Dipl. T (Marine Environment), Ept
Laboratory Supervisor

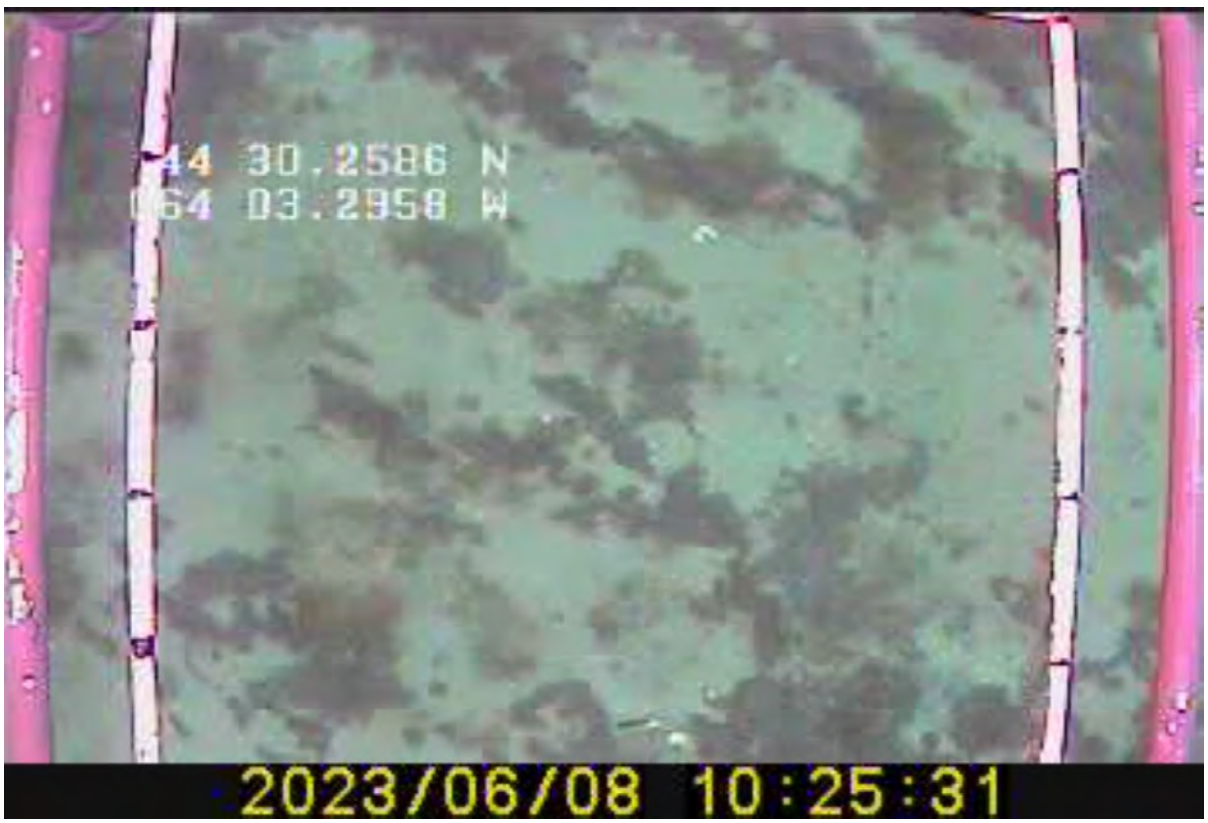
APPENDIX H
Baseline Survey Screen Captures of the Seafloor

SI-1

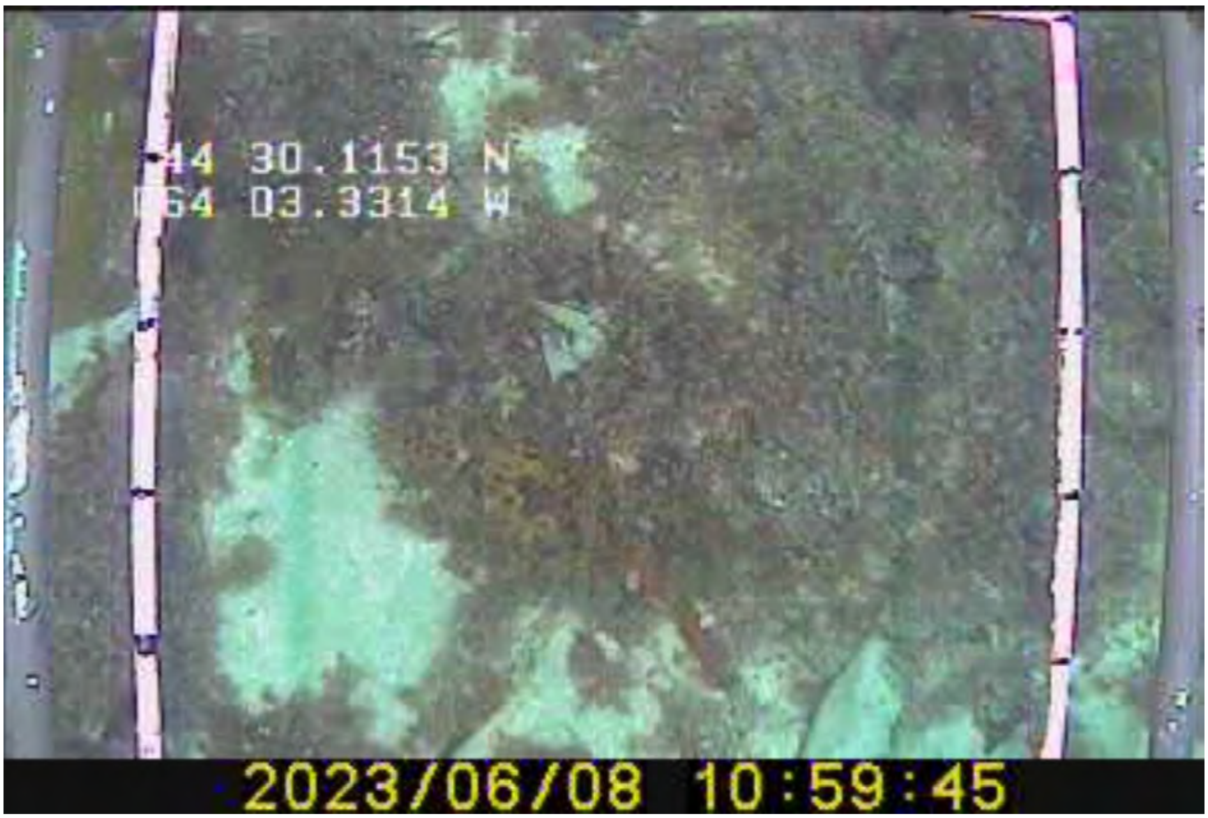
SI-2

SI-3

SI-4



SI-REF

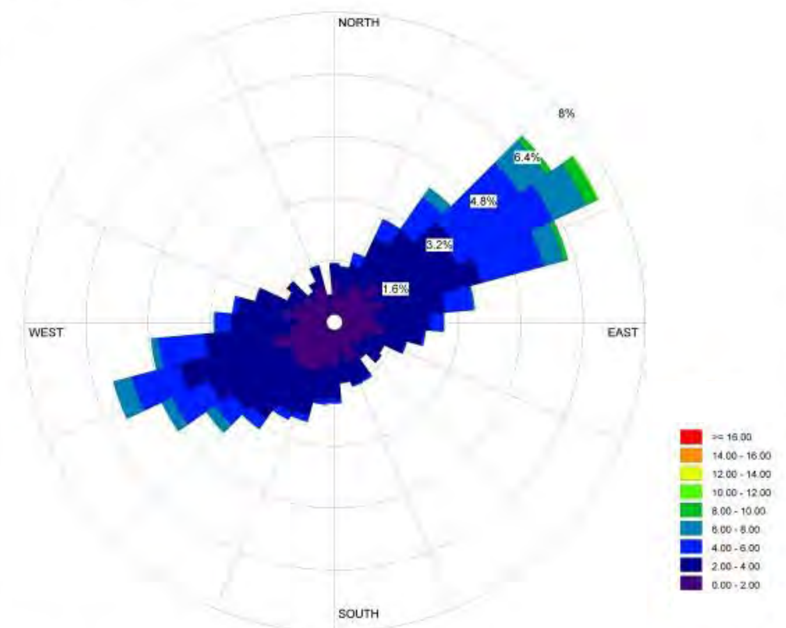


SI-5

APPENDIX I
ADCP Data

CURRENT ROSE PLOT:

#1006 Saddle Island, NS
Current speed & direction - 2 m above bottom



COMMENTS:

DATA PERIOD:

Start Date: 2023-05-09 - 00:00
End Date: 2023-06-09 - 23:00

PROFILE COUNT:

4247

AVG. CURRENT SPEED:

2.70

COMPANY NAME:

Sweeney International Marine Corp.

MODELER:

[redacted]

DATE:

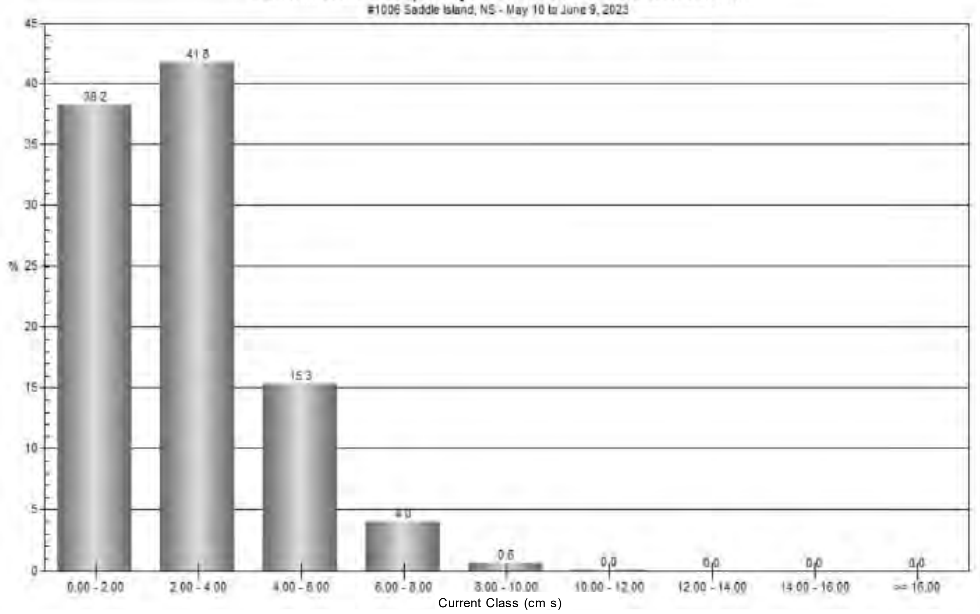
2023-07-17

PROJECT NO.:

SW2016-061

Current Class Frequency Distribution - 2 m above bottom

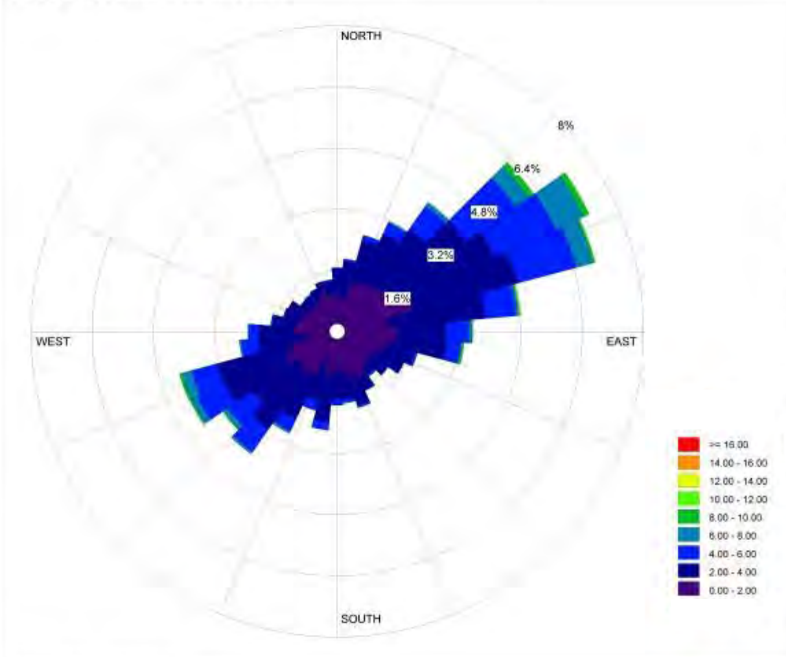
#1006 Saddle Island, NS - May 10 to June 9, 2023



CURRENT ROSE PLOT:

#1006 Saddle Island, NS

Current speed & direction - 4 m above bottom



COMMENTS:

DATA PERIOD:

Start Date: 2023-05-09 - 00:00
End Date: 2023-06-09 - 23:00

PROFILE COUNT:

4247

AVG. CURRENT SPEED:

2.50

COMPANY NAME:

Sweeney International Marine Corp.

MODELER:

[redacted]

DATE:

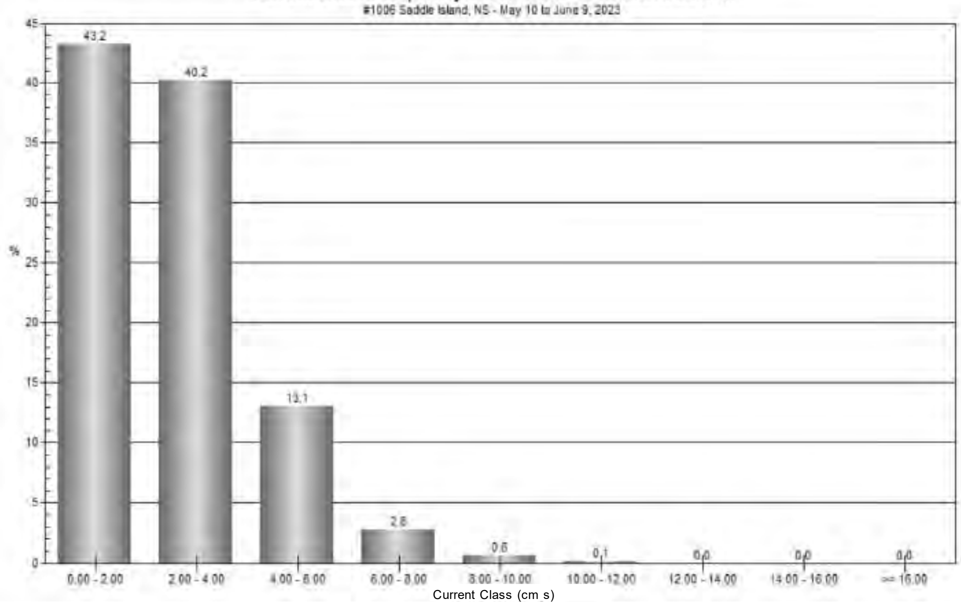
2023-07-17

PROJECT NO.:

SW2016-061

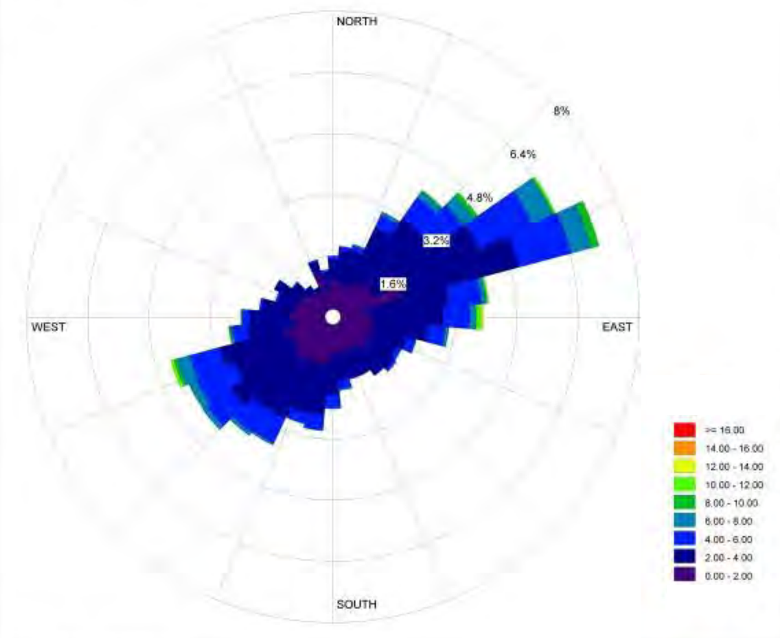
Current Class Frequency Distribution - 4 m above bottom

#1006 Saddle Island, NS - May 10 to June 9, 2023



CURRENT ROSE PLOT:

#1006 Saddle Island, NS
Current speed & direction - 6 m above bottom



COMMENTS:

DATA PERIOD:

Start Date: 2023-05-09 - 00:00
End Date: 2023-06-09 - 23:00

PROFILE COUNT:

4247

AVG. CURRENT SPEED:

2.67

COMPANY NAME:

Sweeney International Marine Corp.

MODELER:

[redacted]

DATE:

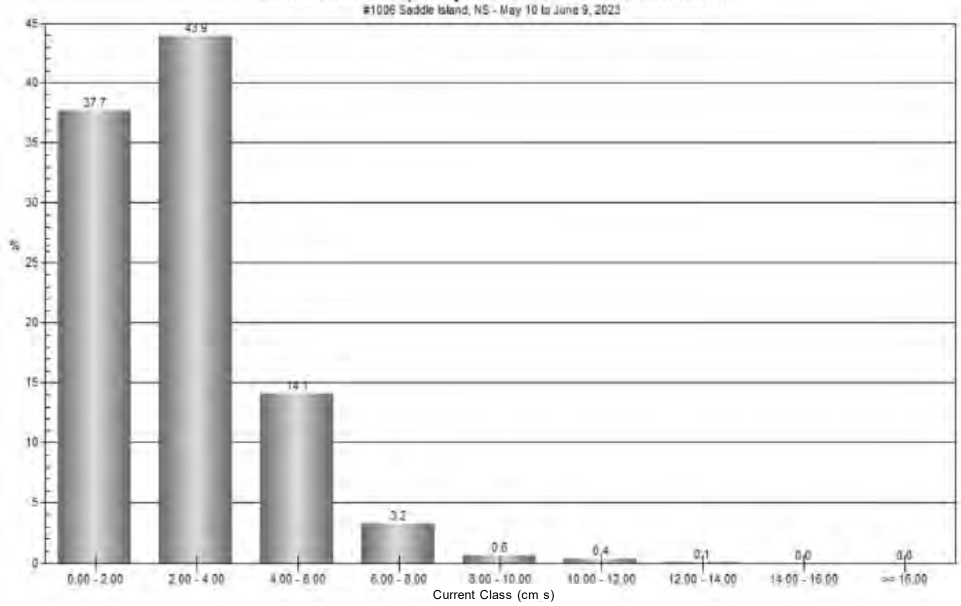
2023-07-17

PROJECT NO.:

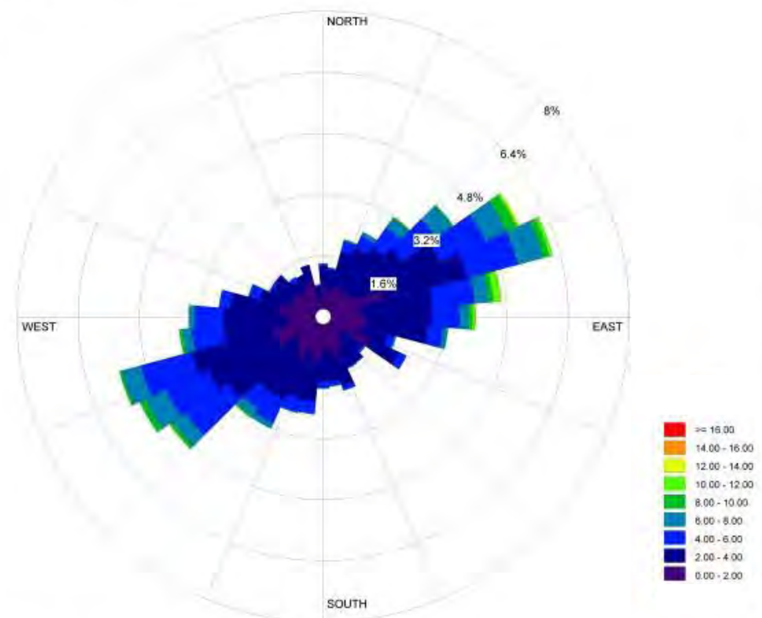
SW2016-061

Current Class Frequency Distribution - 6 m above bottom

#1006 Saddle Island, NS - May 10 to June 9, 2023



CURRENT ROSE PLOT:
#1006 Saddle Island, NS
Current speed & direction - 8 m above bottom



COMMENTS:

DATA PERIOD:
Start Date: 2023-05-09 - 00:00
End Date: 2023-06-09 - 23:00

PROFILE COUNT:
4247

AVG. CURRENT SPEED:
2.93

COMPANY NAME:
Sweeney International Marine Corp.

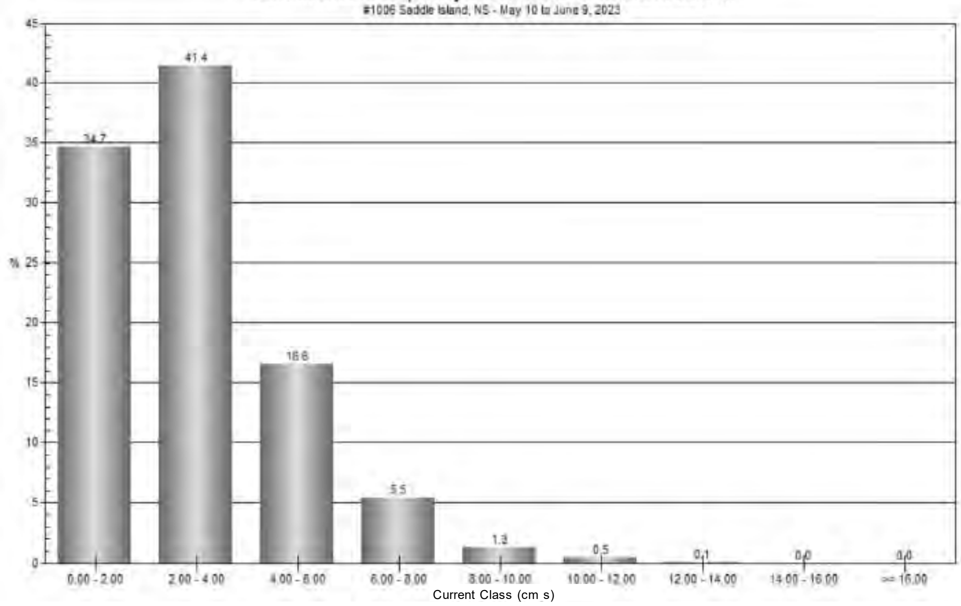
MODELER:
[redacted]

DATE:
2023-07-17

PROJECT NO.:
SW2016-061

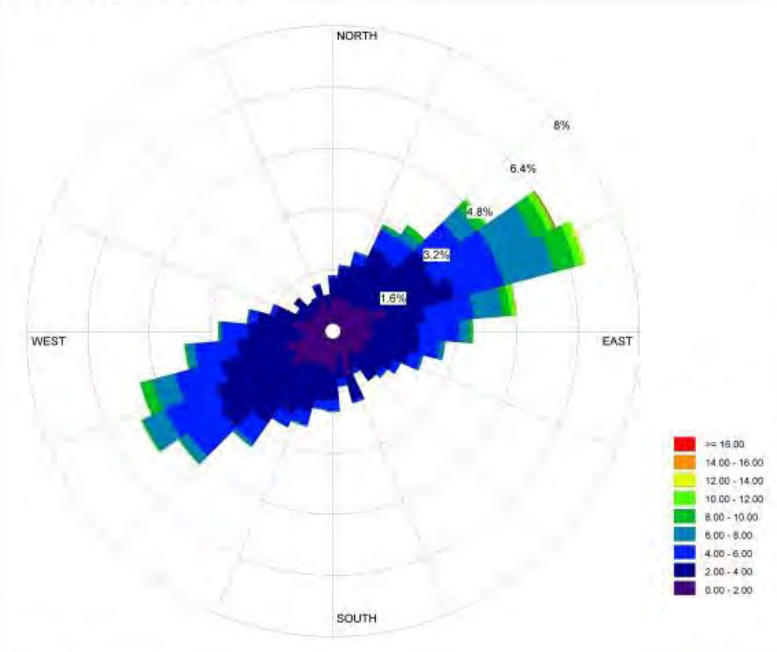
Current Class Frequency Distribution - 8 m above bottom

#1006 Saddle Island, NS - May 10 to June 9, 2023



CURRENT ROSE PLOT

#1006 Saddle Island, NS
Current speed & direction - 10 m above bottom



COMMENTS

DATA PERIOD:

Start Date: 2023-05-09 - 00:00
End Date: 2023-06-09 - 23:00

PROFILE COUNT

4247

AVG. CURRENT SPEED

3.13

COMPANY NAME

Sweeney International Marine Corp.

MODELER

[redacted]

DATE

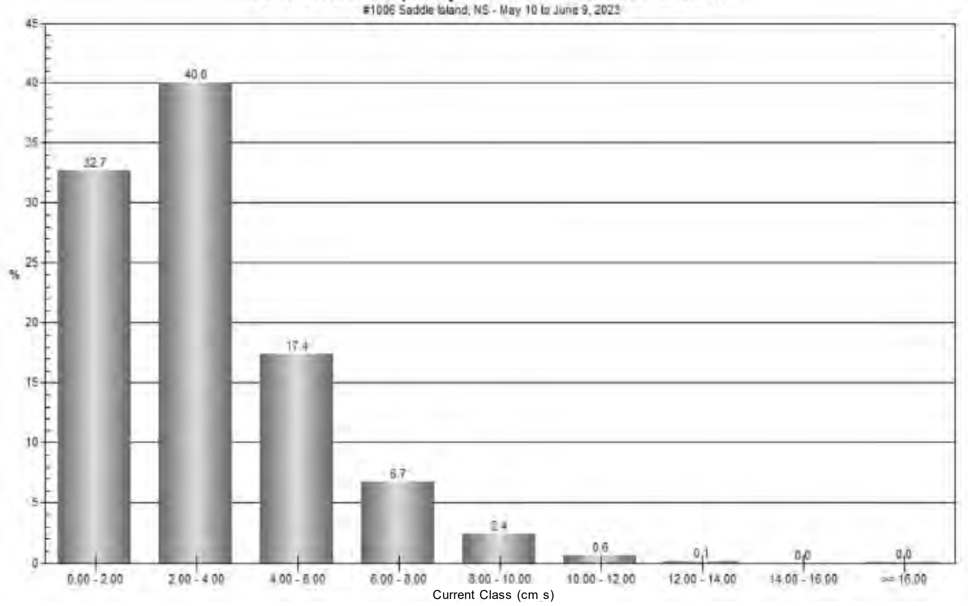
2023-07-17

PROJECT NO.

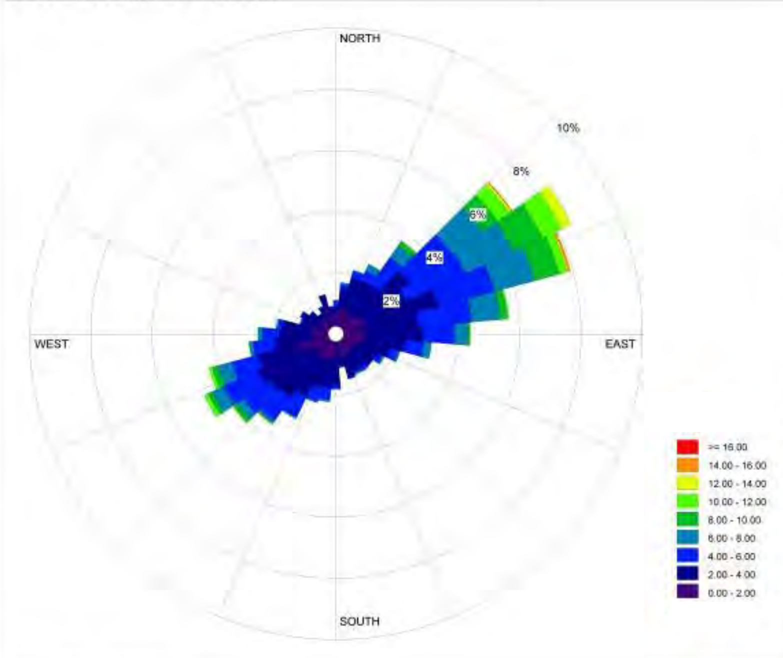
SW2016-061

Current Class Frequency Distribution - 10 m above bottom

#1006 Saddle Island, NS - May 10 to June 9, 2023



CURRENT ROSE PLOT:
#1006 Saddle Island, NS
Current speed & direction - 12 m above bottom



COMMENTS:

DATA PERIOD:
Start Date: 2023-05-09 - 00:00
End Date: 2023-06-09 - 23:00

PROFILE COUNT:
4247

AVG. CURRENT SPEED:
3.54

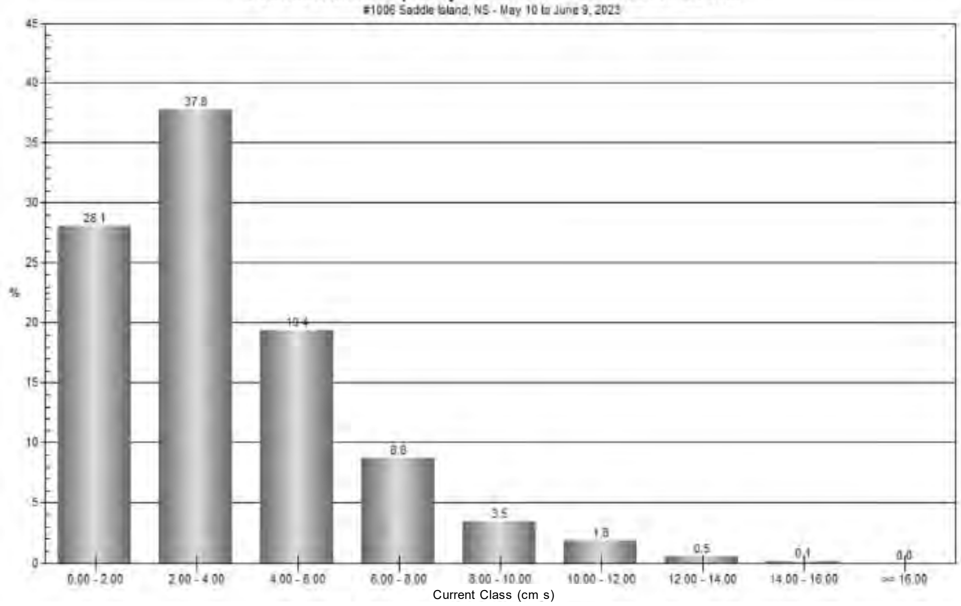
COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

DATE:
2023-07-17

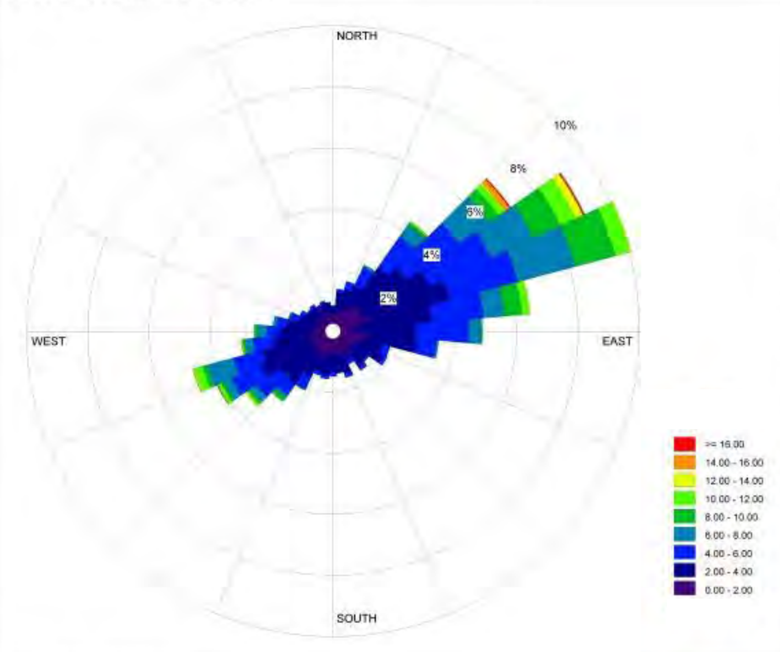
PROJECT NO.:
SW2016-061

Current Class Frequency Distribution - 12 m above bottom
#1006 Saddle Island, NS - May 10 to June 9, 2023



CURRENT ROSE PLOT:

#1006 Saddle Island, NS
Current speed & direction - 14 m above bottom



COMMENTS:

DATA PERIOD:

Start Date: 2023-05-09 - 00:00
End Date: 2023-06-09 - 23:00

PROFILE COUNT:

4247

AVG. CURRENT SPEED:

3.69

COMPANY NAME:

Sweeney International Marine Corp.

MODELER:

[redacted]

DATE:

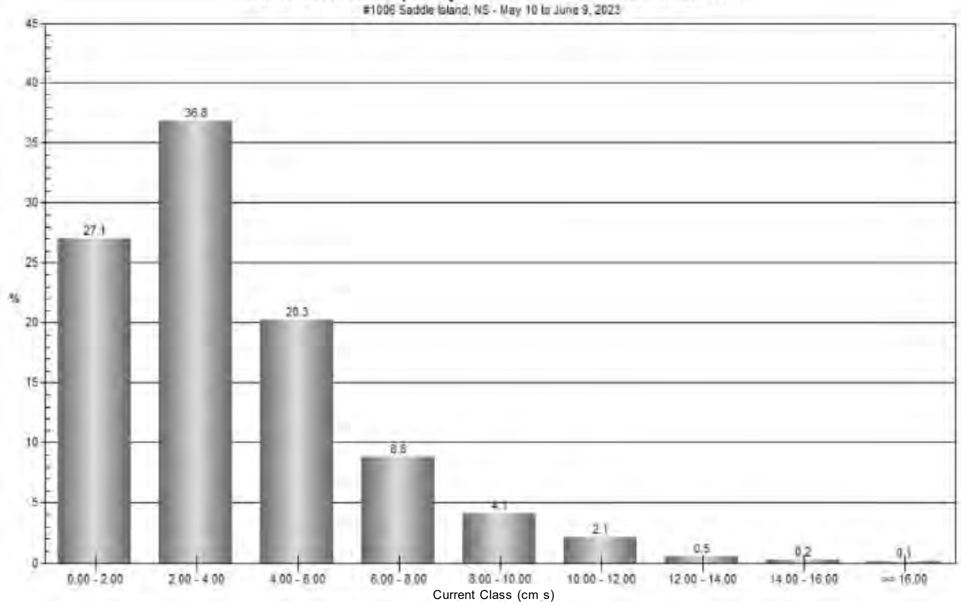
2023-07-17

PROJECT NO.:

SW2016-061

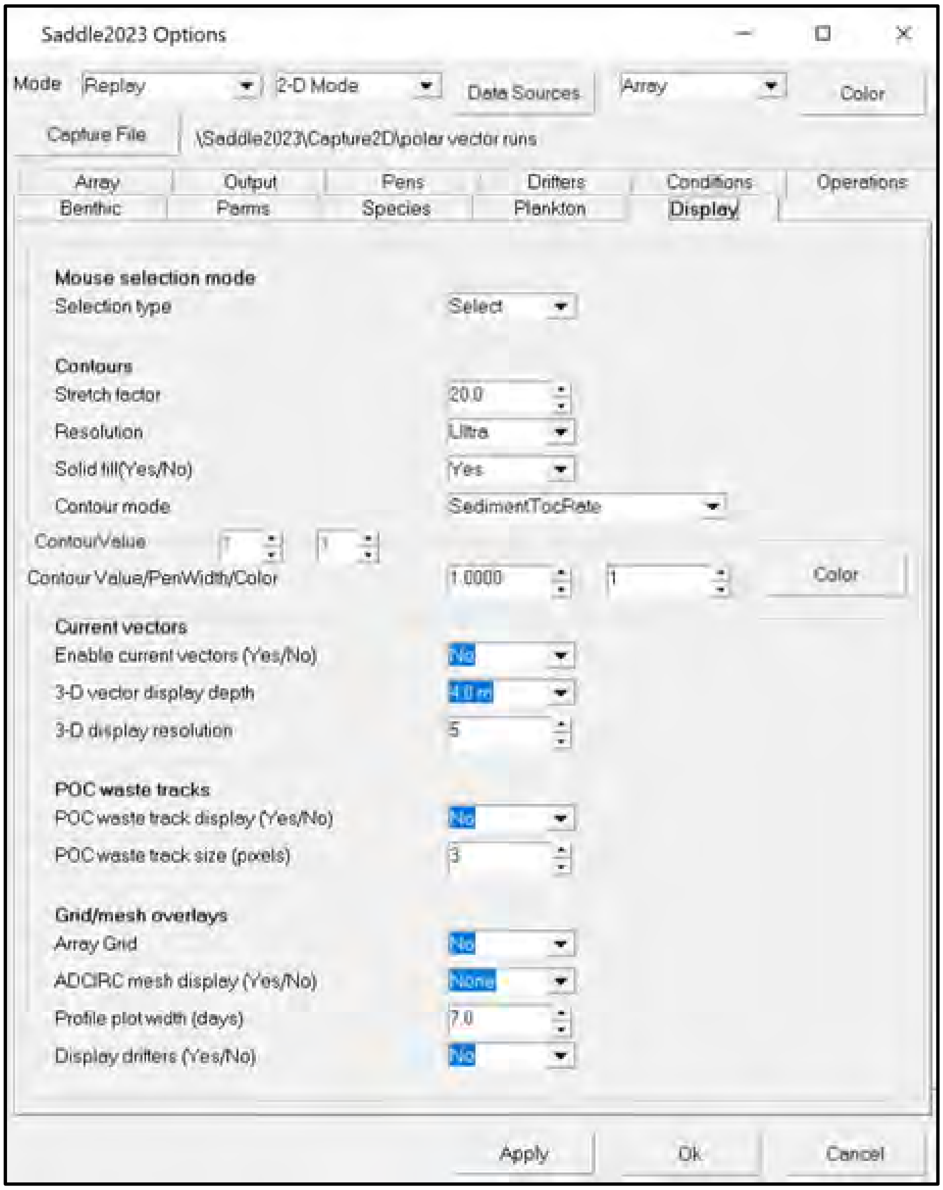
Current Class Frequency Distribution - 14 m above bottom

#1006 Saddle Island, NS - May 10 to June 9, 2023

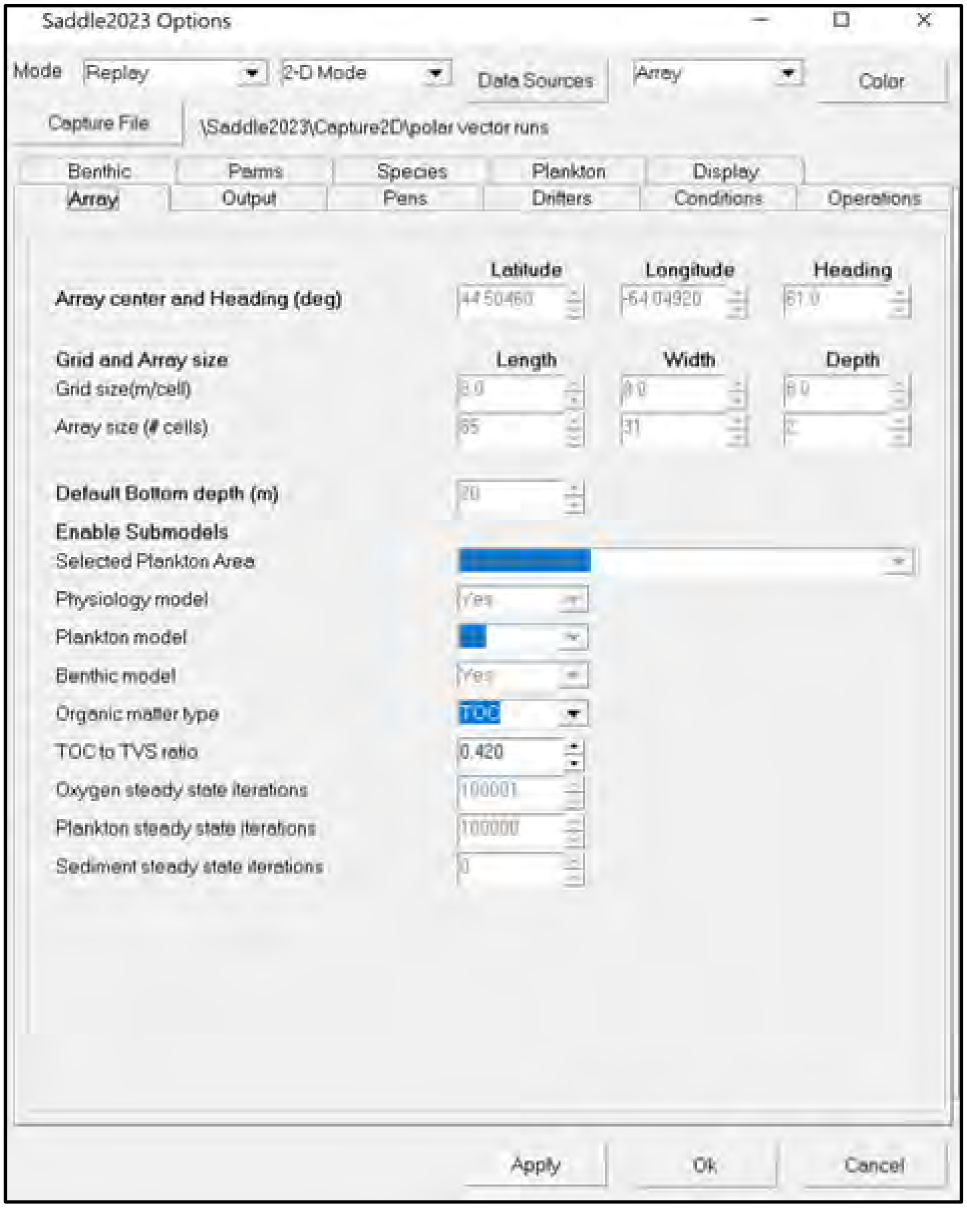


APPENDIX J
AquaModel Settings

Project Options



Project Options



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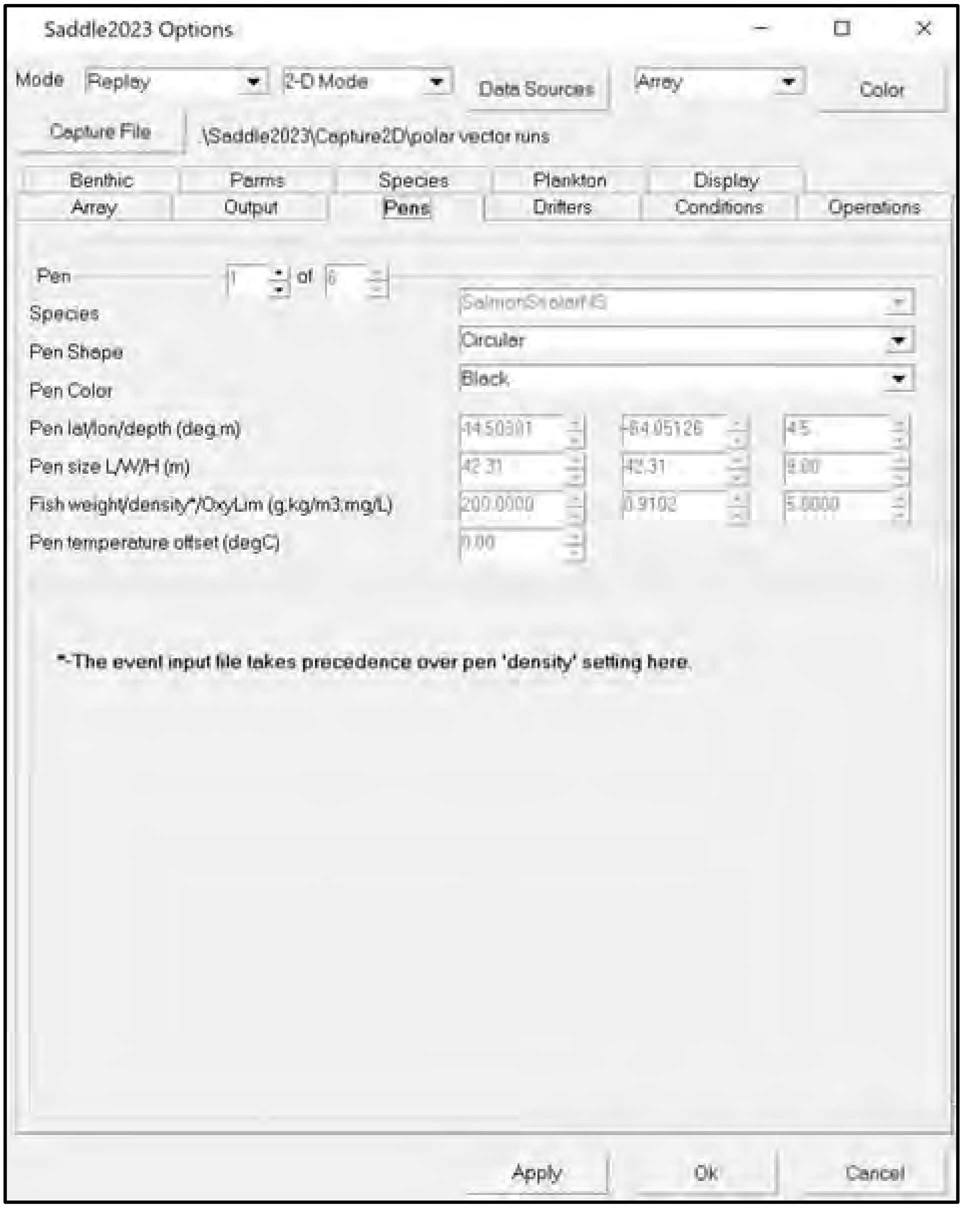
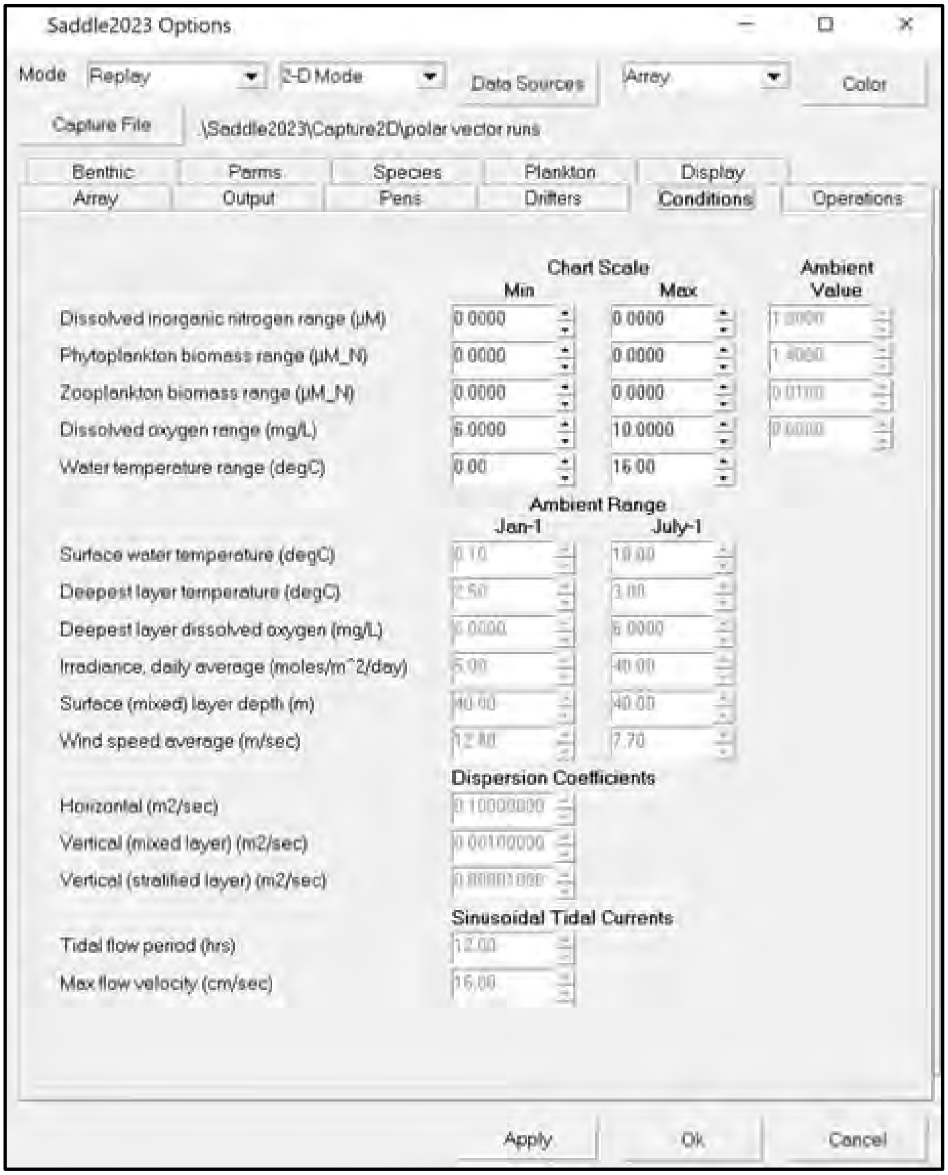


Project Options



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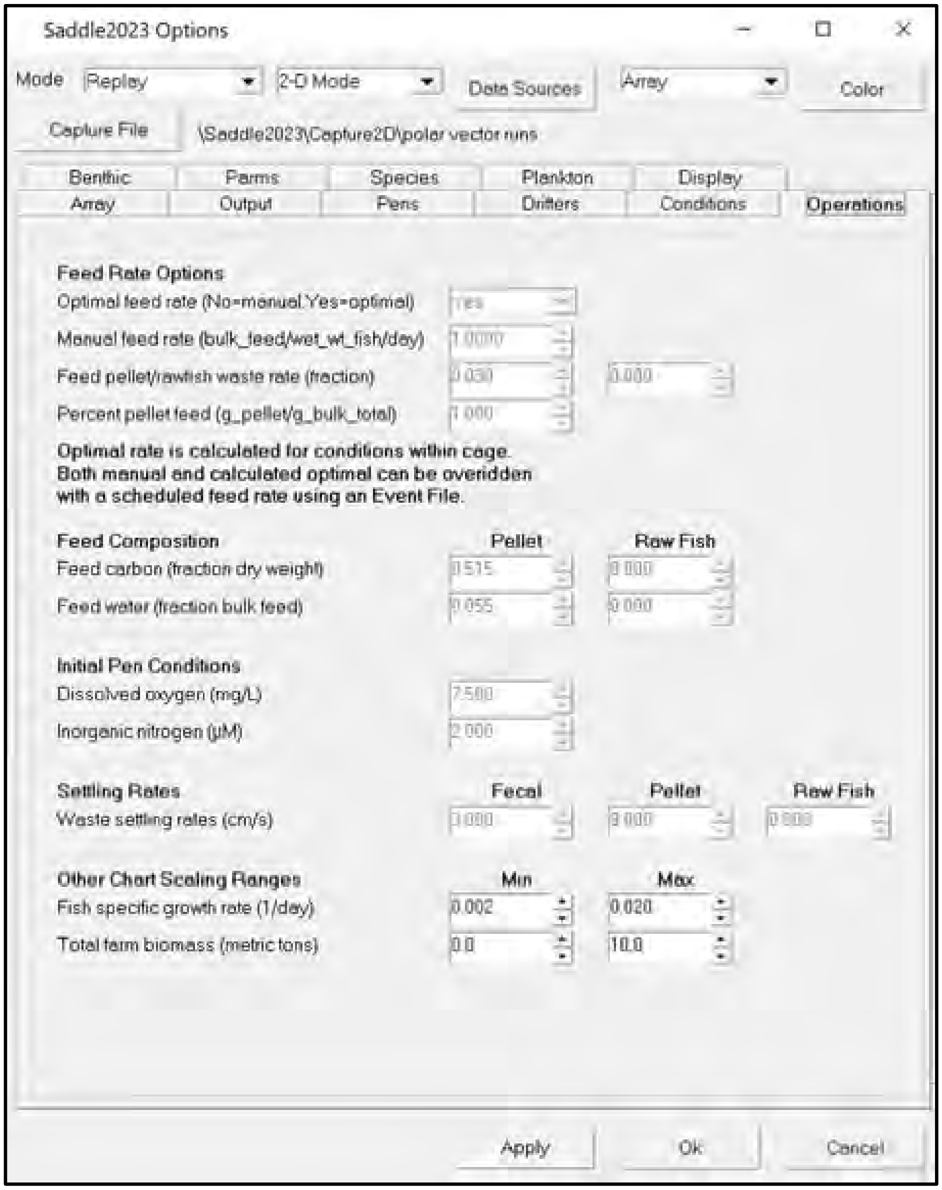

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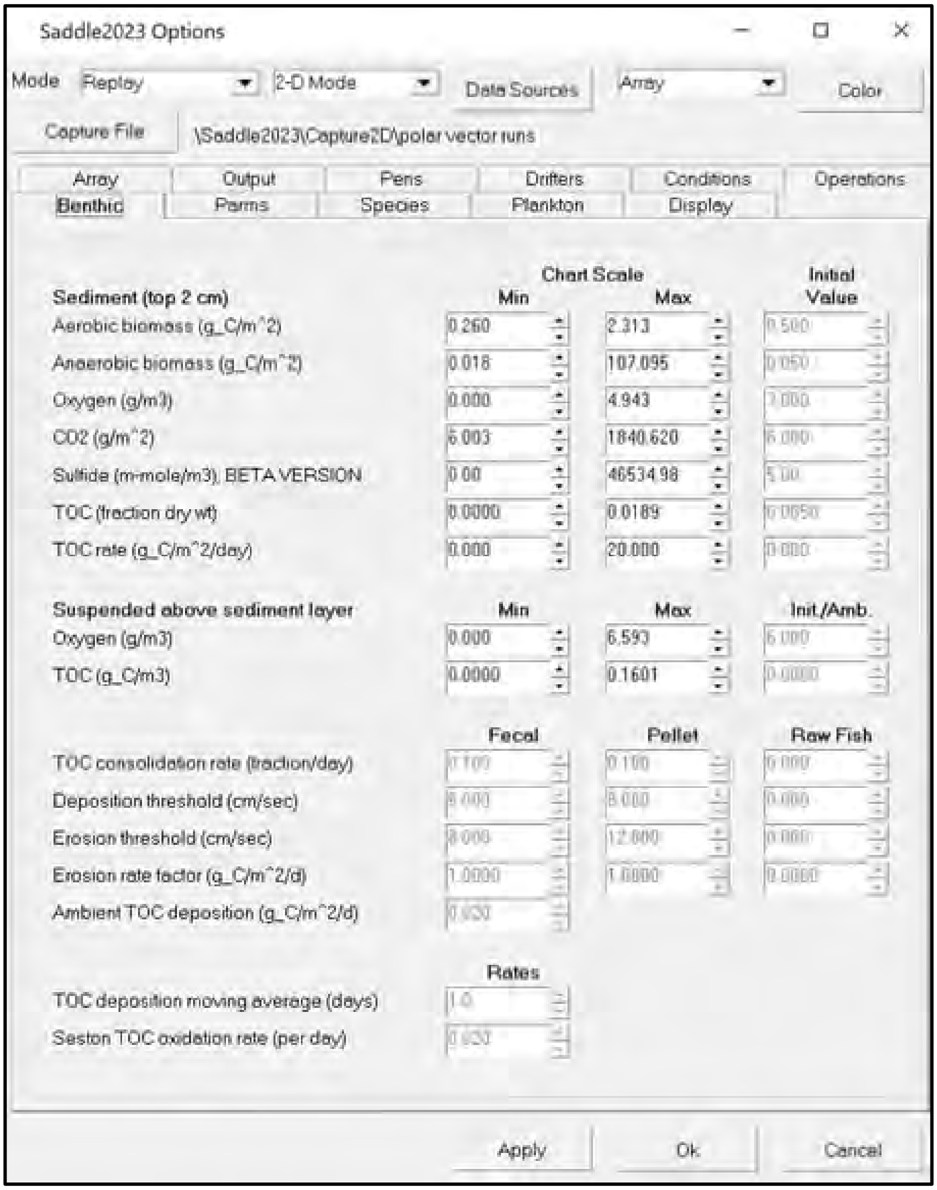
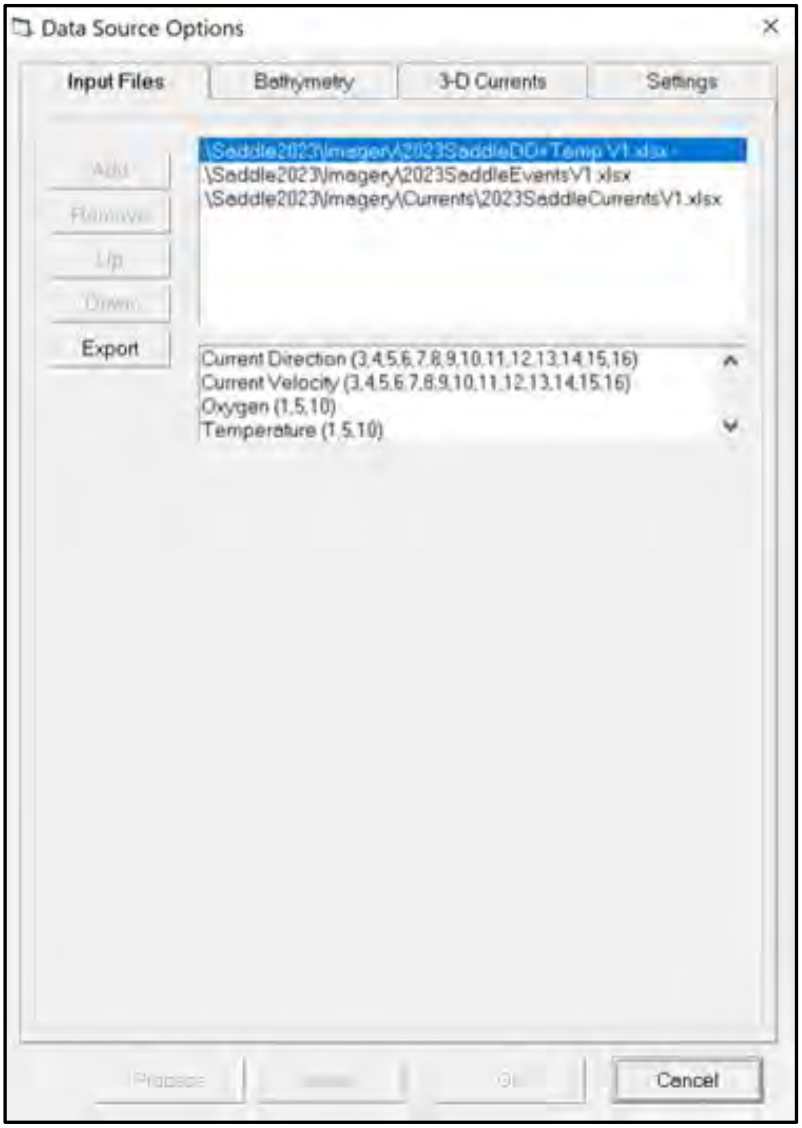


Data Source Options

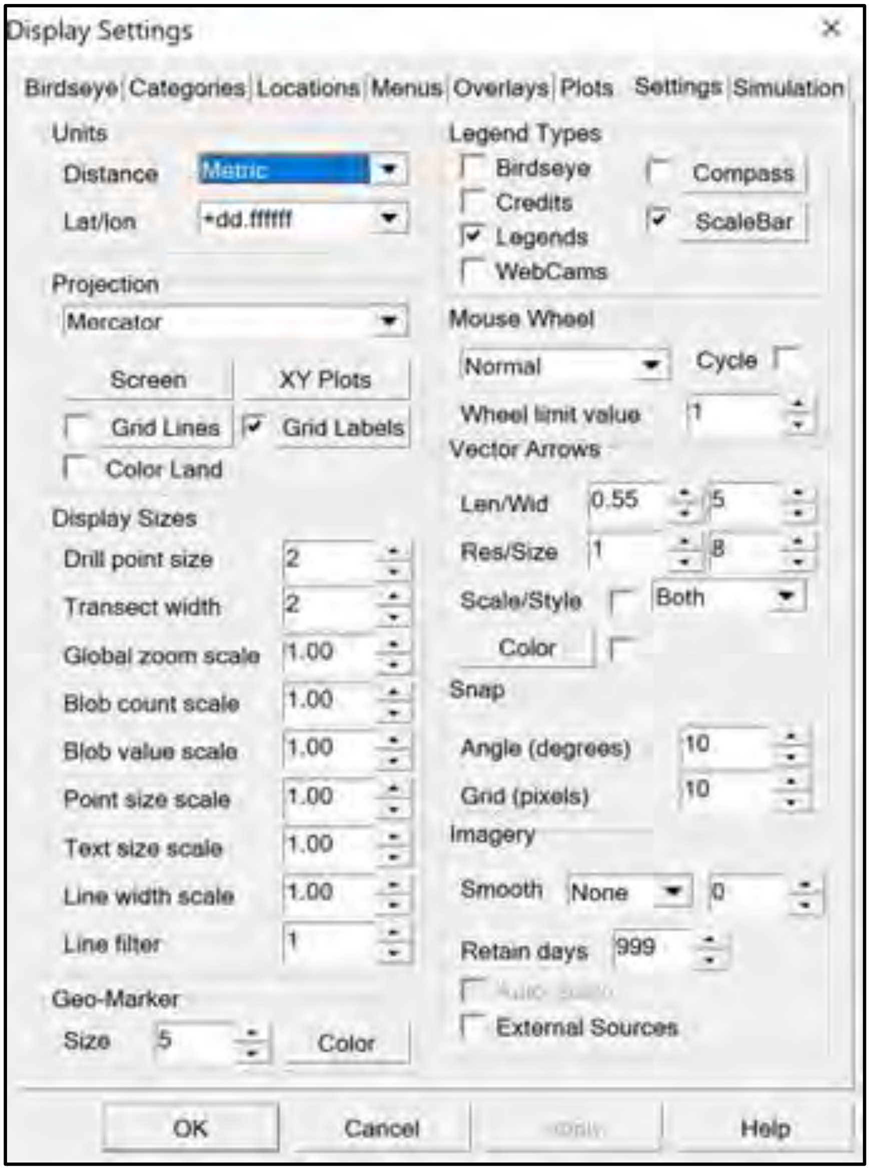


Data Source Options

Display Settings

Display Settings

Display Settings



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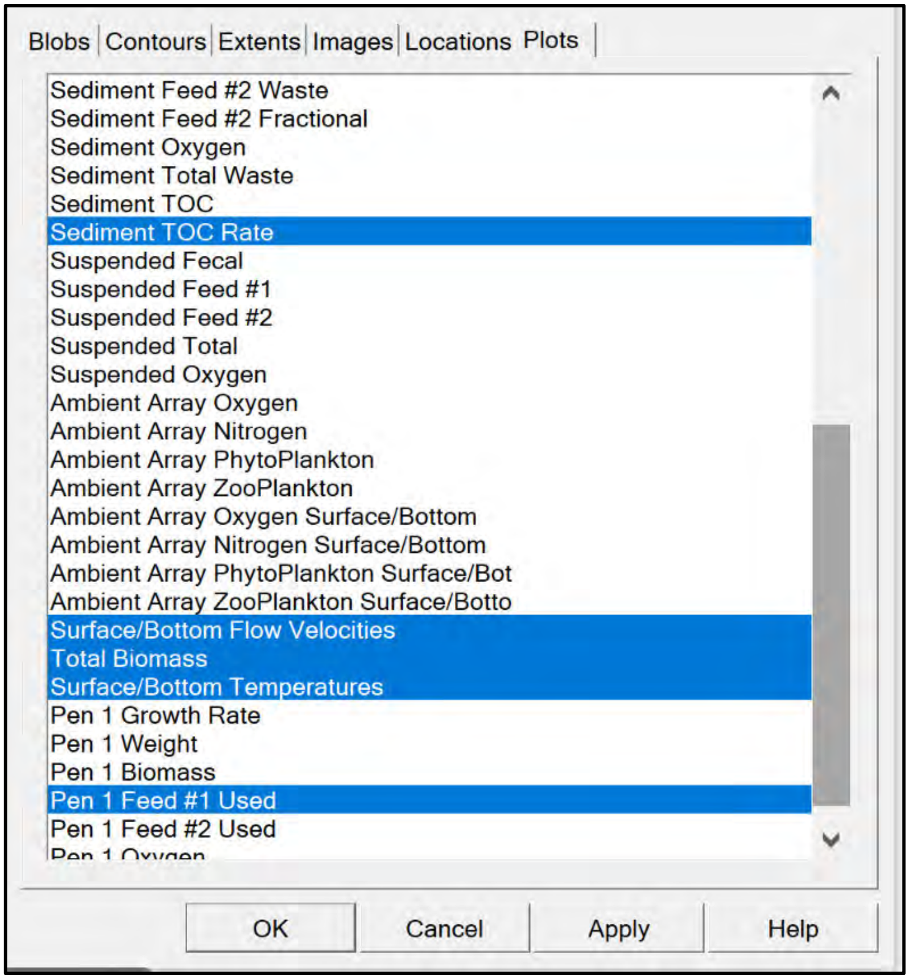
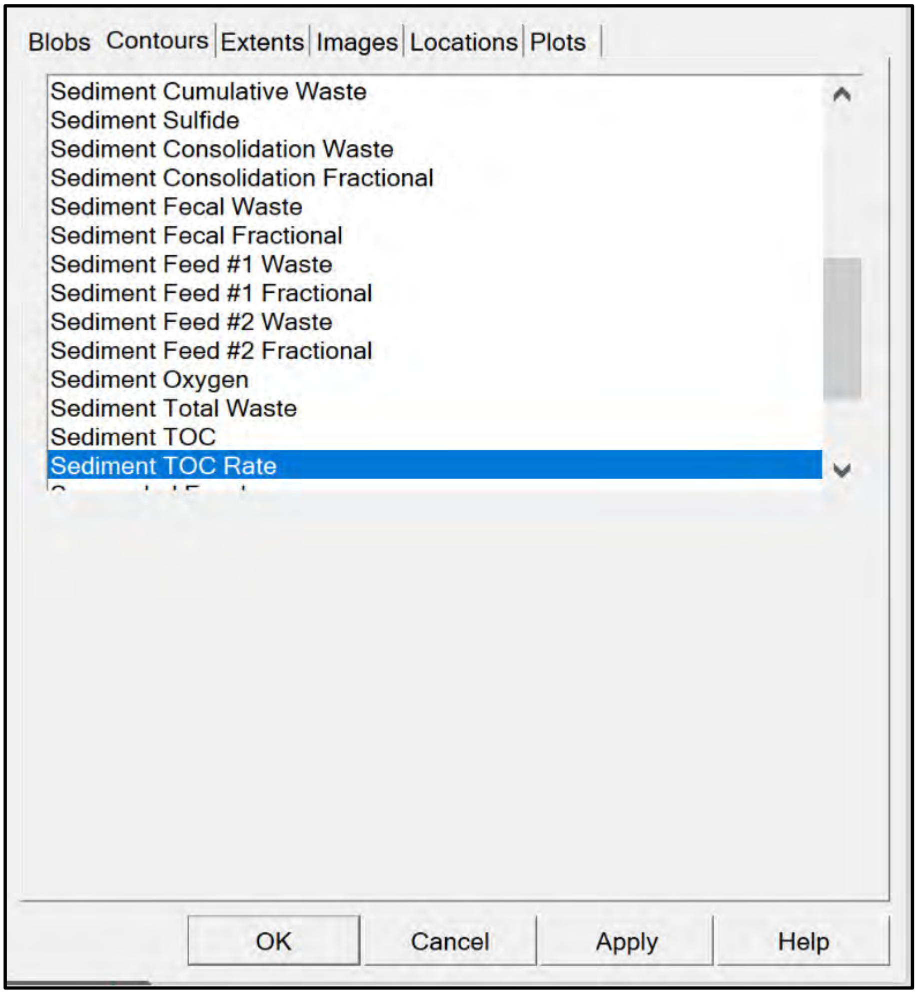


Data Graphics



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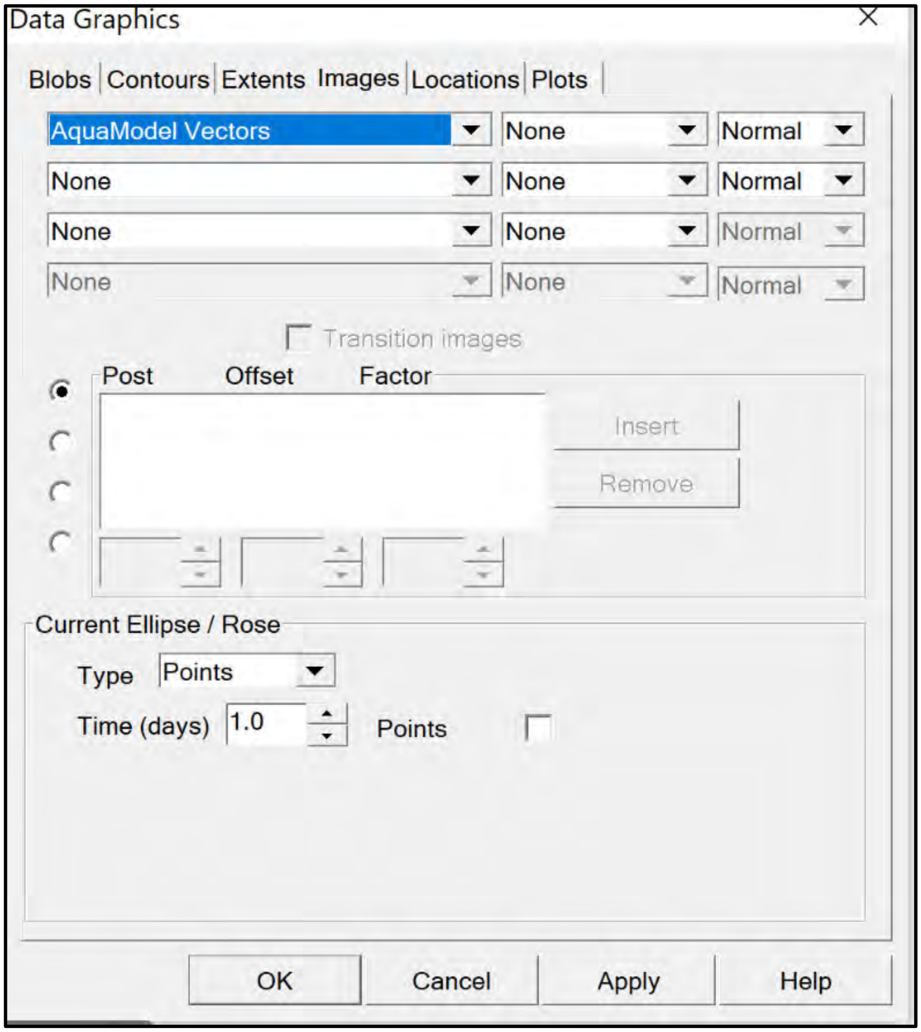
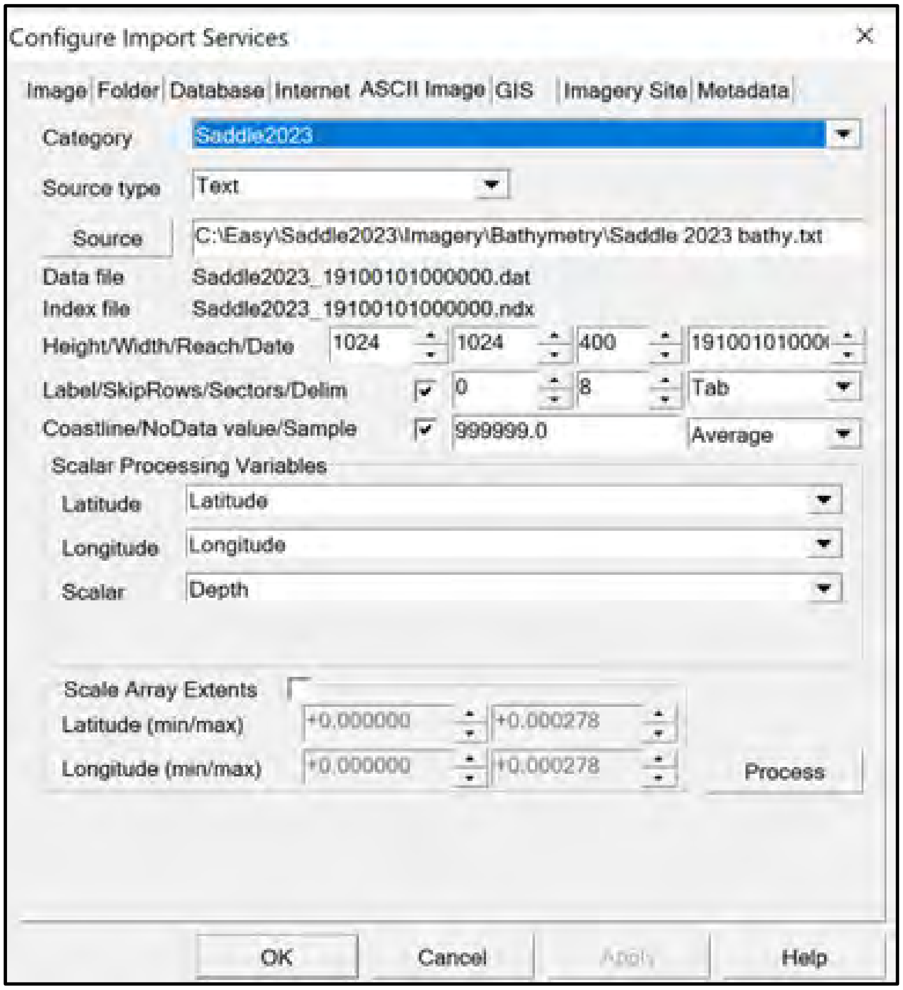


Configure Import Services



APPENDIX K

Habitat Map of Seafloor Characteristics of Saddle Island (#1006)

FISH & FISH HABITAT MAP
AQUACULTURE SITE #1006

SADDLE ISLAND

ASPOTOGAN HARBOUR
PROVINCE OF NOVA SCOTIA
2023

UTM grid 20 T
North

Project #: SW2016-061

Drawn by [redacted]

[redacted] MSc
Sr. Marine Environmental Biologist

Date: June 21, 2023

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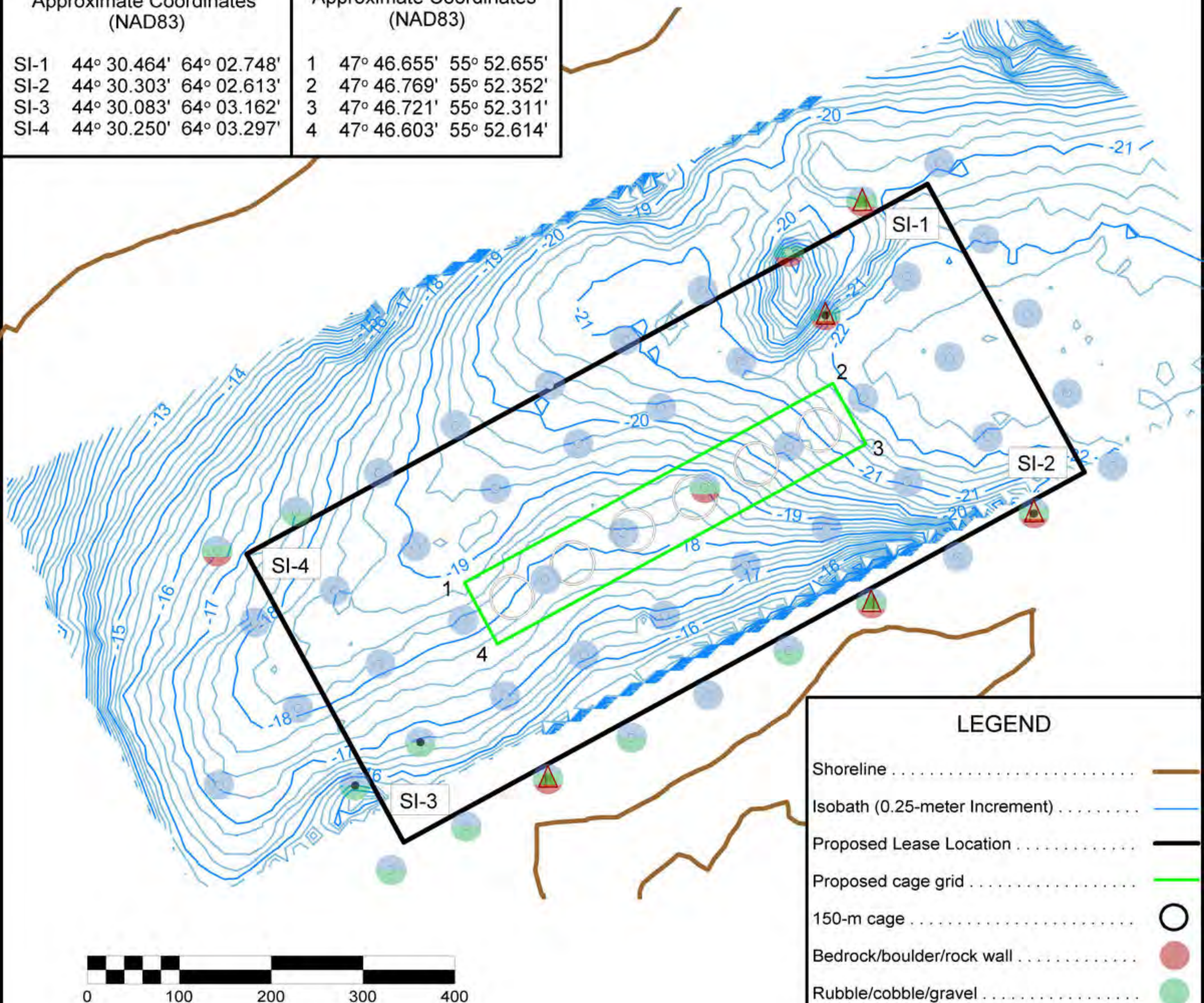
KELLY COVE SALMON LTD.

Proposed Lease Approximate Coordinates (NAD83)		
SI-1	44° 30.464'	64° 02.748'
SI-2	44° 30.303'	64° 02.613'
SI-3	44° 30.083'	64° 03.162'
SI-4	44° 30.250'	64° 03.297'

Proposed Grid Approximate Coordinates (NAD83)		
1	47° 46.655'	55° 52.655'
2	47° 46.769'	55° 52.352'
3	47° 46.721'	55° 52.311'
4	47° 46.603'	55° 52.614'



LEGEND

Shoreline	
Isobath (0.25-meter Increment)	
Proposed Lease Location	
Proposed cage grid	
150-m cage	
Bedrock/boulder/rock wall	
Rubble/cobble/gravel	
Sand/silt/mud	
Sand/silt/mud over bedrock	
Rubble/cobble/gravel over bedrock	
Sand/silt/mud over rubble/cobble/gravel	
All substrate types present	
Hard-bottom station	
Soft-bottom station	
Mixed macroalgae bed	

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

BATHYMETRIC DATA FOR THE ISOBATHS WERE PROVIDED BY SIMCORP FIELD CREW ON **APRIL 26, 2023** USING A GARMIN GPSMAP 7x3/9x3/12x3 AND GARMIN GT54UHD ULTRA HIGH-DEFINITION SONAR COMBINATION UNIT AND MAPSOURCE MAPPING SOFTWARE AND GARMIN DATA: BLUECHART AMERICAS v9.5. DATA WERE CORRECTED TO THE LOW TIDE ON THE DAY OF DATA COLLECTION.

DATA FOR THE SUBSTRATE-TYPE ICONS WERE COLLECTED ON JUNE 8, 2023.

DIGITAL CHART #: CA4386(a)
PAPER CHART #: 4386
UTM ZONE: 20 T

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

Figure K-1: SBFH1 – SBFH8 video screen captures

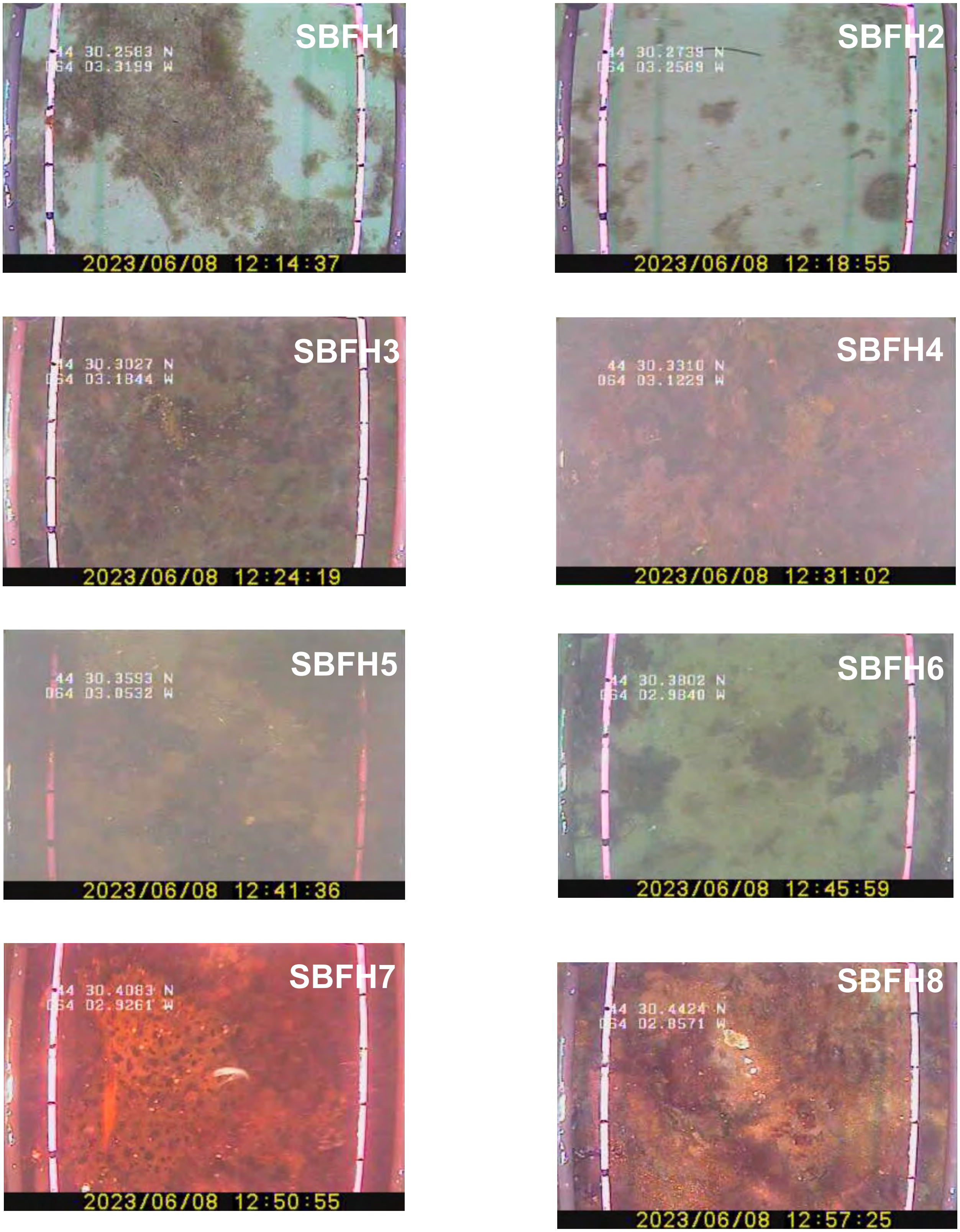


Figure K-2: SBFH9 – SBFH16 video screen captures

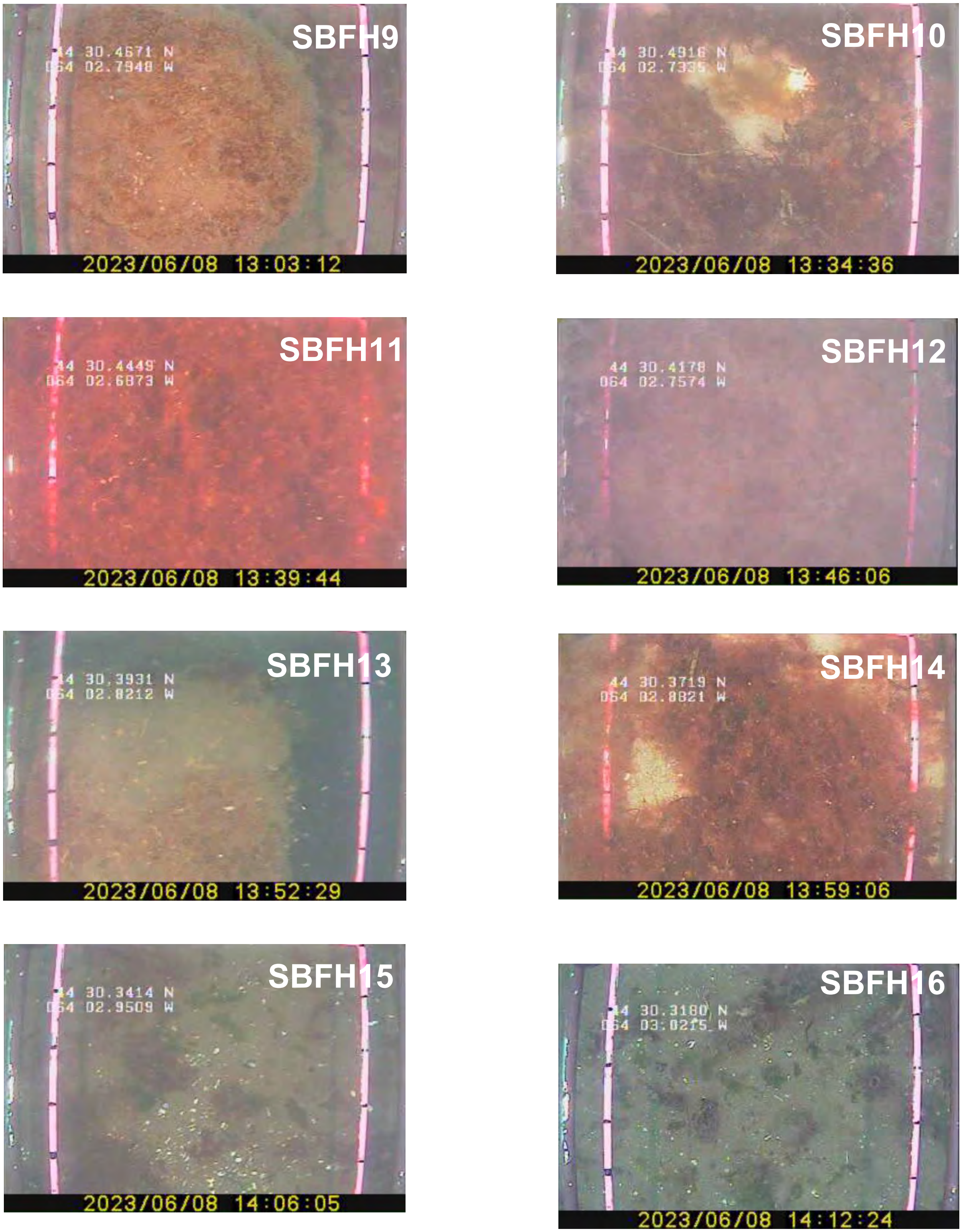


Figure K-3: SBFH17 – SBFH24 video screen captures

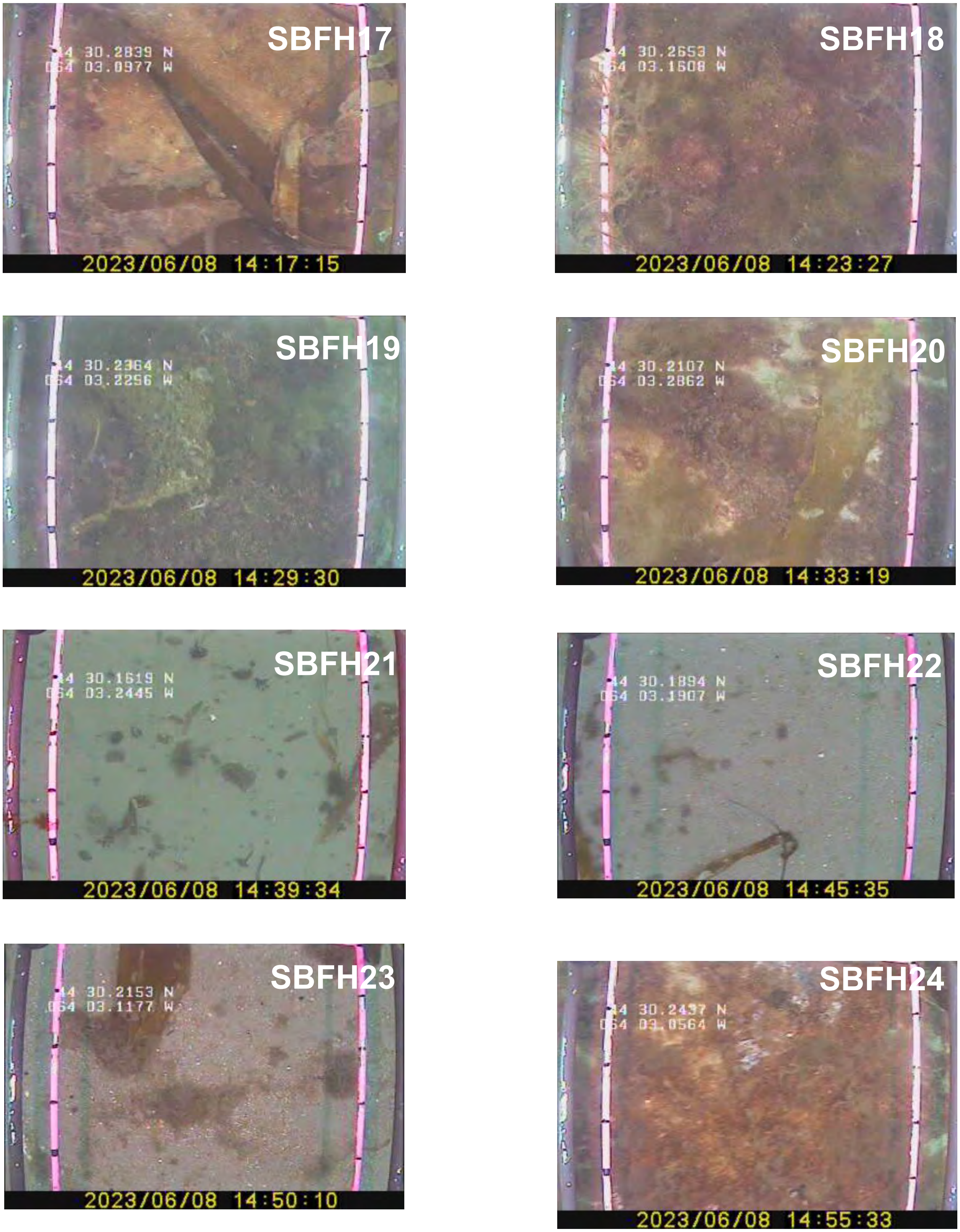


Figure K-4: SBFH25 – SBFH32 video screen captures

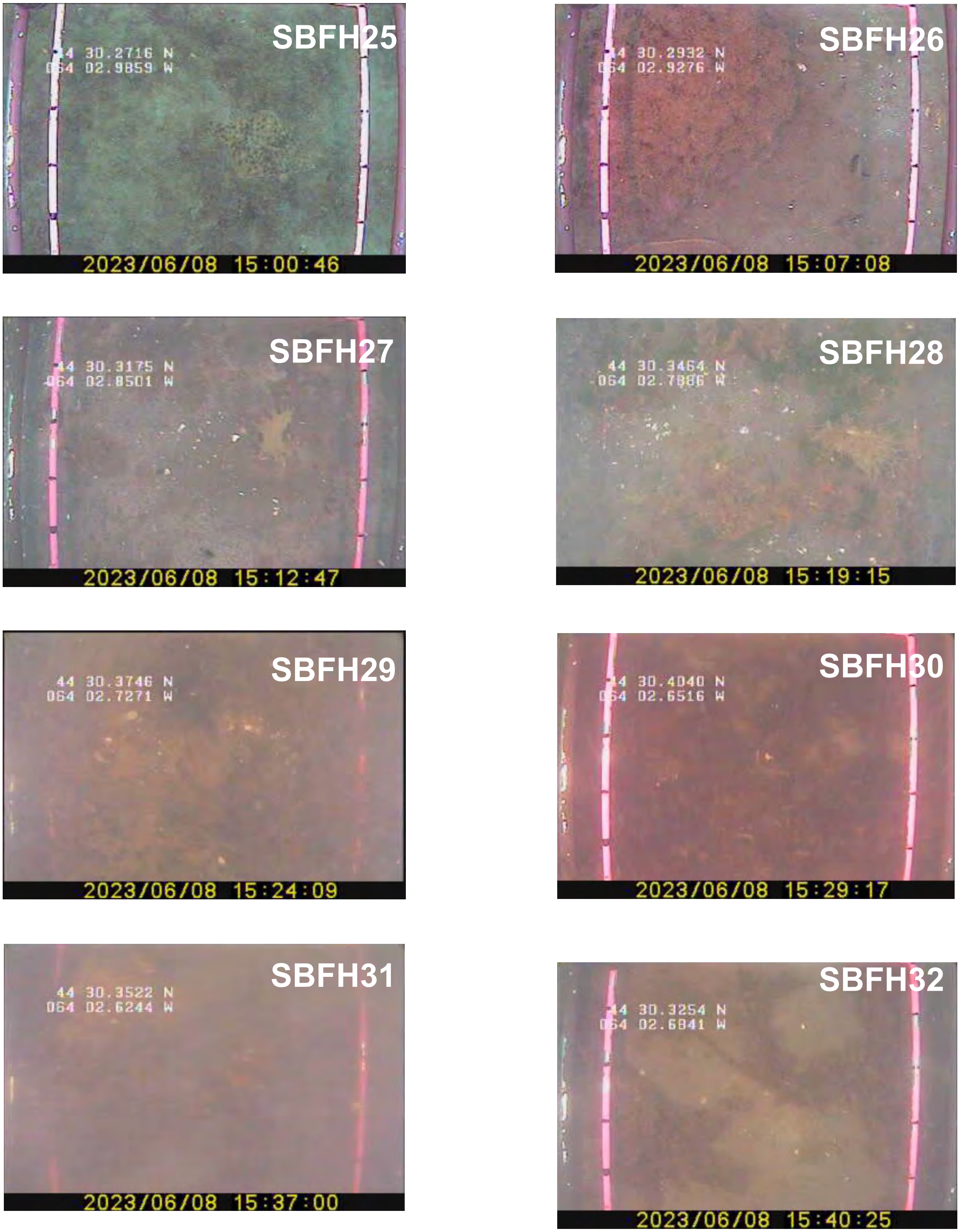


Figure K-5: SBFH33 – SBFH40 video screen captures

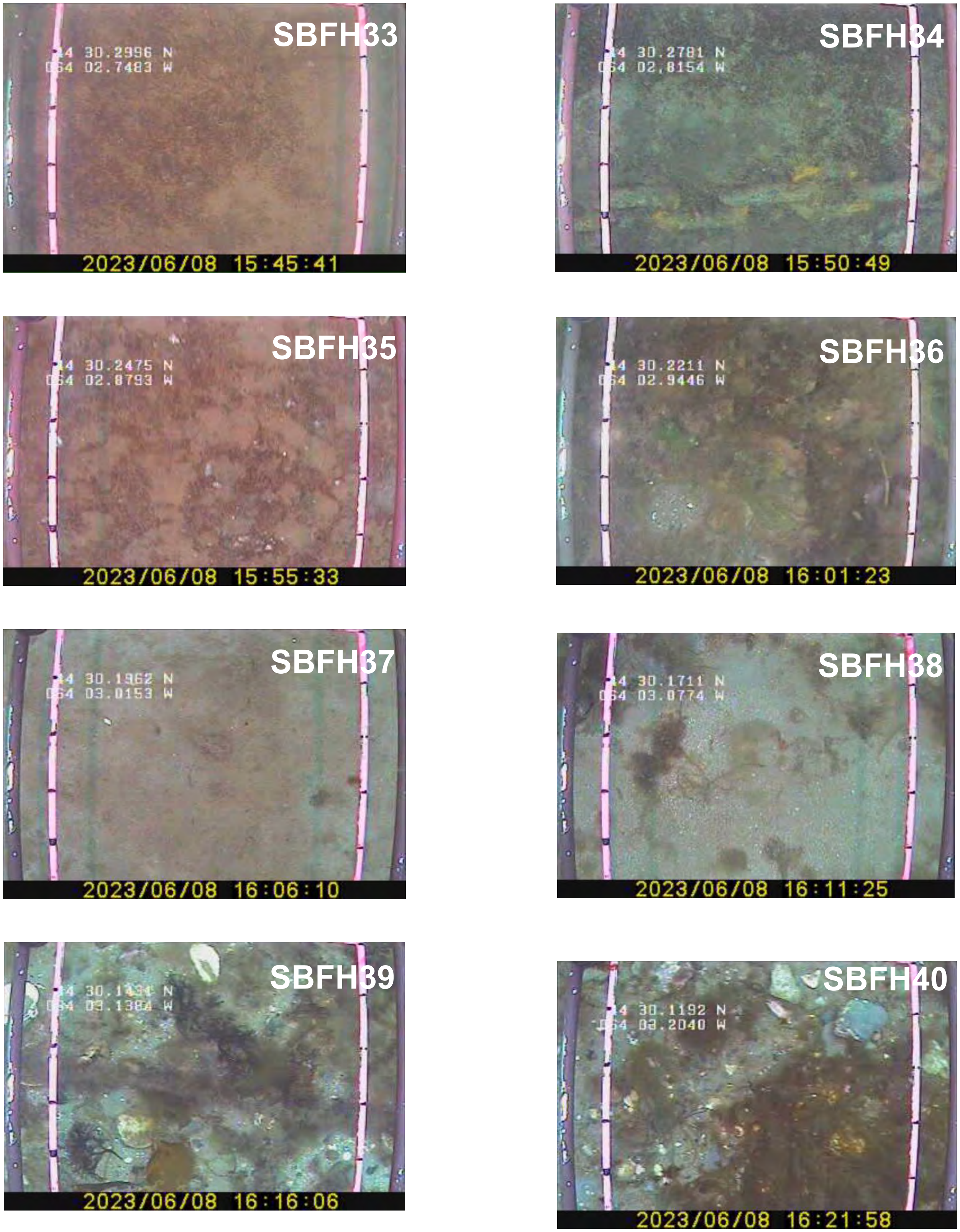
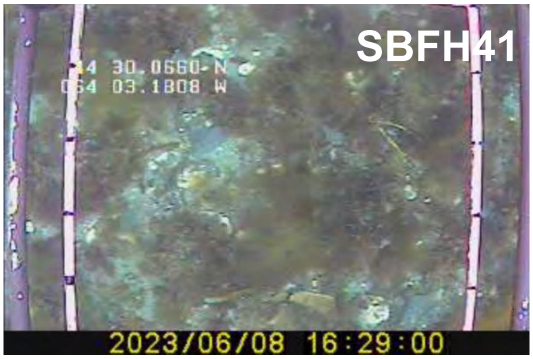
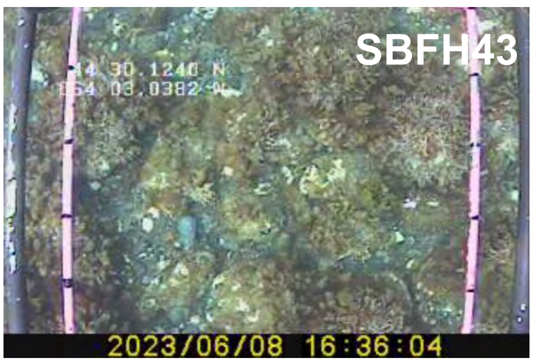


Figure K-6: SBFH41 – SBFH48 video screen captures





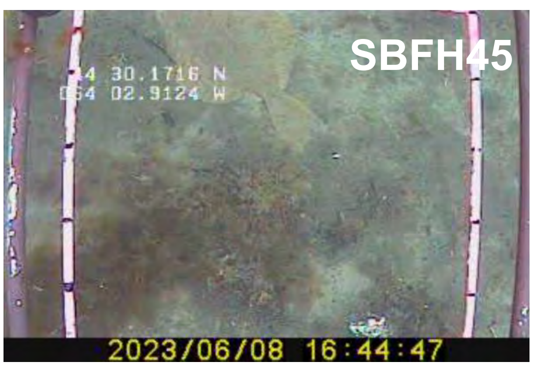
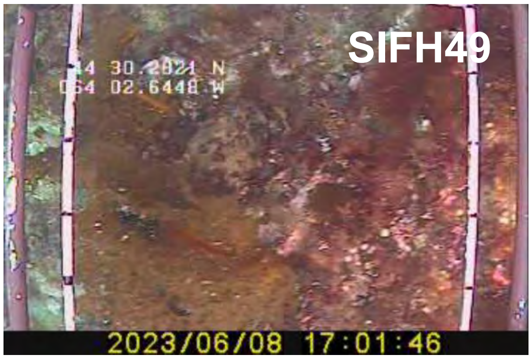


Figure K-7: SBFH49 – SBFH50 video screen captures



APPENDIX M
Comprehensive Species List from the Fish and Fish Habitat Survey of Saddle Island (#1006)

Common Name	Station																								
	SBFH1	SBFH2	SBFH3	SBFH4	SBFH5	SBFH6	SBFH7	SBFH8	SBFH9	SBFH10	SBFH11	SBFH12	SBFH13	SBFH14	SBFH15	SBFH16	SBFH17	SBFH18	SBFH19	SBFH20	SBFH21	SBFH22	SBFH23	SBFH24	SBFH25
Broadleaf Kelp								15%	15%																
Brown Algae													40%												
Common Seastar																									
Crustose Algae																									
Ctenophore																		>10							
Encrusting Sponge																									
Green Algae																									
Lobster																									
Northern Cerianthid																1									
Rhodophyta					10%			20%	25%				30%												
Sand Dollar																									
Sculpin																									
Sea Colander									15%																
Shrimp													>100												
Summer Flounder																									
Unidentified Fish																									
Winter Flounder	1																								3

Common Name	Station																									
	SBFH26	SBFH27	SBFH28	SBFH29	SBFH30	SBFH31	SBFH32	SBFH33	SBFH34	SBFH35	SBFH36	SBFH37	SBFH38	SBFH39	SBFH40	SBFH41	SBFH42	SBFH43	SBFH44	SBFH45	SBFH46	SBFH47	SBFH48	SBFH49	SBFH50	SI-REF
Broadleaf Kelp																										
Brown Algae	10%												<5%	5%				75%	5%			75%		45%		
Common Seastar																		1								
Crustose Algae														5%	25%			5%				5%				
Ctenophore										2																
Encrusting Sponge															15%											
Green Algae																		5%								
Lobster																	1									
Northern Cerianthid																										
Rhodophyta	5%														5%			5%						40%		
Sand Dollar																1%										
Sculpin																	1%									
Sea Colander																										
Shrimp							>32																			
Summer Flounder																				1						
Unidentified Fish	1														1											
Winter Flounder														1		1				1				1		

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SIMCorp Environmental Sciences Lab
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™

APPENDIX C
Wildlife Interaction Plan

Wildlife Interaction Plan

for Marine Salmonid Farms on the East Coast of North America

Version 23.07-08

This Wildlife Interaction Plan (WIP) has been created to address Section 7 Environment – Predator and Wildlife Interactions of the Best Aquaculture Practices (BAP) Salmon Farms Standard. The guidance and practices herein have and will continue to be followed by all North American-East Coast employees of Cooke Aquaculture who are employed in the Saltwater Division and those who directly interact with the salmon farms. This plan merely acts as an overall summary of the current requirements that each salmon farm must follow and in the event of any conflict of information or direction between this document and the requirements and the plans related to address those requirements, those plans, and the requirements will prevail.

Table of Contents

Appendices

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.

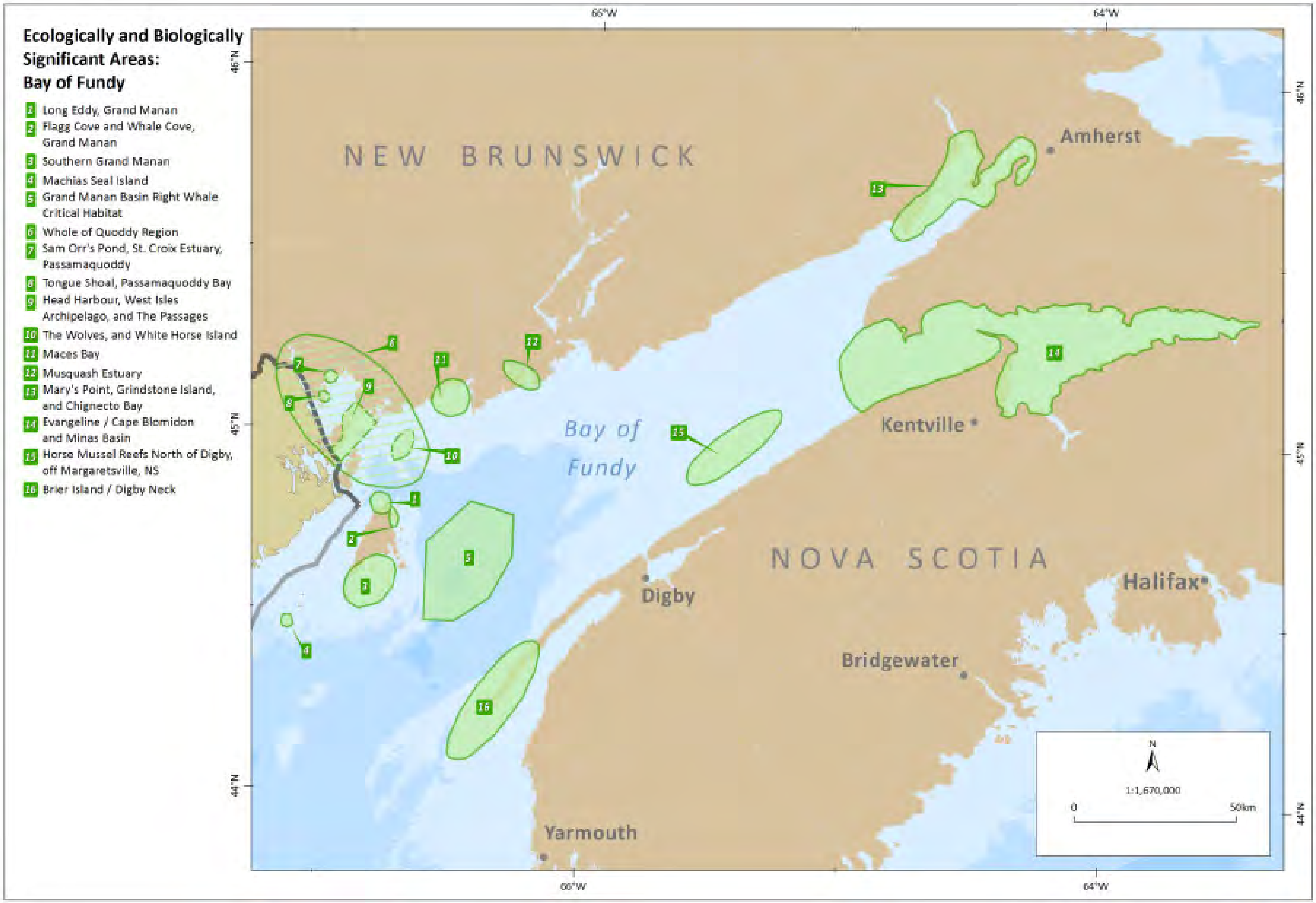
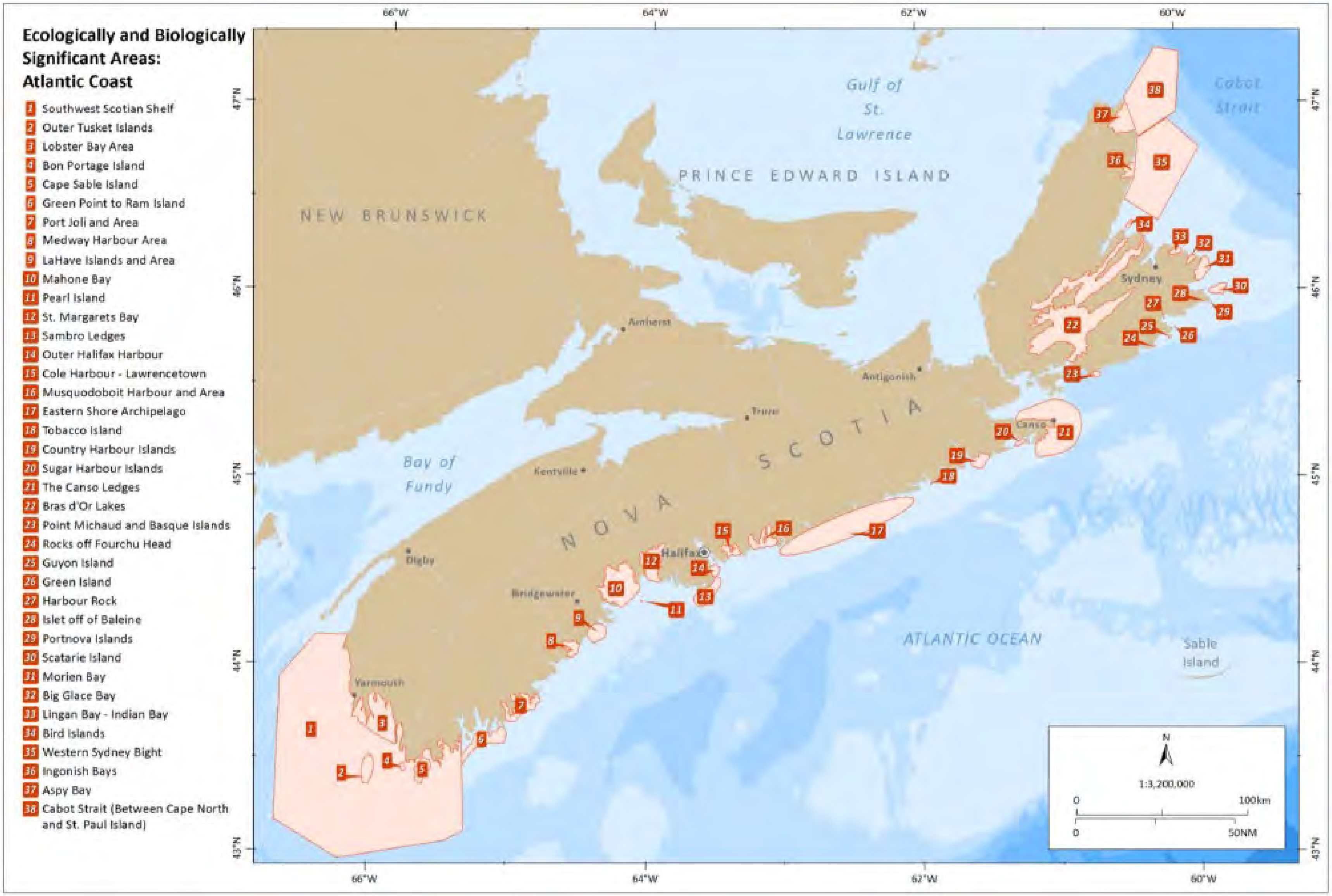
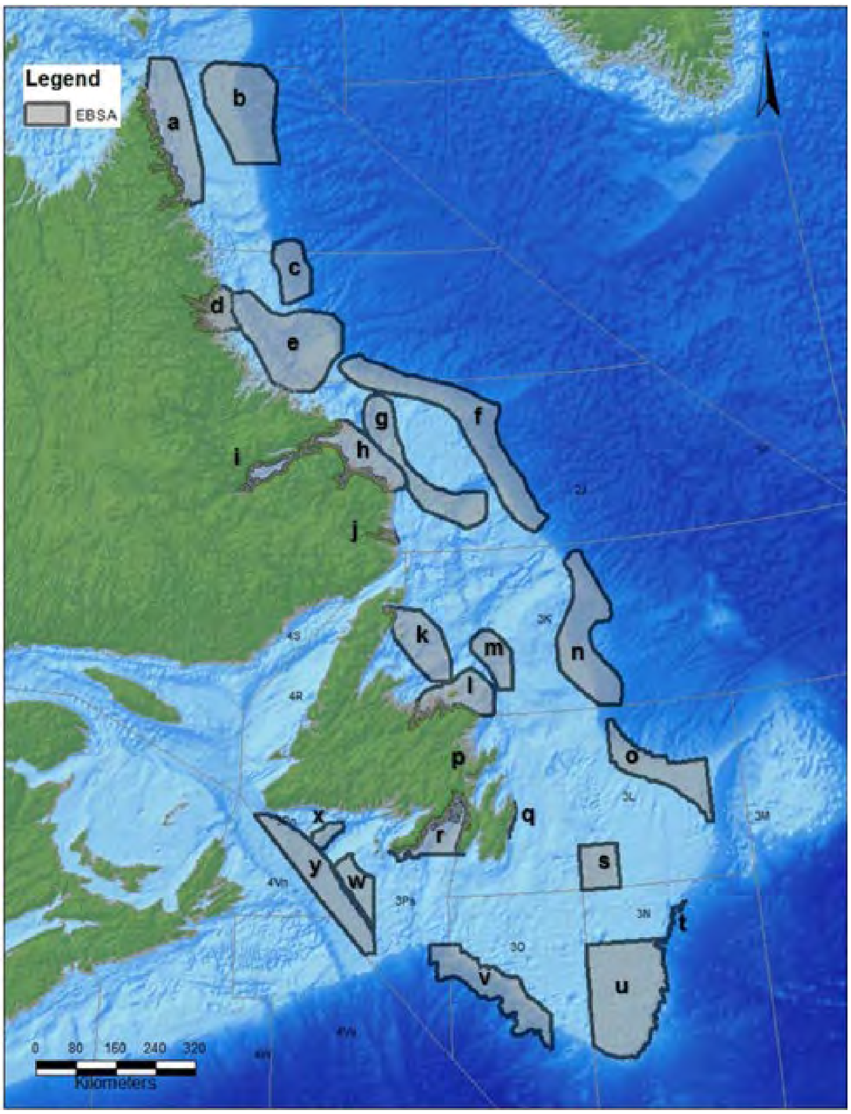


Figure 2. Location of identified Atlantic coast sub-region EBSAs – boundaries represent a best approximation of where a significant feature or features exist.



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.



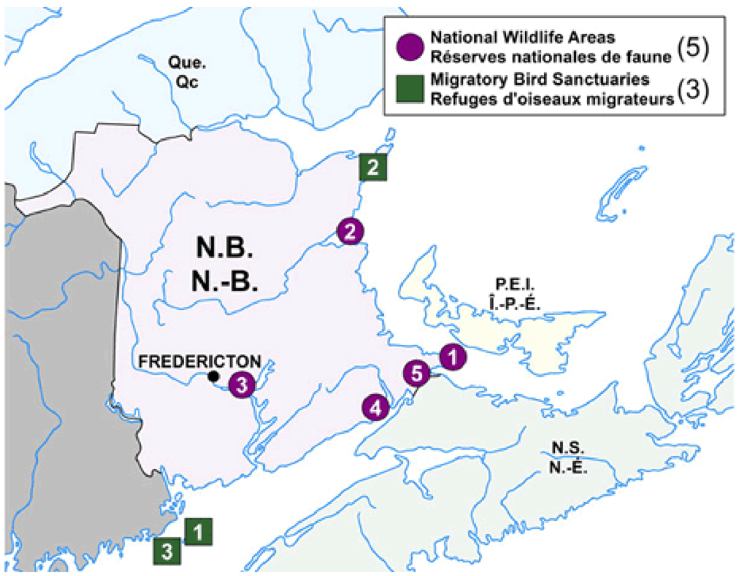
[4] DFO. 2016. Refinement of Information Relating to Ecologically and Biologically Significant Areas (EBSAs) Identified in the Newfoundland and Labrador (NL) Bioregion. DFO Can. Sci. Advis. Sec. Sci. Resp. 2016/032.

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.

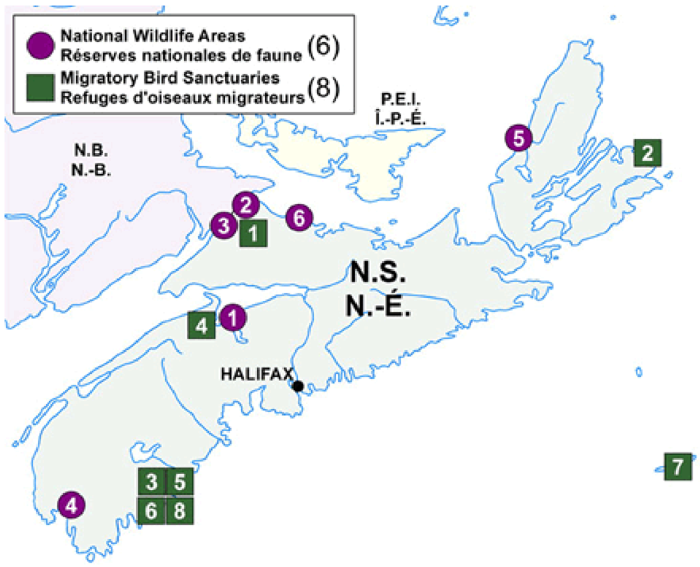


National Wildlife Areas			
No.	**Name**	**Year Established**	**Size in Hectares**
1	Cape Jourimain	1980	654
2	Portage Island	1979	349
3	Portobello Creek	1995	3,011
4	Shepody	1980	1,062
5	Tintamarre	1977	1,970

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.

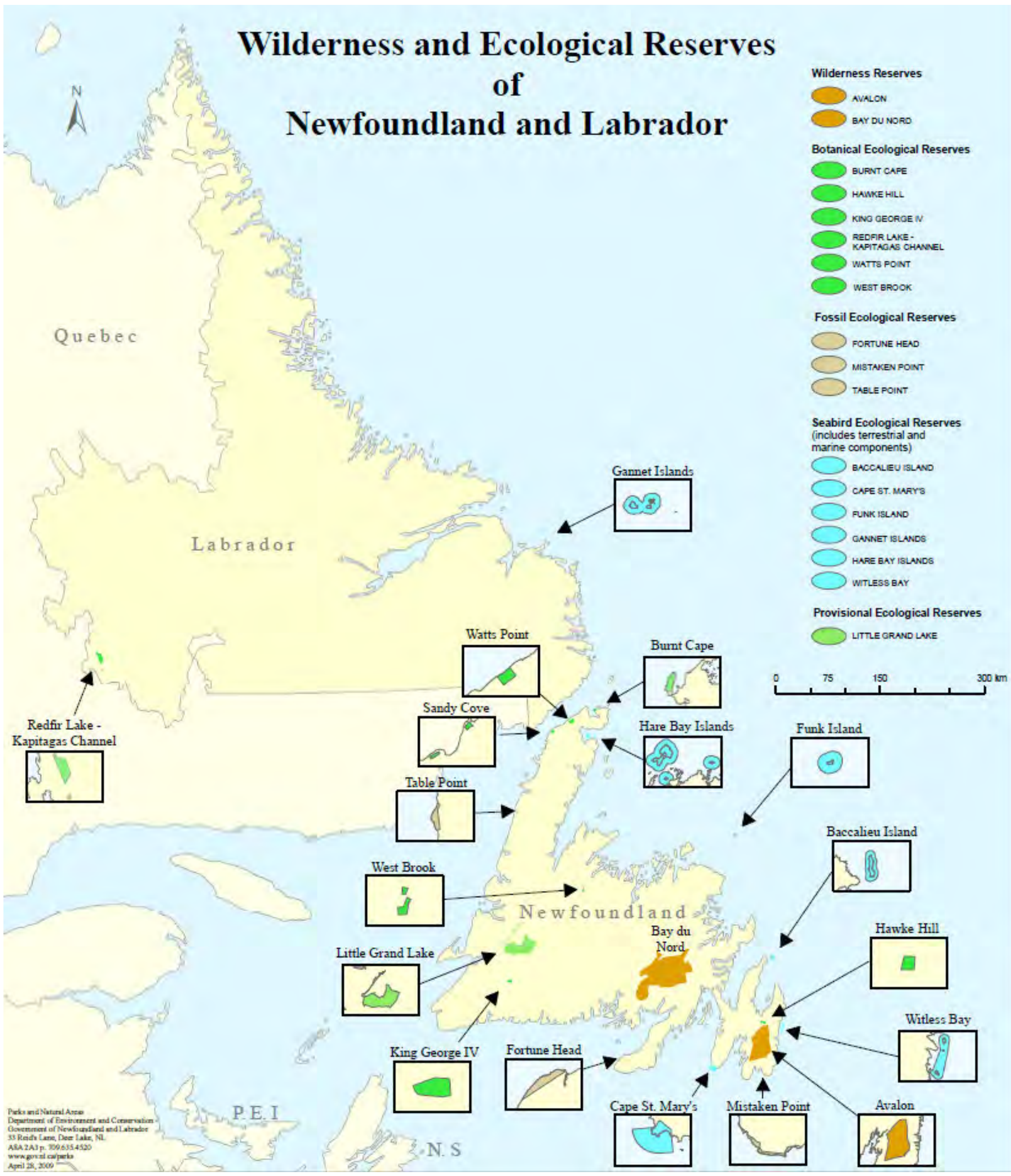
Table 1. Migratory Bird Sanctuaries in Newfoundland and Labrador.

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.
  - o 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.
  - o Protect Black Dogfish from human induced mortality (e.g., bycatch in the commercial fishery) in the Laurentian Channel.
  - o Protect Smooth Skate from human induced mortality (e.g., bycatch in the commercial fishery) in the Laurentian Channel.
  - o Protect Porbeagle sharks from human induced mortality (e.g., bycatch in the commercial fishery, seismic activities) in the Laurentian Channel.
  - o 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.
  - o 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.
  - o Maintain productivity of harvested species.
  - o Maintain biodiversity of individual species, communities, and populations within the different ecotypes.
  - o 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.
  - o 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.
  - o 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.
  - o Conserve and protect marine areas of high biodiversity at the community, species, population, and genetic levels within the MPA.
  - o 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.
  - o 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.
  - o 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)

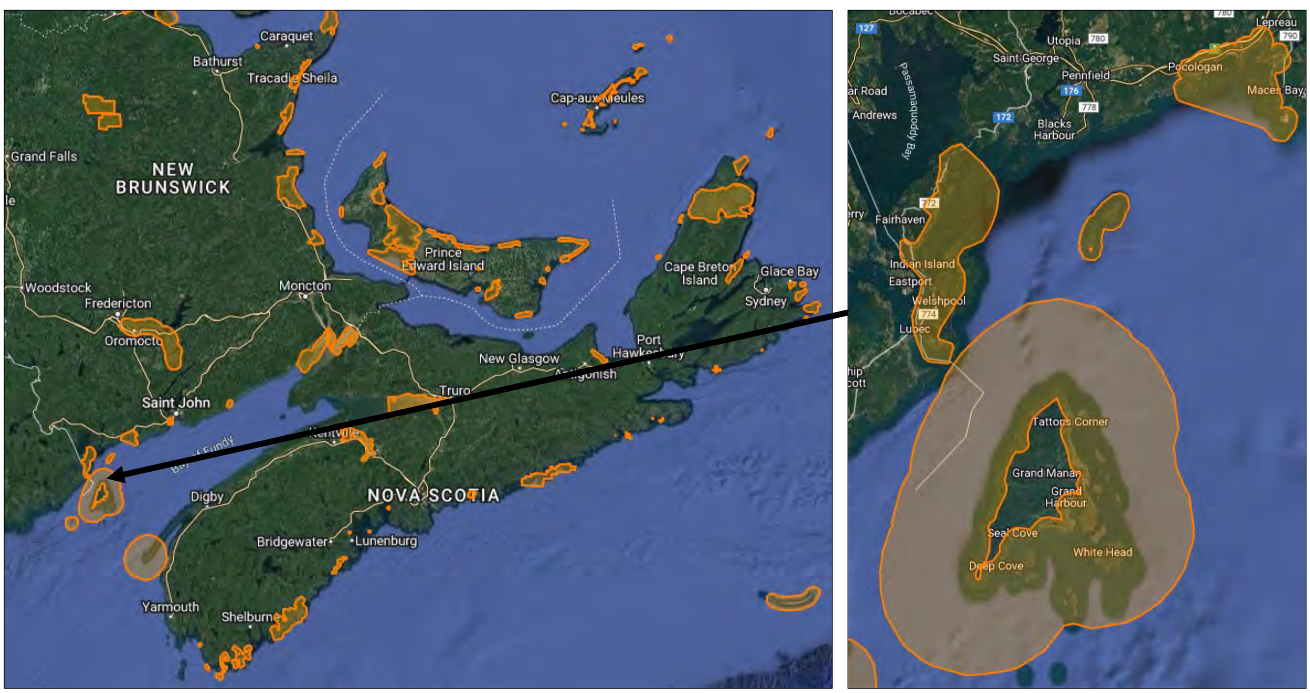
The SARA is a key federal government commitment *"to prevent wildlife species from being extirpated or becoming extinct, to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity and to manage species of special concern to prevent them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

APPENDIX D
Notice of Works

Transport Canada / Transports Canada

NAVIGATION PROTECTION ACT (NPA)
NOTICE OF WORKS FORM

WARNING: Any false or misleading statement with respect to this form and supporting documentation, including the misrepresentation of a material fact, may result in the refusal to authorize or issue Approval, or result in the suspension or cancellation of an Approval obtained through fraudulent means.

PRIOR TO COMPLETING THIS FORM:
1. Determine if your project is on a navigable water listed on the Schedule to the NPA. A *Notice to the Minister* is required for works on scheduled navigable waters. Works on non-scheduled navigable waters may be eligible to opt in; if requesting Opt-in, the Opt-in annex must be included with your *Notice to the Minister*.
2. Self assess your project against the *Minor Works Order* to determine if a *Notice to the Minister* is required. Links to the NPA Schedule, Order and Regulations can be accessed through the Navigation Protection Program (NPP) website at http://www.tc.gc.ca/eng/programs-621.html.

PURPOSE

This *Notice of Works* Form and its supporting documentation (as well as other relevant information) which may be required for a review by Transport Canada (TC), once completed and submitted, comprise the *Notice to the Minister* as required under the NPA. For assistance in completing your submission, refer to the guidance provided on the NPP website under "Apply to the NPP" including the *Guide to the Navigation Protection Program's Notification, Application and Review Requirements*.

SUPPORTING DOCUMENTATION REQUIREMENTS

Mandatory Information Checklist (incomplete information will be returned with no action)	Recommended Information (may expedite your review)
☑ Completed and signed "Notice of Works Form" with all mandatory fields completed	☑ Body of water details
☑ Map showing location of project[1]	☑ Land use/Ownership information
☑ Top/Plan drawing with dimensions[1]	☑ Body of water use information
☑ Side/Profile drawing with dimensions[1]	☑ Impacts, obstructions and mitigation plans
	☐ Any environmental review information
[1] 6 copies if hard copy submission	☑ Operation, maintenance and marking plans
	☐ Photographs of work site and body of water
	☐ Aboriginal consultation results
	☑ Other government agencies involved
	☐ Water lot lease information
	☐ Opt-in request annex (non-scheduled navigable waters only)

When submitting a Notice to the Minister, owners should note:

- All plans and drawings must be legible when printed on 11" x 17" paper
- For e-mail submissions, provide a scan of all relevant supporting documentation
- Your completed Notice to the Minister should be sent to the appropriate regional office as outlined below

TRANSPORT CANADA NAVIGATION PROTECTION PROGRAM REGIONAL OFFICE LOCATIONS

Pacific Region 820-800 Burrard Street Vancouver BC V6Z 2J8 Telephone: 604-775-8867 Email: NPPPAC-PPNPAC@tc.gc.ca	**Prairie and Northern Region** Canada Place 1100-9700 Jasper Ave Edmonton AB T5J 4E6 Telephone: 780-495-8215 Email: NPPPNR-PPNRPN@tc.gc.ca	**Ontario Region** 100 South Front Street, 1st Floor Sarnia ON N7T 2M4 Telephone: 519-383-1863 Email: NPPONT-PPNONT@tc.gc.ca
Headquarters (For info on the NPP and NPA ONLY) Notices not processed at this office Tower C, 330 Sparks Street, 18th Floor Ottawa ON K1A 0N5 Telephone: 613-991-3476 Email: NPPHQ-PPNAC@tc.gc.ca	**Quebec Region** 401-1550 d'Estimauville Avenue, 5th Floor Quebec QC G1J 0C8 Telephone: 877-646-6420 Email: PPNQUE-NPPQUE@tc.gc.ca	**Atlantic Region** 95 Foundry Street, 6th Floor P.O. Box 42 Moncton NB E1C 8K6 Telephone: 506-851-3113 Email: NPPATL-PPNATL@tc.gc.ca

Canada

Transport Canada / Transports Canada

NAVIGATION PROTECTION ACT
NOTICE OF WORKS FORM

TC file number (if known):

Are you the riparian property owner? ◯ Yes ◯ No

GENERAL INFORMATION

Official and/or local name(s) of the body of water (Required) **Saddle Island, Aspotogan Harbour**	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[2]

Individual or company name (Required)	Contact name (Required) [redacted]

Mailing address (Required)

P.O. Box 33

City/Town (Required)	Province/Territory (Required)	Postal code (Required)
Bridgewater	**Nova Scotia**	**B4V 2W6**

Primary telephone number (Required)	Other telephone number	E-mail
902-275-7493		[redacted]

Owner's agent/mandatary (contractor/consultant/representative/co-proponent, if any)

Company name	Contact name
Sweeney International Marine Corp.	[redacted]

Mailing address

46 Milltown Blvd.

City/Town	Province/Territory	Postal code
St. Stephen	**New Brunswick**	**E3L 1G3**

Primary telephone number	Other telephone number	E-mail
[redacted]		[redacted]

WORK SITE INFORMATION

Nearest municipality/county/district (Required)	Province/Territory (Required)
Lunenburg County	**Nova Scotia**

Site location such as lot, concession, section, township, range, meridian, 911 address, property identification, etc. (Required)

Saddle Island aquaculture site #1006 is located in Aspotogan Harbour, approximately 15 kilometers east by south of the community of Chester and 14.5 kilometers south of the community of Hubbards. Site #1006 is situated on the northern side of Saddle Island.

Site position Latitude North (Required)			Site position Longitude West (Required)		
Degrees **44**	Minutes **30**	Seconds **16.9**	Degrees **64**	Minutes **02**	Seconds **57.2**

Hydro chart number: **4386**

Topo map number:

Canada

Body of water details, such as characteristics, bank/bottom features, biological components, flow/tides, etc.

Site #1006 is located on the northern side of Saddle Island in Aspotogan Harbour. The site is currently under review for a boundary amendment. The proposed amendment would see the site occupy a 30.22 ha parcel. The site is located over waters ranging from 16 - 21 m in depth. The sediment composition of the seafloor is composed primarily of hard packed sand, silt and mud with rare pebbles and cobble observed. Unattached macroalgae is common throughout the site.

Potential obstructions, such as natural/man-made, other works, navigation aids, etc.

This site will consist of plastic circular cages and compensator buoys. The outside corners of the lease will also be marked with buoys.

Land use/Ownership, such as past/current, private/government, rural/suburban, coastal, environmental, etc.

Aquaculture site #1006 is owned and operated 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

The area surrounding aquaculture site #1006 is used primarily by recreational vessels traveling throughout the area. The primary vessel traffic around Saddle Island are from aquaculture vessels.

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 one string of 6 circular 150 m circumference cages. Cages are present on site all year round.

Method of construction such as temporary works, activities, etc. (Required)

The aquaculture site consists of an anchored cage system (see attached plans). Crews will visit the site daily to feed and maintain cage system.

Anticipated impacts such as source, severity, mitigation, marking, waste/debris management, use, cumulative, etc.

Expected start date (dd-mm-yyyy) (Required)

01-10-2024

Expected completion date (dd-mm-yyyy) (Required)

01-10-2044

Canada

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)

09-05-2023.

Date (dd-mm-yyyy) (Required)

[redacted]

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

Canada

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

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