RECEIVED
By Nova Scotia Aquaculture Review Board at 4:15 pm, Nov 13, 2025

NSARB-2025-001-APP-004

EXB 004a

APPLICATION PACKAGE

Volume 1

AQ#0814x, AQ#1430, AQ#1431

Submission to the Nova Scotia Aquaculture Review Board

Nova Scotia Department of Fisheries and Aquaculture

Executive Summary

The enclosed represents a submission to the Nova Scotia Aquaculture Review Board (NSARB) by the Nova Scotia Department of Fisheries and Aquaculture (DFA) pursuant to section 47 of the *Fisheries and Coastal Resources Act* and section 16 of the *Aquaculture Licence and Lease Regulations*.

WFN Fish Farm Limited Partnership (WFN), formerly known as Waycobah First Nations Band Council and as We'koqma'q First Nation, applied for a boundary amendment to AQ#0814x and two new marine finfish aquaculture licences and leases, AQ#1430 and AQ#1431, for the cultivation of Rainbow trout (*Oncorhynchus mykiss*). The application for the boundary amendment of AQ#0814x will combine three existing sites (AQ#0814, AQ#0845, AQ#0600). The existing site, AQ#0814x, is also licensed for the cultivation of Atlantic salmon (*Salmo salar*), which is included with the amendment application.

- AQ#0814x (AQ#0814, AQ#0845, AQ#0600) - Whycocomagh Bay, Inverness County (63.77 ha)
- AQ#1430 (North Aberdeen) - Whycocomagh Bay, Inverness County (34.91 ha)
- AQ#1431 (South Aberdeen) - Whycocomagh Bay, Inverness County (34.42 ha)

An option to lease (AQ#1413) was granted to WFN on June 19, 2018, for a period of six months. The option to lease period was extended for an additional six-month timeframe, expiring on June 19, 2019. In accordance with section 11 of the *Aquaculture Licence and Lease Regulations*, two new marine finfish applications were received by DFA on March 5, 2019, prior to the expiry of the option to lease. In addition, in accordance with section 13 of the *Aquaculture Licence and Lease Regulations*, one boundary amendment application was received by DFA on March 5, 2019. The application packages were considered complete once application fees were received on April 8, 2019.

The initial submission from WFN included separate Development Plans for each of the three licence and lease applications and a single Scoping Report that applies to all three applications. WFN applied for and was granted special experimental site AQ#5010 within the boundaries of proposed site AQ#1430 on August 23, 2019, and AQ#5013 within the boundaries of proposed site AQ#1431 on September 14, 2021, both for the cultivation of Rainbow trout. The objectives of the experimental sites are to assess the technical feasibility of an aquaculture site while implementing new production methods and to research the application of a new technology to model and predict sulfide levels in Whycocomagh Bay. Based on experience gained through the experimental sites, additional information and updated Development Plans were submitted to address changes to the proposed production plan and site infrastructure.

A final consolidated Development Plan was submitted for each application on April 23, 2024 to incorporate all current and updated information since the applications were first submitted, including information gained during network agency review and practical experience from the special experimental sites. The final plan also included a request by WFN to reduce the size of the proposed AQ#0814x boundary amendment from 65.53 ha to 63.77 ha, eliminating an area that was no longer required for production, allowing for easier navigation around the site, and no longer requiring the proposed navigation corridor through the site.

This Application Package is presented in two volumes. Volume 1 contains the final, updated package reviewed by the Department and presented to the NSARB for consideration. It includes the updated (i.e., applicant name) application forms, the consolidated and updated Development Plans submitted in April 2024, the appendices updated from the original submission as required, the baseline monitoring packages, and the original Scoping Report with appendices. Volume 2 contains all original and historical submissions of Development Plans and additional information by WFN since 2019, which have been incorporated into the final April 2024 Development Plan. The Development Plan versions sent to network agency partners for feedback are found in Volume 2, Sections 4.1 to 4.5. The updated Development Plan versions in Volume 1, Section 2.0 and Volume 2, Sections 4.6 to 4.7, submitted in 2023 and 2024, were not re-networked to network agencies as the proposed changes (as summarized in the Introduction of the respective Development Plans found in Sections 2.1, 2.2, and 2.3) could be adequately considered and addressed through DFA's regulatory programs as required.

TABLE OF CONTENTS – APPLICATION PACKAGE
VOLUME 1
AQ#0814x, AQ#1430, AQ#1431

DOCUMENT	VOLUME	PAGE #
1.0 APPLICATION FORMS	1	5
1.1 AQ#0814x Application Form	1	6
1.2 AQ#1430 Application Form	1	13
1.3 AQ#1431 Application Form	1	19
2.0 DEVELOPMENT PLANS (UPDATED DEVELOPMENT PLANS 2024)	1	25
2.1 AQ#0814x Development Plan	1	26
2.2 AQ#1430 Development Plan	1	86
2.3 AQ#1431 Development Plan	1	149
Addendum 1 – Development Plan Appendices	1	213
A1.1 Appendix A – Baseline Survey 2015	1	214
A1.2 Appendix B – BAP Farm Standard 2023	1	226
A1.3 Appendix C – Resumes for Senior Personnel	1	300
A1.4 Appendix D – Algar et al. Carrying Capacity Study	1	309
A1.5 Appendix E – Atlantic Canada Conservation Data Centre Reports	1	312
A1.6 Appendix F – Wind and Wave Conditions Report 2021	1	373
A1.7 Appendix G – Updated Notice of Works Forms	1	406
Addendum 2 – Additional Information	1	434
A2.1 Baseline Monitoring Packages 2018	1	435
3.0 SCOPING REPORT	1	436
Addendum 3 – Scoping Report Appendices	1	450
A3.1 Appendix A – Oran Advertisement	1	451
A3.2 Appendix B – Royal Gazette Posting	1	453
A3.3 Appendix C – Open House Notice	1	488
A3.4 Appendix D – The Inverness Oran Newspaper Article	1	490
4.0 HISTORICAL DEVELOPMENT PLAN SUBMISSIONS	2	498
4.1 Application Forms (2019)	2	499
4.1.1 AQ#0814x Application Form (2019)	2	500
4.1.2 AQ#1430 Application Form (2019)	2	508
4.1.3 AQ#1431 Application Form (2019)	2	515
4.2 Development Plans (2019)	2	522
4.2.1 AQ#0814x Development Plan (2019)	2	523
4.2.2 AQ#1430 Development Plan (2019)	2	566
4.2.3 AQ#1431 Development Plan (2019)	2	613
4.2.4 Development Plan Appendices (2019)	2	660
4.3 Additional Information Requests and Responses (2019)	2	823
4.4 Development Plan Revisions AQ#1430 and AQ#1431 (2020)	2	838
4.5 Depositional Models AQ#1430 and AQ#1431 (2020)	2	848
4.6 Updates to Development Plans (2023)	2	865
4.7 Updates to Development Plans (2024)	2	882

1.0 APPLICATION FORMS

1.1 AQ#0814x Application Form

NOVA SCOTIA

Office Use Only 7

Aquaculture Amendment Application

Licence/Lease No: 0814

Applicant Information: March 7, 2024

WFN FISH FARM LIMITED PARTNERSHIP

Applicant: Wikogmaq First Nation Contact Person: Donald Davis

Nova Scotia Registry of Joint Stocks Number: _____

Revenue Canada Business Number: [redacted]

Telephone No. (Work): [redacted] (Home): _____ (Cell): [redacted]

Fax No.: [redacted] E-mail: [redacted]

Mailing Address: [redacted]

Whycocomagh, NS Postal Code: B0E 3M0

Civic Address: [redacted]

[redacted] Postal Code: B0E 3M0

Amendment Request:

The amendment is requested for: (Check all appropriate boxes)

- ☐ Land-based
- ☑ Marine
- ☐ Marine Plants
- ☑ Finfish
- ☐ Shellfish
- ☐ Other species
- ☐ Change or addition of species
- ☐ Change of culture method
- ☑ Change of site boundaries (for marine applications)
- ☐ Other change

Submit completed applications to:

Nova Scotia Department of Fisheries and Aquaculture, Aquaculture Division
1575 Lake Road, Shelburne, NS B0T 1W0
E-mail: aquaculture@novascotia.ca

NOVA SCOTIA

Office Use Only 8

Provide explanation of change requested. Add additional pages, as required.

See attached.

Application Materials

A complete application includes the following:

- Amendment application fee (payable to Minister of Finance) according to Section 77 of 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*
- Application Form
- Development Plan according to application
- Report on Public Engagement during Scoping (for adjudicative amendment applications and for other applications as applicable)
- Copy of up-to-date Shareholder's Register which sets out the shareholdings of the company (if applicable)

Public Notice and Disclosure

As part of the process for deciding on an aquaculture application, the Nova Scotia Department of Fisheries and Aquaculture ("Fisheries and Aquaculture") will disclose application information to other government bodies, including, if applicable, the Nova Scotia Aquaculture Review Board for use at an adjudicative hearing relating to the application.

In accordance with departmental policy, which seeks to promote public involvement in the process for deciding on aquaculture applications, Fisheries and Aquaculture will disclose application information – not including, however, personal or business confidential information – on the departmental website.

Aquaculture Amendment Application Licence/Lease No. 0814

Explanation of change requested:

We'koqma'q First Nation is requesting a boundary amendment to Site 0814 which will allow the replacement of three leases/licences with a single lease of larger total area. The three current sites are #0814 (1.39 ha), #0845 (1.57 ha) and #0600 (1.39 ha). They are all licensed for the marine cage cultivation of Atlantic salmon and rainbow trout. The requested amended site overlays all of these sites, is 75 hectares in size, and includes a navigational corridor. It is located in Whycocomagh Bay, south of the village of Whycocomagh and Indian Island. This request is one part of We'koqma'q's larger plan to expand its trout aquaculture operations in Whycocomagh Bay. This expansion will increase its trout production capacity four fold to 1,000,000 fish per year. We'koqma'q has been successfully conducting rainbow trout aquaculture in this region for seven years, first as a contract grower, and for the past four years as the business owner. The proposed amended site is expected to support the grow-out of 1500 tons of rainbow trout.

NOVA SCOTIA

Office Use Only 10

Privacy Statement

The personal and business confidential information collected as part of an aquaculture application will only be used or disclosed by Fisheries and Aquaculture for the purpose of deciding on the application.

All application information collected is subject to the Freedom of Information and Protection of Privacy Act ("FOIPOP") and will only be used or disclosed in accordance with FOIPOP.

By signing and submitting this form, I acknowledge that I have read, understand, and accept the above statements regarding the collection, use, and disclosure of the information provided on this form.

Signature of Applicant

[redacted]

Date

Feb 26/2019

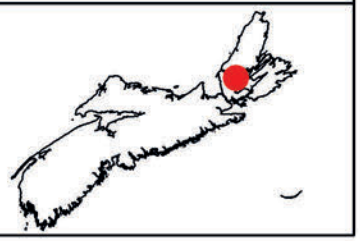
Signature of Nova Scotia Department of Fisheries and Aquaculture Designate

Date

Submit completed applications to:

Nova Scotia Department of Fisheries and Aquaculture, Aquaculture Division
1575 Lake Road, Shelburne, NS B0T 1W0
E-mail: aquaculture@novascotia.ca

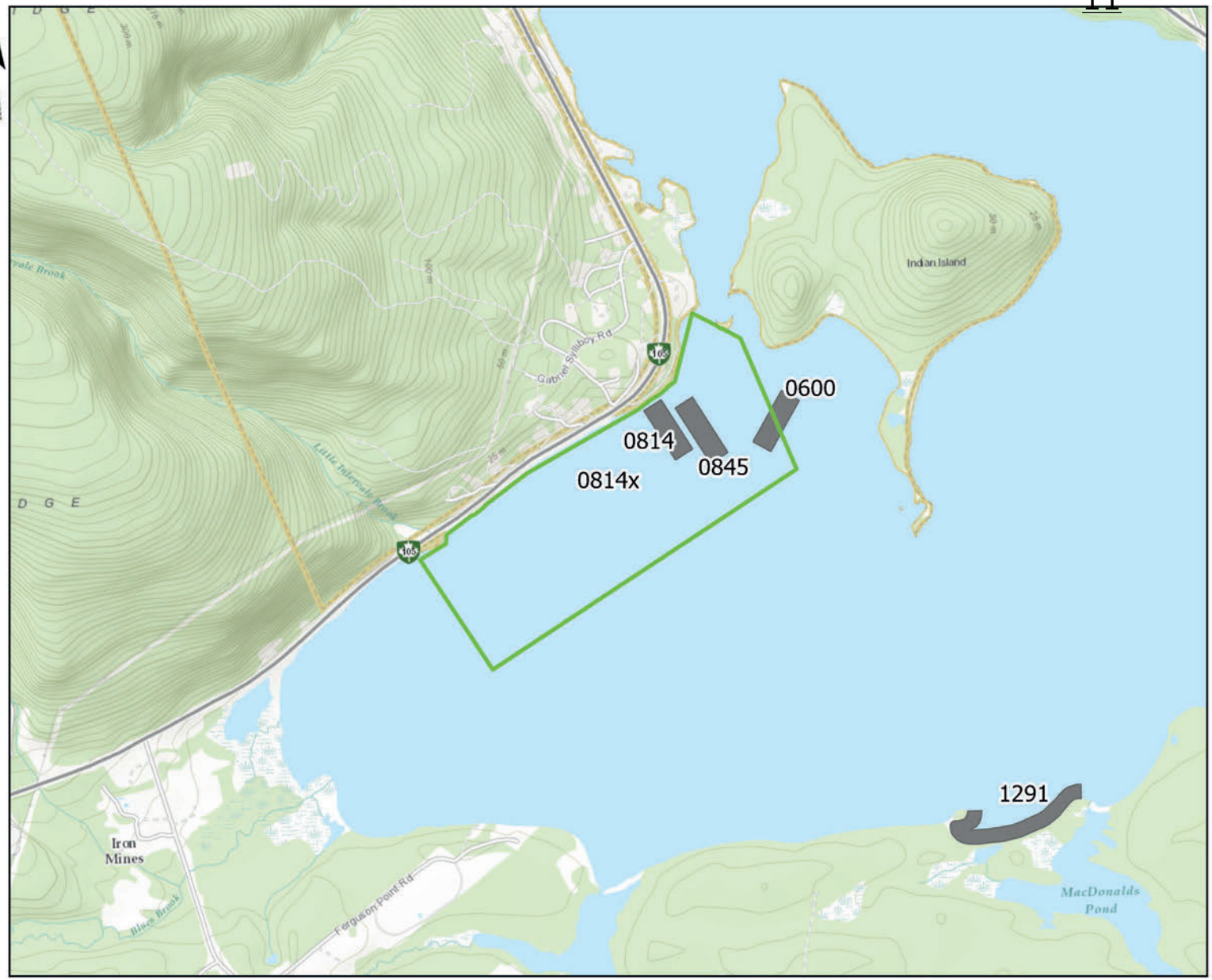
SCHEDULE A



Aquaculture Site
0814x

Corner	Latitude	Longitude
1	45° 57' 15.880"	-61° 7' 29.091"
10	45° 57' 8.352"	-61° 7' 32.088"
2	45° 57' 12.960"	-61° 7' 21.504"
3	45° 56' 58.344"	-61° 7' 13.080"
4	45° 56' 36.920"	-61° 8' 2.060"
5	45° 56' 49.272"	-61° 8' 13.200"
6	45° 56' 50.990"	-61° 8' 9.020"
7	45° 56' 51.980"	-61° 8' 8.900"
8	45° 56' 58.610"	-61° 7' 55.830"
9	45° 57' 5.328"	-61° 7' 38.064"
Centre	45° 56' 55.480"	-61° 7' 40.306"

DATUM NAD 83 CSRS UTM Zone 19
The above coordinates are not from a legal survey



License/Lease Holder	County	Waterbody	Hectares	Species Type	Culture Type	Chart
WFN Fish Farm Limited Partnership	Inverness	Whycocomagh Bay	63.77	Finfish	Suspended Culture	4278

Proposed Commercial Application
Other Issued Commercial

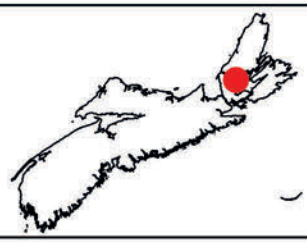
0 0.25 0.5 1 km

NOVA SCOTIA
Fisheries and Aquaculture

Disclaimer
This map should not be used for navigation or legal purposes. It is intended for general reference use only.
Date: 2024-04-22 Created By: MK

Province of Nova Scotia, Esri, HERE, Garmin, USGS, METI/NASA, AAFC, NRCan

SCHEDULE A



Aquaculture Site

0814x

Corner	Latitude	Longitude
1	45° 57' 15.880"	-61° 7' 29.091"
10	45° 57' 8.352"	-61° 7' 32.088"
2	45° 57' 12.960"	-61° 7' 21.504"
3	45° 56' 58.344"	-61° 7' 13.080"
4	45° 56' 36.920"	-61° 8' 2.060"
5	45° 56' 49.272"	-61° 8' 13.200"
6	45° 56' 50.990"	-61° 8' 9.020"
7	45° 56' 51.980"	-61° 8' 8.900"
8	45° 56' 58.610"	-61° 7' 55.830"
9	45° 57' 5.328"	-61° 7' 38.064"
Centre	45° 56' 55.480"	-61° 7' 40.306"

DATUM NAD 83 CSRS UTM Zone 19
The above coordinates are not from a legal survey



License/Lease Holder	County	Waterbody	Hectares	Species Type	Culture Type	Chart
WFN Fish Farm Limited Partnership	Inverness	Whycocomagh Bay	63.77	Finfish	Suspended Culture	4278

Proposed Commercial Application
Property Boundary

0 100 200 400 600
Meters

NOVA SCOTIA
Fisheries and Aquaculture

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

Date: 2024-04-22 Created By: MK

Esri Community Maps Contributors, Province of Nova Scotia, Esri Canada, Esri, TomTom, Garmin, SafeGraph, METI/NASA, USGS, NRCan, Parks Canada, Sources: NRCan, Esri Canada, and Canadian Community Maps contributors.

1.2 AQ#1430 Application Form

NOVA SCOTIA

NORTH ABERDEEN AQ 1430

Office Use Only

Received 14

05 MARS 2019

Fisheries and Aquaculture
Shelburne, NS

Aquaculture Licence/Lease Application

Applicant Information: March 7, 2024

WFN FISH FARM LIMITED PARTNERSHIP

Applicant: ~~Wikmaq First Nation~~ Contact Person: Donald Davis

Nova Scotia Registry of Joint Stocks Number: _____

Revenue Canada Business Number: [redacted]

Telephone No. (Work): [redacted] (Home): _____ (Cell): [redacted]

Fax No.: [redacted] E-mail: [redacted]

Mailing Address: [redacted]

Whycocomagh, NS Postal Code: B0E 3M0

Civic Address: [redacted]

Whycocomagh, NS Postal Code: B0E 3M0

Proposed Site Information:

Location of Site: North Aberdeen, Whycocomagh Bay County: Inverness Site Size (Ha): 37

Site Dimensions: 370x895

Hydrographic Chart No.: CHS Chart No. 4278

Approximate Center Coordinates: Latitude: 45°58'41.78"

Longitude: -61°01'28.51"

Type of Licence Application

(Check appropriate boxes):

☑ Commercial licence/lease

☐ Experimental licence/lease

☐ Marine Plants ☑ Finfish ☐ Shellfish ☐ Other

Submit completed applications to: **Nova Scotia Department of Fisheries and Aquaculture, Aquaculture Division**
1575 Lake Road, Shelburne, NS B0T 1W0
E-mail: aquaculture@novascotia.ca

- ☐ Land-based
  - ☐ Freshwater
  - ☐ Saltwater
  - ☐ U-Fish
  - ☐ Hatchery
  - ☐ Nursery Facility
  - ☐ Growout
- ☑ Marine
  - ☑ Cage culture
  - ☐ Suspended shellfish or marine plants
  - ☐ Bottom shellfish with gear
  - ☐ Bottom shellfish without gear

Application Materials

A complete application includes the following:

- Application fee (payable to Minister of Finance) according to Section 77 of 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*
- Application Form
- Development Plan according to application
- Report on Public Engagement during Scoping (for all Marine applications and for other applications, as applicable)
- Copy of up-to-date Shareholder's Register which sets out the shareholdings of the company (if applicable, and if not already provided during the Option to Lease application process.

Public Notice and Disclosure

As part of the process for deciding on an aquaculture application, the Nova Scotia Department of Fisheries and Aquaculture ("Fisheries and Aquaculture") will disclose application information to other government bodies, including, if applicable, the Nova Scotia Aquaculture Review Board for use at an adjudicative hearing relating to the application.

In accordance with departmental policy, which seeks to promote public involvement in the process for deciding on aquaculture applications, Fisheries and Aquaculture will disclose application information – not including, however, personal or business confidential information – on the departmental website.

Privacy Statement

The personal and business confidential information collected as part of an aquaculture application will only be used or disclosed by Fisheries and Aquaculture for the purpose of deciding on the application.

All application information collected is subject to the Freedom of Information and Protection of Privacy Act ("FOIPOP") and will only be used or disclosed in accordance with FOIPOP.

By signing and submitting this form, I acknowledge that I have read, understand, and accept the above statements regarding the collection, use, and disclosure of the information provided on this form.

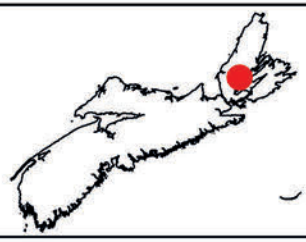
Signature of Applicant [redacted]

Date Feb 26/2019

Signature of Nova Scotia Department of Fisheries and Aquaculture Designate [redacted]

Date March 5, 2019

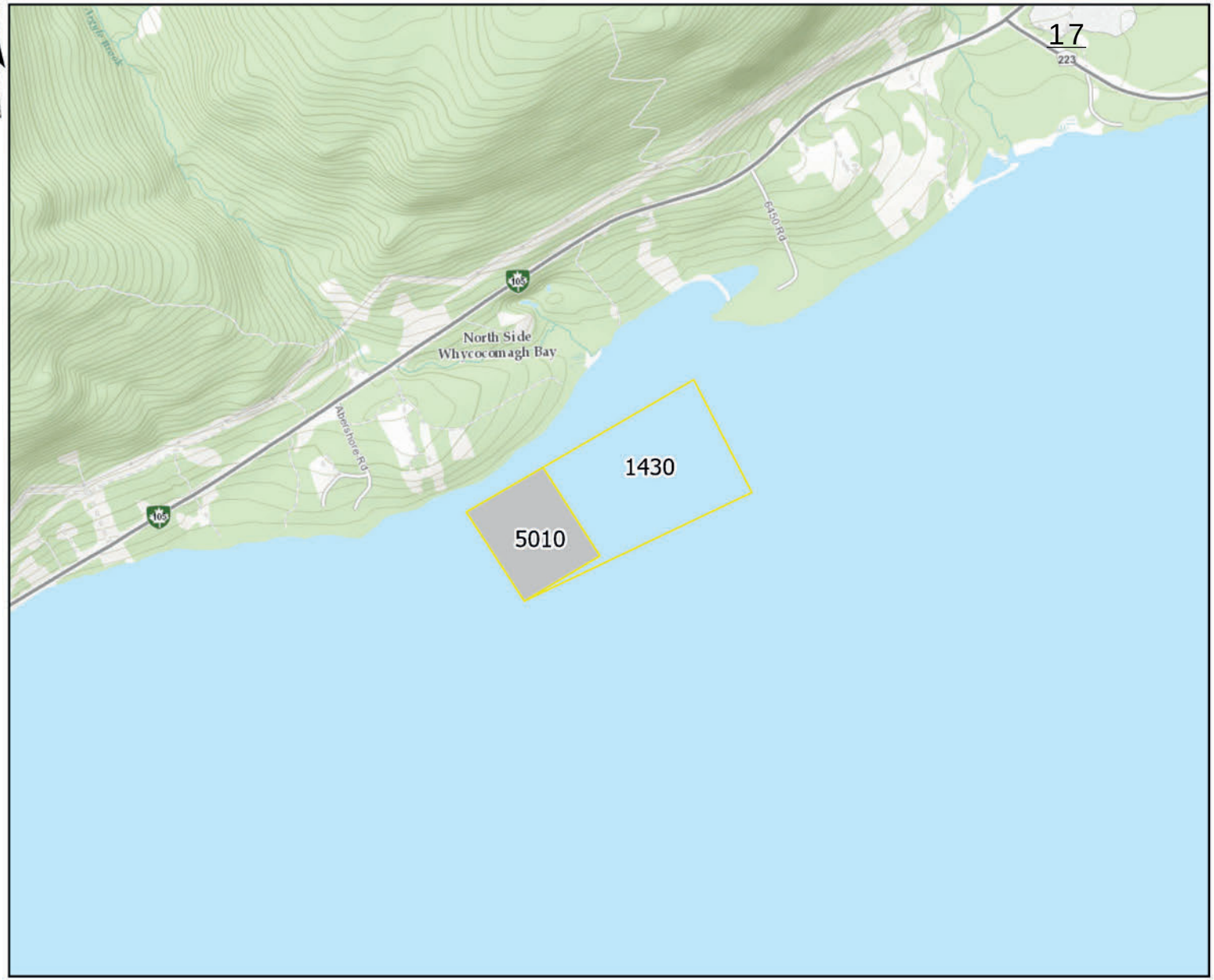
SCHEDULE A



Aquaculture Site
1430

Corner	Latitude	Longitude
1	45° 58' 54.40"	-61° 01' 14.92"
2	45° 58' 41.78"	-61° 01' 06.14"
3	45° 58' 30.40"	-61° 01' 42.65"
4	45° 58' 40.40"	-61° 01' 51.51"
Centre	45° 58' 41.86"	-61° 01' 27.43"

DATUM NAD 83 CSRS UTM Zone 19
The above coordinates are not from a legal survey



License/Lease Holder	County	Waterbody	Hectares	Species Type	Culture Type	Chart
WFN Fish Farm Limited Partnership	Inverness	Whycocomagh Bay	34.91	Finfish	Suspended Culture	4278

Proposed Commercial Lease
Issued Experimental

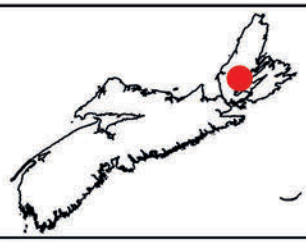
0 0.25 0.5 1 km

NOVA SCOTIA
Fisheries and Aquaculture

Disclaimer
This map should not be used for navigation or legal purposes. It is intended for general reference use only.
Date: 2024-06-25 Created By: MK

Province of Nova Scotia, Esri, HERE, Garmin, USGS, METI/NASA, AAFC, NRCan

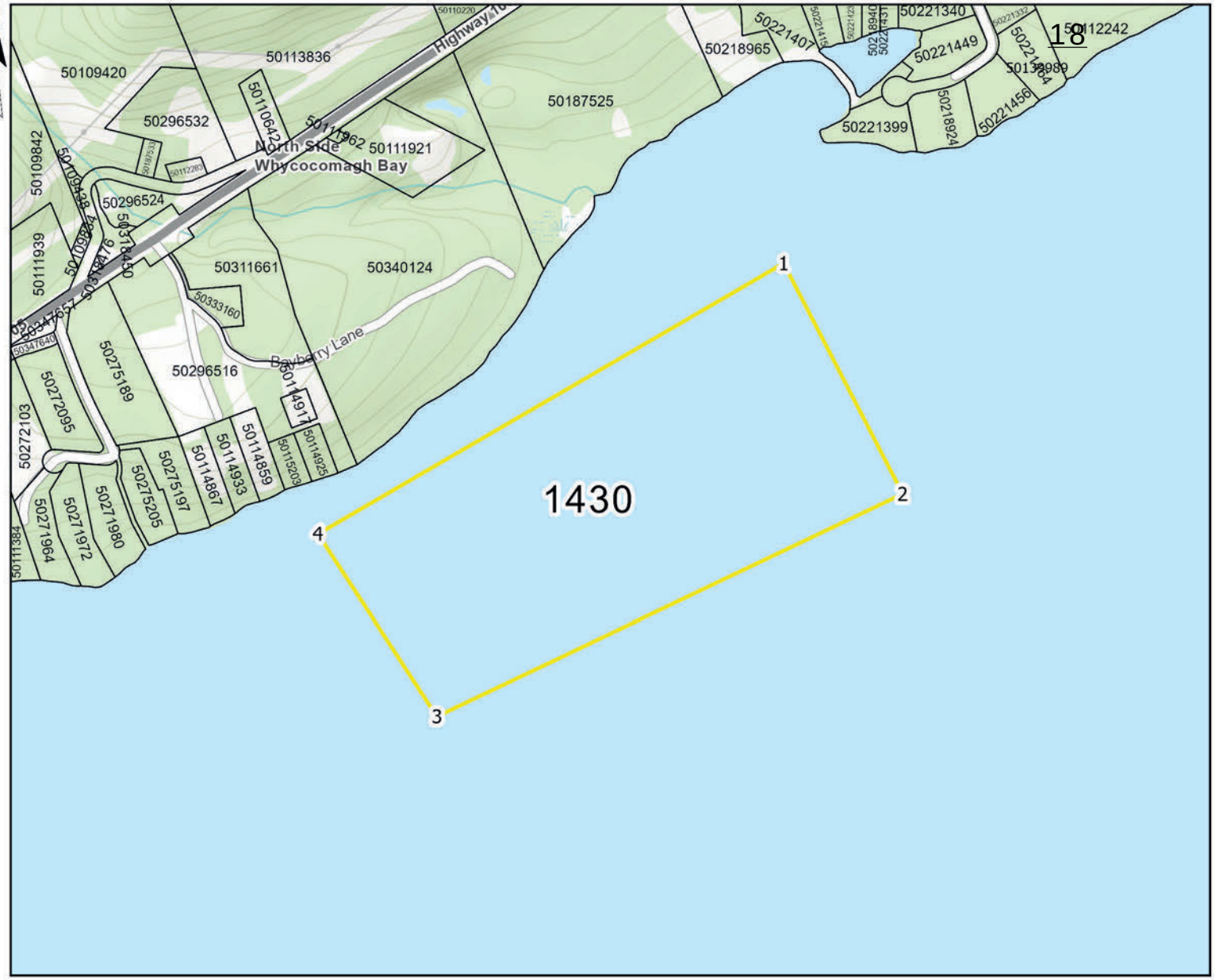
SCHEDULE A



Aquaculture Site
1430

Corner	Latitude	Longitude
1	45° 58' 54.40"	-61° 01' 14.92"
2	45° 58' 41.78"	-61° 01' 06.14"
3	45° 58' 30.40"	-61° 01' 42.65"
4	45° 58' 40.40"	-61° 01' 51.51"
Centre	45° 58' 41.86"	-61° 01' 27.43"

DATUM NAD 83 CSRS UTM Zone 19
The above coordinates are not from a legal survey



License/Lease Holder	County	Waterbody	Hectares	Species Type	Culture Type	Chart
WFN Fish Farm Limited Partnership	Inverness	Whycocomagh Bay	34.91	Finfish	Suspended Culture	4278

Proposed Commercial Lease
Property Boundary

0 100 200 400 600
Meters

NOVA SCOTIA
Fisheries and Aquaculture

Disclaimer
This map should not be used for navigation or legal purposes. It is intended for general reference use only.
Date: 2024-06-25
Created By: MK

Esri Community Maps Contributors, Province of Nova Scotia, Esri Canada, Esri, TomTom, Garmin, SafeGraph, METI/NASA, USGS, NRCan, Parks Canada, Sources: NRCan, Esri Canada, and Canadian Community Maps contributors.

1.3 AQ#1431 Application Form

NOVA SCOTIA

Office Use Only 20
AQ 1431. Received
05 MARS 2019
Fisheries and Aquaculture
Shelburne, NS

Aquaculture Licence/Lease Application

Applicant Information: March 7, 2024

WFN FISH FARM LIMITED PARTNERSHIP ~~NATION~~

Applicant: ~~We'Kogma'g First Nation~~ Contact Person: DONALD DAVIS

Nova Scotia Registry of Joint Stocks Number: _____

Revenue Canada Business Number: [redacted]

Telephone No. (Work): [redacted] (Home): _____ (Cell): [redacted]

Fax No.: [redacted] E-mail: [redacted]

Mailing Address: [redacted]

Whycocomagh, N.S. B0E 3M0 Postal Code: B0E 3M0

Civic Address: [redacted], Waycobah, N.S.

_____ Postal Code: B0E 3M0

Proposed Site Information:

Location of Site: South Aberdeen, Whycocomagh Bay County: Inverness Site Size (Ha): 34

Site Dimensions: 930m x 370m

Hydrographic Chart No.: CHS Chart No. 4278

Approximate Center Coordinates: Latitude: 45°57'38.14"

Longitude: -61°01'28.51"

Type of Licence Application

(Check appropriate boxes):

☑ Commercial licence/lease

☐ Experimental licence/lease

☐ Marine Plants ☑ Finfish ☐ Shellfish ☐ Other

Submit completed applications to: **Nova Scotia Department of Fisheries and Aquaculture, Aquaculture Division**
1575 Lake Road, Shelburne, NS B0T 1W0
E-mail: aquaculture@novascotia.ca

- ☐ Land-based
  - ☐ Freshwater
  - ☐ Saltwater
  - ☐ U-Fish
  - ☐ Hatchery
  - ☐ Nursery Facility
  - ☐ Growout
- ☑ Marine
  - ☑ Cage culture
  - ☐ Suspended shellfish or marine plants
  - ☐ Bottom shellfish with gear
  - ☐ Bottom shellfish without gear

Application Materials

A complete application includes the following:

- Application fee (payable to Minister of Finance) according to Section 77 of 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*
- Application Form
- Development Plan according to application
- Report on Public Engagement during Scoping (for all Marine applications and for other applications, as applicable)
- Copy of up-to-date Shareholder's Register which sets out the shareholdings of the company (if applicable, and if not already provided during the Option to Lease application process.

Public Notice and Disclosure

As part of the process for deciding on an aquaculture application, the Nova Scotia Department of Fisheries and Aquaculture ("Fisheries and Aquaculture") will disclose application information to other government bodies, including, if applicable, the Nova Scotia Aquaculture Review Board for use at an adjudicative hearing relating to the application.

In accordance with departmental policy, which seeks to promote public involvement in the process for deciding on aquaculture applications, Fisheries and Aquaculture will disclose application information – not including, however, personal or business confidential information – on the departmental website.

Privacy Statement

The personal and business confidential information collected as part of an aquaculture application will only be used or disclosed by Fisheries and Aquaculture for the purpose of deciding on the application.

All application information collected is subject to the Freedom of Information and Protection of Privacy Act ("FOIPOP") and will only be used or disclosed in accordance with FOIPOP.

By signing and submitting this form, I acknowledge that I have read, understand, and accept the above statements regarding the collection, use, and disclosure of the information provided on this form.

Signature of Applicant

[redacted]

Date

Feb 26, 2019

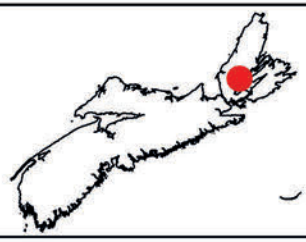
Signature of Nova Scotia Department of Fisheries and Aquaculture Designate

[redacted]

Date

March 5, 2019

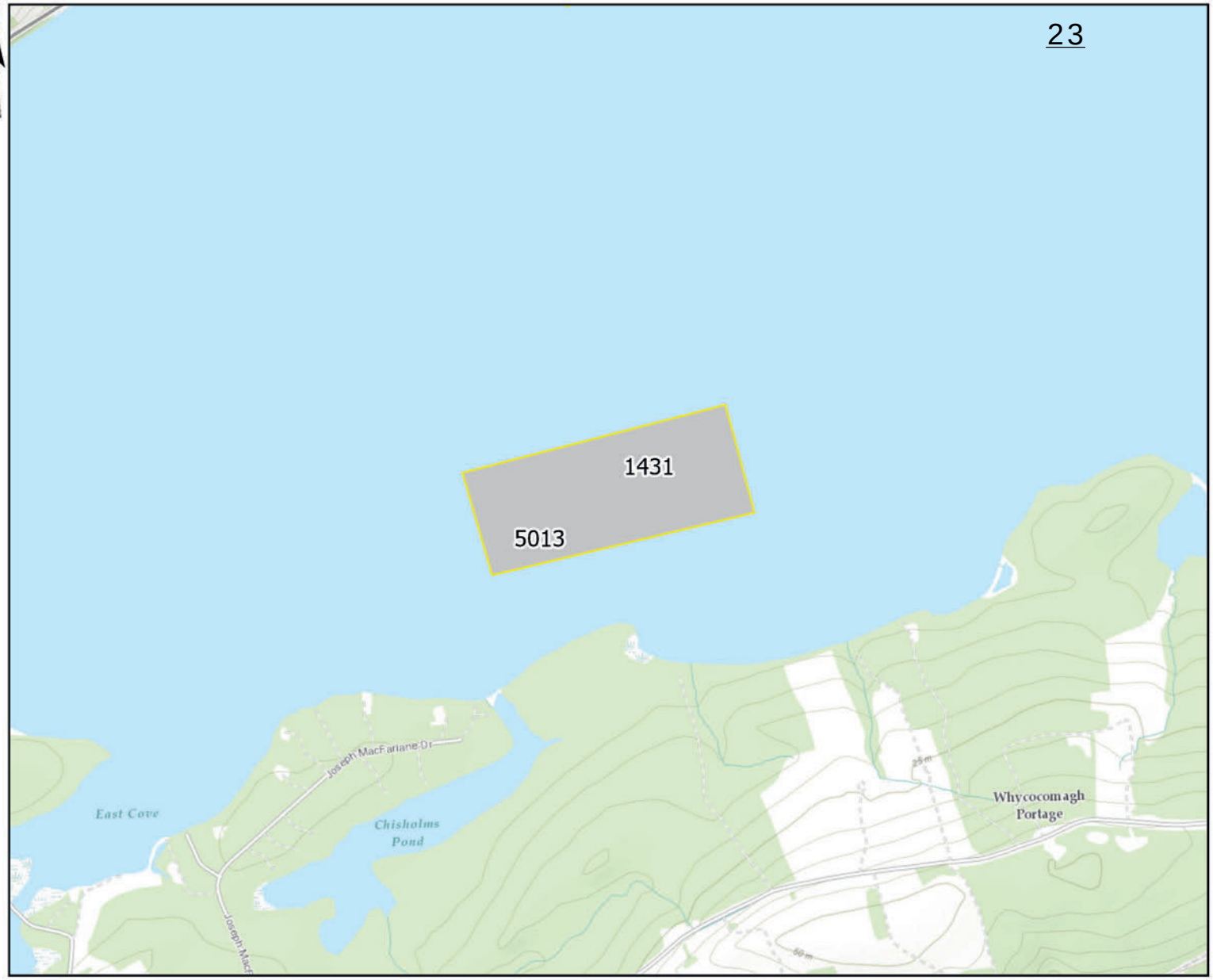
SCHEDULE A



Aquaculture Site
1431

Corner	Latitude	Longitude
1	45° 57' 39.100"	-61° 2' 1.010"
2	45° 57' 45.900"	-61° 1' 19.050"
3	45° 57' 33.900"	-61° 1' 14.860"
4	45° 57' 27.700"	-61° 1' 56.710"
Centre	45° 57' 36.243"	-61° 1' 38.338"

DATUM NAD 83 CSRS UTM Zone 19
The above coordinates are not from a legal survey



License/Lease Holder	County	Waterbody	Hectares	Species Type	Culture Type	Chart
WFN Fish Farm Limited Partnership	Inverness	Whycocomagh Bay	34.42	Finfish	Suspended Culture	4278

Proposed Commercial Lease
Issued Experimental

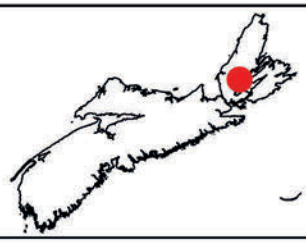
0 0.25 0.5 1 km

NOVA SCOTIA
Fisheries and Aquaculture

Disclaimer
This map should not be used for navigation or legal purposes. It is intended for general reference use only.
Date: 2024-06-25 Created By: MK

Province of Nova Scotia, Esri, HERE, Garmin, USGS, METI/NASA, AAFC, NRCan

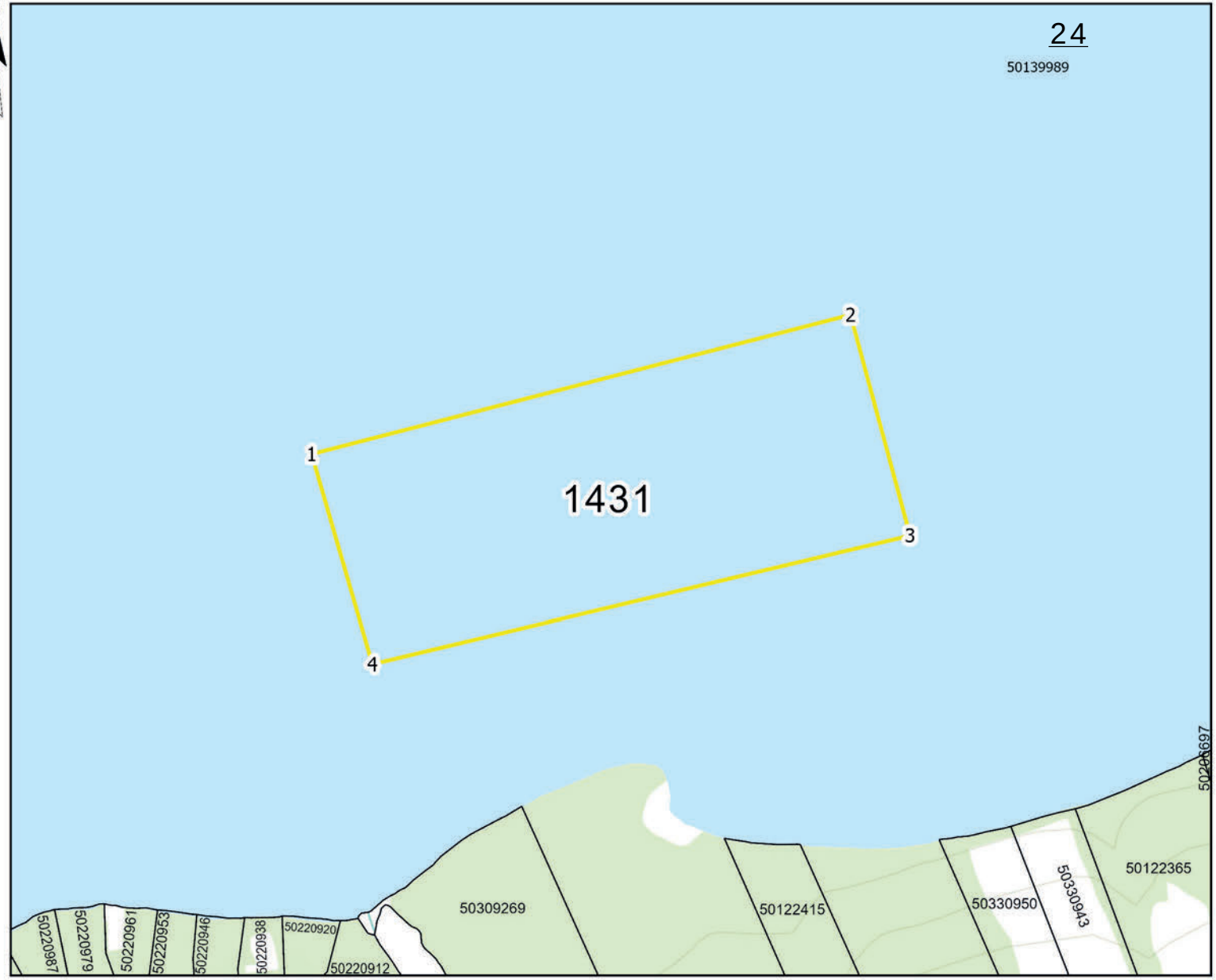
SCHEDULE A



Aquaculture Site
1431

Corner	Latitude	Longitude
1	45° 57' 39.100"	-61° 2' 1.010"
2	45° 57' 45.900"	-61° 1' 19.050"
3	45° 57' 33.900"	-61° 1' 14.860"
4	45° 57' 27.700"	-61° 1' 56.710"
Centre	45° 57' 36.243"	-61° 1' 38.338"

DATUM NAD 83 CSRS UTM Zone 19
The above coordinates are not from a legal survey



License/Lease Holder	County	Waterbody	Hectares	Species Type	Culture Type	Chart
WFN Fish Farm Limited Partnership	Inverness	Whycocomagh Bay	34.42	Finfish	Suspended Culture	4278

Proposed Commercial Lease
Property Boundary

0 100 200 400 600
Meters

NOVA SCOTIA
Fisheries and Aquaculture

Disclaimer
This map should not be used for navigation or legal purposes. It is intended for general reference use only.
Date: 2024-06-25 Created By: MK

Esri Community Maps Contributors, Province of Nova Scotia, Esri Canada, Esri, TomTom, Garmin, SafeGraph, METI/NASA, USGS, NRCan, Parks Canada, Sources: NRCan, Esri Canada, and Canadian Community Maps contributors.

2.0 DEVELOPMENT PLANS (UPDATED DEVELOPMENT PLANS 2024)

2.1 AQ#0814x Development Plan

Updated Development Plan for Boundary Amendment AQ 0814x, Inner Whycocomagh Bay, Option to Lease 1413

WFN Fish Farm Limited Partnership
April 23, 2024

INTRODUCTION

In February, 2019, We'koqma'q First Nation submitted three application packages for commercial finfish aquaculture sites in the Bras D'Or Lake near their Mi'kmaw community. These packages requested two new commercial marine finfish leases[1] and a boundary amendment to amalgamate three existing small commercial marine finfish leases. These proposed sites are within the Option to Lease # 1413 and are located on: the northeast side of Whycocomagh Bay near Aberdeen, the southeast side of Whycocomagh Bay, near Whycocomagh Portage, and in the west end of Whycocomagh Bay, south of the village of Whycocomagh. The sites are intended to operate together, as a single farm. These aquaculture sites and activities they will permit will promote We'koqma'q First Nation's long-term objectives of achieving financial stability for their community, sustaining employment for band members and developing a vertically integrated business that can see success for generations.

In the years previous to these applications, We'koqma'q focused on building an egg-to-plate steelhead trout aquaculture operation. This included acquiring and investing in a hatchery with historical success with salmonid production, investing in sea pen infrastructure and capacity, and modernizing the local processing plant. The next logical step became expanding their steelhead trout farming activities in the lake.

At the time of the applications, We'koqma'q had seven years of experience operating marine finfish sites, three as a contract grower and four as the business owner. This informed the original applications. However, more than five years have passed since the original application submissions, and We'koqma'q has been working hard to better understand the fish, the environment's capacity for aquaculture, and how best to sustainably farm the waters of their local community. Since the original applications in 2019, We'koqma'q First Nation has successfully acquired and operated experimental finfish leases in areas overlapping AQ 1430 and AQ 1431, where the commercial leases are being sought. This experimental work is allowing We'koqma'q to investigate new technology, including the effectiveness and efficiency of 100m polar circle cages and camera-monitored feed barges and the suitability of triploid stocks for rainbow trout aquaculture in the Bras D'Or Lake. It is also enabling development of a diagenesis model (FINS) to predict sulfide levels below a finfish aquaculture operation. Over these years, We'koqma'q also worked with Dalhousie University to model farm interactions with the environment and evaluate the commercial performance of a new

[1] Within this document the term "lease" is intended to refer to both the lease and licence required for marine finfish aquaculture production in Nova Scotia. It is sometimes also referred to as a "site".

strain of rainbow trout. All of this development work has informed production plans and will continue to inform the direction that We'koqma'q takes in the future.

As a result of this additional time and experience, the original development plans within the three application packages for commercial finfish aquaculture sites were updated several times according to business planning, information gleaned from fish production and monitoring operations on experimental sites in the area, and in response to network review questions and concerns.

This document submission represents a revision of the development plan for one of these three commercial finfish aquaculture sites: denoted as AQ 0814x, otherwise known as "Inner Whycocomagh Bay". The intention of this submission is to collate all changes into a single development plan document to facilitate review of the application. A similar revised development plan has been prepared for the other two commercial finfish lease applications that are part of We'koqma'q's vision for a sustainable steelhead trout farm.

One general point is the change in the applicant's name to WFN Fish Farm Limited Partnership. Since submission of the applications in 2019, We'koqma'q First Nation Band Council established a new limited partnership to hold the fish farm operations. This limited partnership includes a general partner (WHI General Partner Incorporated) and a limited partner (We'koqma'q First Nation). Therefore, the name WFN Fish Farm Limited Partnership as the applicant better reflects the operational status of the fish farm since it includes the mind and management of the business. WFN Fish Farm Limited Partnership has been abbreviated to WFN throughout this document.

Changes in content to the original development plan are listed by section in the table below, along with the reasons for the modifications.

Section (s)	Brief description of change	Date of submission requesting change	Reason for the modification
General	Updated the site references to the numbers designated by NSDFA in their review process (i.e. AQ 0814x, AQ 1430, AQ 1431).	April 23, 2024	To add clarity on the site being described.
General	Replaced applicant name to WFN Fish Farm Limited Partnership (WFN) throughout the documents.	March 7, 2024	To reflect the formation of the Limited Partnership created to operate and govern the finfish farm activities.
General	Replaced BAP Standards reference to "BAP Farm Standard, Issue 3.1" throughout the document.	April 23, 2024	To reflect the current BAP standard applicable for the site.
General	Added sub-headings in various places in the document.	April 23, 2024	Intended to better organize the information provided.
General	Made text adjustments according to change of people, status of activities, etc.	April 23, 2024	Small corrections were made to verb tenses and wording to accommodate the completion of projects and changing of people that have occurred since 2019.
General	Added footnotes regarding modifying "Corner Lease 1" and moving it to the southwest.	April 23, 2024	To acknowledge change in lease shape since the original application.
Introduction	New Introduction section added to the Development Plan.	April 23, 2024 (Similar introductory sections appear in the previous Development Plan Update submissions.)	To provide context for the updated Development Plan.
Section 1.0	Reworded to reflect changes made to other sections of the Development Plan.	April 23, 2024	To accurately reflect plans and current knowledge.
2.1 Production Plan	Added strains of trout to be used	July 4, 2019	Response to a request for additional information from NSDFA.

Section (s)	Brief description of change	Date of submission requesting change	Reason for the modification
2.1 Production Plan	Changed the production plan, including the "Maximum site biomass", description of infrastructure to be used (cage size, cage number), number of fish per cage, stocking density, stocking date and fallow plan. Added a note on the use of triploid stocks.	July 20, 2023, February 26, 2024, April 23, 2024	Business planning, advice from consultants, information gleaned from fish production and monitoring on the experimental site in the area, and network responses informed a new production plan that was better suited to sustainably farm in the area.
2.1 Production Plan	Added a Gantt chart to explain fallowing at AQ 0814x. The addition of this figure required changing the numbering of all subsequent figures.	April 23, 2024	To clarify intended fallowing schedule.
2.2 Infrastructure	Added equipment and infrastructure acquired since 2019.	September 9, 2020; July 20, 2023; February 26, 2024, April 23, 2024	To demonstrate investment in major capital acquisitions that will support the technical capability and business outcomes for the farm's operations.
2.4 Employment	Updated text.	April 23, 2024	To reflect updated employment plans.
2.5 Other economic contribution to the local community and Province	Updated text.	April 23, 2024	To improve clarity and update expectations.
3.1 Status of fisheries activities	Updated recreational fishing season and species fished in the local area.	April 24, 2020	To correct content according to NSDFA Inland Division's input.
3.1 Status of fisheries activities	Added reference to latest CSAS for salmon in Salmon Fishing Area 19 and added reference to latest available information for LFA 28 (lobster). Neither updated reference changed the status of these fisheries.	April 23,2024	To recognize updated information was available on the status of the Atlantic salmon fishery and the lobster fishery in the local area.
3.1 Status of fisheries activities.	Added description of Moderate Livelihood Fishery in the region.	April 23, 2024	To update potential fisheries activities in the area with the acknowledgement of the Moderate Livelihood Fishery.

Section (s)	Brief description of change	Date of submission requesting change	Reason for the modification
3.2 Impacts on fisheries activities	Added expected impact on Moderate Livelihood Fishery.	April 23, 2024	To update potential fisheries activities in the area with the acknowledgement of the Moderate Livelihood Fishery.
3.2 Impacts on fisheries activities *(Mitigating Fisheries Impacts through Operational Procedures – Fish Escape)*	Updated FMP containment requirements and their application at WFN.	July 20, 2023; April 23, 2024	To advise of FMP containment requirements enhanced since the original development plan submission in 2019 and their application at WFN.
3.2 Impacts on fisheries activities *(Mitigating Fisheries Impacts through Operational Procedures – Fish Escape)*	Updated status of BAP certification.	July 20, 2023; April 23, 2024	To reflect current certification status.
3.2 Impacts on fisheries activities *(Mitigating Fisheries Impacts through Operational Procedures – Fish Escape)*	Added reference to trialing triploid stocks for their application at the farm and intention to use in the future, if these stocks thrive.	July 20, 2023	To describe an enhanced biological containment measure being trialed to mitigate risks associated with a fish escape.

Section (s)	Brief description of change	Date of submission requesting change	Reason for the modification
3.2 Impacts on fisheries activities *(Mitigating Fisheries Impacts through Operational Procedures – Fish Escape)*	Updated the technical capacity of WFN with a revised list of management personnel and description of recent investments in training of employees.	July 20, 2023	To reflect the current management team and enhanced technical capacity of WFN.
3.2 Impacts on fisheries activities *(Mitigating Fisheries Impacts through Operational Procedures – Disease and Biosecurity)*	Addition of description of WFN's application of the FMP and updates to operational procedures that address Disease and Biosecurity.	July 20, 2023	To describe improvements to procedures that mitigate Disease and Biosecurity risks.
3.2 Impacts on fisheries activities *(Mitigating Fisheries Impacts through Operational Procedures – Environmental Impacts)*	Added description of FINS modelling work (Proactive Environmental Impact Modelling).	July 20, 2023	To describe research efforts initiated after 2019 that target the development of a model intended to predict environmental impact below a finfish operation in order to assist with planning stocking levels for a site (FINS).
3.2 Impacts on fisheries activities *(Mitigating Fisheries Impacts through Operational Procedures – Environmental Impacts)*	Updated water column quality parameters monitoring requirements for BAP certification and the status of BAP certification.	April 23, 2024	To reflect current applicable BAP standard requirements and WFN's status regarding BAP certification.

Section (s)	Brief description of change	Date of submission requesting change	Reason for the modification
4.1 Oceanographic environment	Updated hyperlinks and values for wind speeds. Added reference to report entitled "Wind and Wave Conditions – Whycocomagh Bay – Marine Finfish Leases 0814x, 0814, 0600, 1431, 5010, 1430." (Appendix F).	April 23, 2024	Hyperlinks replaced to current references. Old links for wind speed no longer worked, so all information was updated to more recent listings and known available information.
4.3 Site design (*Anoxic water)*	Updated knowledge about the thermocline and oxycline.	April 23, 2024	To ensure information in the plan is current with research and monitoring outcomes.
4.3 Site design (*Infrastructure for the site*)	Updated cage size and grid design.	September 9, 2020; with additional revisions April 23, 2024	To ensure information in the plan is current with intended infrastructure plans that have evolved from work at experimental sites in the area as well as engagement with engineers.
6.1 Navigation Protection Act Approval	Updated submission to Transport Canada of drawings of gear on site. Note that there were adjustments to site boundaries requested for this site (AQ 0814x). These adjustments did not increase lease area. See also Appendix G.	April 23, 2024	To reflect change in infrastructure required for production plan modifications described in Section 2.1 and 4.3.
7.1 Identification of local salmon populations	Added a reference to the latest CSAS (2020). There was no change to the information regarding local salmon.	April 23,2024	To recognize updated information on the status of Atlantic salmon in the local area.
8.1 Identification of other aquaculture sites	Updated listing of other aquaculture sites in the area.	April 23, 2024	To clarify and update the current status of nearby aquaculture sites.

Section (s)	Brief description of change	Date of submission requesting change	Reason for the modification
8.2 Interactions with other aquaculture operations	Added information regarding how the three commercial finfish sites intended for the area will work together to provide the production level required for financial sustainability.	February 26, 2024	To reflect production plan modifications described in Section 2.1 and to clarify the fallowing period for rotating between cage arrays on the sites as well as complete lease fallowing.
Appendix B	Updated Appendix B (BAP Farm Standard).	April 23,2024	Updated to current applicable BAP standard (BAP Farm Standard Issue Number 3.1).
Appendix C	Updated Appendix C (Resumes of Senior Personnel)	July 20, 2023	Updated to reflect current management team.
Appendix D	Updated Appendix D with addition of a citation for a Master of Science thesis.	April 23, 2024	To provide a reference to outcomes of modelling research work completed since 2019.
Appendix F	Added a new Appendix: “Wind and Wave Conditions – Whycocomagh Bay – Marine Finfish Leases 0814x, 0814, 0600, 1431, 5010, 1430”.	April 23, 2024	To provide updated information regarding wind and wave conditions relevant for site design.
Appendix G	Added CNWA Notice of Works as an appendix.	April 23, 2024	To ensure current site design information is included as part of the Development Plan.

SECTION 1: THE OPTIMUM USE OF MARINE RESOURCES

WFN Fish Farm Limited Partnership (WFN) is requesting a boundary amendment which will allow the replacement of three leases with a single lease of larger total area called 0814x. The three current sites are: AQ 0814 (1.39 ha), AQ 0845 (1.57 ha) and AQ 0600 (1.39 ha). They are all licensed for the marine cage cultivation of Atlantic salmon and rainbow trout. The requested amended site overlays all of these sites and is approximately 65 hectares in size. It is located in the east end of Whycocomagh Bay, south of the village of Whycocomagh. This lease application is one part of WFN's larger plan to achieve a trout aquaculture production level that promotes financial viability while ensuring social and environmental sustainability. WFN has been successfully conducting rainbow trout aquaculture in this region for several years, first as a contract grower, and for the past nine years as the business owner. The proposed site is expected to support the grow-out of 200 tons of rainbow trout annually and hold over 2000 tons of trout over the winter months.

The amended AQ 0814x will share employment with two other proposed commercial finfish aquaculture sites in Whycocomagh Bay (AQ 1430 and AQ 1431), while supporting the continuity of WFN's finfish operations as a whole by optimizing use of its local infrastructure, including a processing plant, a land-based storage facility, a land-based hatchery, management offices and farm management software. WFN is expected to directly employ 67 people with all proposed sites in operation. It will also promote the installation of new infrastructure and investment in new equipment - not only for the finfish cage operation, but also for WFN's processing plant and hatchery.

An examination of the habitat below the proposed site, published studies from the area and knowledge collected during scoping for the proposed activities suggest that this development can proceed in harmony with fishery activities in the public waters surrounding the proposed aquacultural operation. Management measures will be in place to mitigate the most significant risks of finfish aquaculture to the environment, these being fish escape, disease and biosecurity, and benthic environmental impacts. These measures are supplemented by partnering on research projects aimed to model impacts of different production levels and determine suitable environmental monitoring of WFN's finfish aquaculture activities.

The oceanographic and biophysical characteristics of the public waters surrounding the aquaculture operation were reviewed. This included data collected within the scoping activities, published studies, as well as the local knowledge and extensive experience of researchers, employees and contractors of the company. This information supports the feasibility of a finfish aquaculture operation at the proposed amended site and provides the best knowledge to inform a site design. This knowledge has been used to develop the infrastructure, procedures and production plans for the site.

Consideration and respect for the other users of the public waters surrounding the site will be demonstrated by WFN's responsible farm practices which include high standards for site maintenance, noise reduction, and waste management. It is the intent of WFN that other users of the waters see the finfish aquaculture site as an opportunity for the region rather than a negative

development. Risks to wildlife users of the region will be mitigated via the management measures intended to reduce risk of fish escape, disease and biosecurity, and benthic environmental impacts. These will be further supplemented with a wildlife interaction plan that recognizes the most susceptible wildlife of the region.

A Notice of Works application accompanies this development plan. Outcomes from Transport Canada's assessment will be applied to ensure the public right of navigation through compliance with the Canadian Navigable Waters Act (CNWA).

The region is one of a handful of regions in Nova Scotia where Atlantic salmon populations still exist. It is also the region that has experienced the longest history of net pen rainbow trout aquaculture. The mitigation measures intended to reduce risk of fish escape, disease and biosecurity, and benthic environmental impacts; and the forward-looking environmental monitoring research WFN is partnering on can assist in the continued successful coexistence of wild Atlantic salmon with WFN's rainbow trout operations. Furthermore, there is environmental and oceanographic data collection in the bay being conducted by other researchers that is supported by WFN which is intended to improve understanding of the local ecosystem as a whole, as well as more broadly with regards to global warming. Although there is no direct intent to use this data to support Atlantic salmon conservation measures, an increased understanding of the environment may contribute to conservation practices in general.

With regards to the number and productivity of other aquaculture sites in the public waters surrounding the proposed aquacultural operation, WFN is currently the only finfish aquaculture producer in Whycocomagh Bay and will manage its sites as a collective in order to ensure that fish health risks and environmental impacts are minimized. Having an increased number of commercial sites will allow financial viability of the steelhead farm while availing enough area to increase fallowing.

This site is one request of three that will enable sustainable operation of WFN's finfish aquaculture operations. Activities will contribute to economic development of We'koqma'q First Nation and the local region in general. Site location considerations and mitigation practices will reduce impacts to other users of the local waters, including the fishery, wildlife (including Atlantic salmon), local residents, and seasonal visitors. This includes the public right to navigation. Ongoing environmental monitoring along with the support of local research efforts should ensure that these practices are effective now, and in the future.

As summarized above and detailed in this development plan, this proposed commercial finfish aquaculture lease should have minimal negative impacts on the factors to be considered in decisions related to marine aquaculture sites; but there are significant positive impacts. Therefore, this request should represent an optimum use of marine resources.

SECTION 2: THE CONTRIBUTION OF THE PROPOSED OPERATION TO COMMUNITY AND PROVINCIAL ECONOMIC DEVELOPMENT

2.1 Production plan

Species: Rainbow trout, *Oncorhynchus mykiss* (called "steelhead" when grown in salt water).

Strain or potential strain: The rainbow trout will be all-female from either or both of two egg sources:

1. Trout Lodge: "Silver Steelhead" or "Winter and Fall Strain" (Now referred to collectively as "Steelhead".)[2]
2. Riverence: "Steelhead Trout" which were developed from the "Donaldson strain"

Triploid stocks: For the past several years, WFN has been trialing the use of triploid rainbow trout stocks. At this time, the triploid fish are showing similar performance as diploid, but it is still early in the evaluation process. In 2024, only triploid fish will be stocked. Provided triploid stocks continue to perform well, WFN intends to use triploid fish in the future.

Maximum site biomass (kg): 200,000 kg during the feeding/grow out period, according to environmental monitoring results and modelling; 2,000,000 kg during the non-feeding/over-wintering period.

Maximum cage density during grow-out period (kg/m^3): 20 kg/m^3

Expected time to achieve maximum production: Minimum of 3 months from stocking.

Size(s) of cages, including net volumes (m^3): 100-m (circumference) polar circle; 8 m depth; 6,350m^3 per cage

Maximum stocked cage number, maximum total stocked net volume (m^3): 1 active production array of 10 cages = 63,500m^3, plus an over-wintering area to house 30 cages maximum = 190,500 m^3.

Maximum number of fish per cage during grow out period: Current plans are for up to 56,000 per cage at harvest size. The numbers initially stocked per cage will be informed from fish performance and environmental monitoring results.

Intended initial stocking date and seed source: October 2025, Big Falls Hatchery (AQ 1028).

Expected grow out period: The feeding/grow out period will be from October to December, according to ice conditions. This lease will also house cages for over-wintering. Fish are not fed during this over-wintering period, but harvesting will occur.

Expected fallow period: The lease has been sized to allow the placement of a grow out array of 2X5 100-m (circumference) cages and an over-wintering location to house fish from all of the farm's Whycocomagh Bay sites (AQ 0814x, AQ 1430, AQ 1431). The plan is to hold a low biomass of fish during the feeding/grow out period (October to December). These and unharvested fish from other sites will then be moved into the over-wintering area where feeding will not occur, from December

[2] https://www.troutlodge.com/en/trout-genetics/trout-eggs/ Accessed March 31, 2024

to April.[3] See Sections 6.1 and 8.2. The entire site will be fallowed for 5 months each year. This fallowing plan is depicted in the Gantt chart below (Figure 1) where months with juveniles on the production array are shown in pink; months with all fish in the over-wintering area are shown in purple; months with no fish on each array are shown in black.

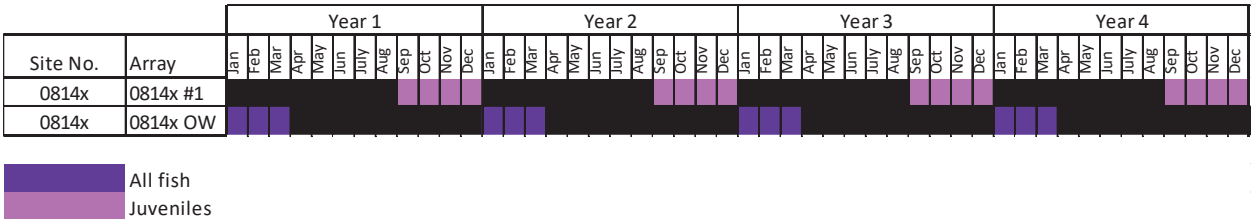


Figure 1: Gantt chart showing timing of fish stocking at AQ 0814x. Months with fish in each area are shown in pink for juveniles, purple for all fish; months with no fish in each area are shown in black.

Additional notes: As previously stated, this site represents one site of three new or amended leases planned for WFN's finfish aquaculture operations. Use of all sites, as described in the development plans, is required to enable WFN to reach financial viability. A summary of the overall expected plans for sites can be found in Section 8.2.

2.2 Infrastructure

This site is to be serviced by WFN's facilities in and around Whycocomagh and Aberdeen. These services include the land-based facilities for holding and managing nets and feed in Whycocomagh; barges, boats and vehicles based in Whycocomagh; management offices at the We'koqma'q Fisheries and Band offices, a FishTalk farm management database housed at the We'koqma'q Fisheries office; and other supporting infrastructure and services. Additional investments in infrastructure and equipment for the fish farm that have occurred since the application was originally made in 2019 include:

- a winter harvest system and oxygenation system for the over-wintering location;
- two new engineered grids;
- more robust containment equipment: 400 mm SDR 17 Polar Cirkel cages of 100 m diameter, certified to the Norwegian NS 9415 Standard[4]; as well as STAR knotless containment nets of polyolefin fibres[5] - designed to withstand frequent net cleaning;
- a built-for-purpose harvest boat;
- a passive grading system;
- two remotely operated net cleaners;

[3] In the past, the production array for this site has been exposed to moving ice in the spring. However, the over-wintering area is sheltered by the adjacent island. As long as ice exposure remains a risk for the production array, cages will not be left here over the winter, so the production area will be used only in the ice-free period, after March, until December. For the winter months (January to March), cages will be pulled into the sheltered overwintering area.

[4] https://www.akvagroup.com/plastic-pens/ Accessed March 31, 2024

[5] https://www.garwarefibres.com/products/smolt-grow-out-cages/star Accessed March 31,2024

- two state-of-the-art feeding barges that enable pan-camera viewing and remote feeding of fish.

Additional new nets, a Lift Up mort retrieval system; an improved net cleaner; an oxygen monitoring, production and delivery system; and modifications to existing vessels are planned for 2024. Pending this application, a new work barge as well as new grid systems are intended for 2025 or 2026. WFN's business plan projects additional significant capital investments at the farm over the next several years.

WFN owns and operates the processing facility that handles their fish. This facility acquired BAP certification in 2021. Since the original site development plans were submitted in 2019, the processing facility has undergone a 2000 sq ft expansion; the roof to the pre-existing section of the building has been replaced; external storage facilities, including cold storage have been added; and a state-of- the art Baader 581 fillet machine has been installed and commissioned. Most recently, the processing facility purchased a vacuum system to add to the pin-boning machine. In 2024, a new raw material weighing system that will give enhanced yield capability will be added, along with a slurry ice system, and new heading and gutting machines.

Just previous to the original application submission, WFN acquired Big Falls Fish Growers in Wolfville, NS, in order to have full control over juvenile production for the aquaculture operations. The hatchery facility has since acquired: bulk oxygen storage; two boiler units for improved hatchery water temperature control; a tractor for farm operations; and is in its second phase of significant water treatment and distribution upgrades for conversion to a water re-use system. The primary focus of these upgrades is to enable the production of a larger fish for distribution to the lake sites and thereby reduce the time required in the net pens.

WFN has the facilities and infrastructure for egg to plate production of high-quality steelhead trout. It is focused on optimizing its business. It has made, and plans to continue to make, significant investments in infrastructure to do so.

2.3 Services and suppliers

Local (NS) service requirements in terms of contractors (welders, carpenters, others) and suppliers of general merchandise will be necessary to support the finfish operations. The scale of these requirements will be reflected by the scale of the operations. Processing will occur at WFN's facility in Aberdeen, NS, upgraded as described above. Juveniles will come from the improved Big Falls Hatchery in Wolfville, NS, described above. Feed will be purchased from outside of the province (Skretting in NB) because of the requirement that the feed mill be BAP certified in order to assist WFN's goal of achieving four-star BAP certification. Eggs will be purchased from an international supplier since there is no local supply. (The development of a local broodstock is under investigation and achieving a critical production mass will be imperative for its success.)

2.4 Employment

AQ 0814x will share employment with two other proposed farming sites (AQ 1430 and AQ 1431), directly requiring 28 positions. These direct employees include a Director of Farming Operations, Farm Manager, Security team, Records Technician, Fish Welfare Lead, Technical Maintenance team, Harvesting & Logistics team, Feed team, Dive and Underwater Maintenance team, and Operations team. Each of the three proposed marine sites are vital to ensuring the security of employment of the rest of WFN since it will optimize the use of the processing facility in Aberdeen, NS (28 employees) and the hatchery in Wolfville, NS (7FT + 4 seasonal employees). In total, WFN's fish farming activities will directly support 67 employees[6].

2.5 Other economic contributions to the local community and Province

Spin off economic benefits to the local communities would be expected to occur as well. A 2019 report on the economic impact of aquaculture in Nova Scotia indicated that 1.55 indirect jobs result from every person directly employed at an aquaculture operation (Foster, 2019). That suggests that an additional 104 indirect jobs depend on the success of this and the other two commercial finfish lease applications. Combining the 67 jobs that are directly tied to WFN and the estimated indirect jobs (104), this represents a total impact of 171 jobs, mostly in rural Nova Scotia.

2.6 Financial viability

WFN's business development plan has been submitted as a separate document.

2.7 Adverse economic impacts

There are no adverse economic impacts expected from fulfillment of this request.

[6] The potential economic benefits to the area were brought up during scoping. See page 5 of Report on Public Engagement During Scoping.

SECTON 3: FISHERIES ACTIVITIES IN THE PUBLIC WATERS SURROUNDING THE PROPOSED AQUACULTURAL OPERATION

3.1 Status of fisheries activities

Recreational fishery

Trout

(Reference: https://novascotia.ca/fish/documents/Anglers-Handbook-2018.pdf and feedback from NSDFA Inland Fisheries)
The proposed aquaculture site is located in NS Recreational Fishing Area 1: Cape Breton, Inverness, Richmond and Victoria Counties, specifically within the Bras D'Or Lake. Here the speckled (brook) trout recreational fishing season is open in the tidal waters of the Bras D'Or Lake, including Whycocomagh Bay in which the proposed site is located, from April 1 to September 30, with some restrictions. The recreational fishing season for brown trout and rainbow trout is year-round. Skye River which feeds into the subwatershed of Whycocomagh Bay of the Bras D'Or approximately 2 km away from the proposed site is open for the same period. Other major recreational fishing rivers in the area feed into different subwatersheds. These include River Denys which feeds into the Denys Basin, and Middle River and Baddeck River which feed into the St. Patricks Channel. River Denys, Middle and Baddeck Rivers are Special Trout Management Areas with minimum size and bag limits. For further reference, the locations of these rivers are shown on a map in Section 7.1 (Figure 11).

A resident population of rainbow trout exists in the Bras D'Or Lake area. This is enhanced every year by the release of juveniles reared in provincial hatcheries to support the above-described rainbow trout sport fishery.

Non-salmonid species

(Reference: https://novascotia.ca/fish/documents/Anglers-Handbook-2018.pdf and feedback from NSDFA Inland Fisheries)
Recreational fishing for the following species is also conducted in the Bras D'Or Lake: white perch, yellow perch, brown bullhead, white sucker, chain pickerel, lake whitefish, striped bass, shad, gaspereau, smelt, and eel.

Atlantic salmon

(Reference: CSAS Science Response 2017/20, 2020/031)
The proposed site is located within Salmon Fishing Area 19. There is no recreational salmon fishing permitted in Whycocomagh Bay, where the proposed site is located. The Middle and Baddeck Rivers, which feed into the Bras D'Or to an adjacent subwatershed (St. Patricks Channel), have an open catch and release fall season for Atlantic salmon. Social and Ceremonial (FSC) allocations are also available on these rivers. For more discussion on this site and these rivers relative to the salmon populations, see Section 7.

Commercial Fishery

Historically, the Bras D'Or Lake has supported some limited fisheries activities. The bottom trawl fishery was banned in the Bras D'Or Lake in 1992. The local herring fishery closed in 1999. This left only lobster and oyster fishing.

Lobster

In 2016, there were 14 licences for commercial lobster fishing in the Bras D'Or Lake (Lobster Fishing Area (LFA) 28), with a trap limit of 250 and a minimum legal-size limit of 84mm. The season runs annually from April 30 to June 30 (DFO, 2017). This was unchanged, as of 2022 (DFO, 2022).

Historical landings from LFA 28 are shown in Figure 2.

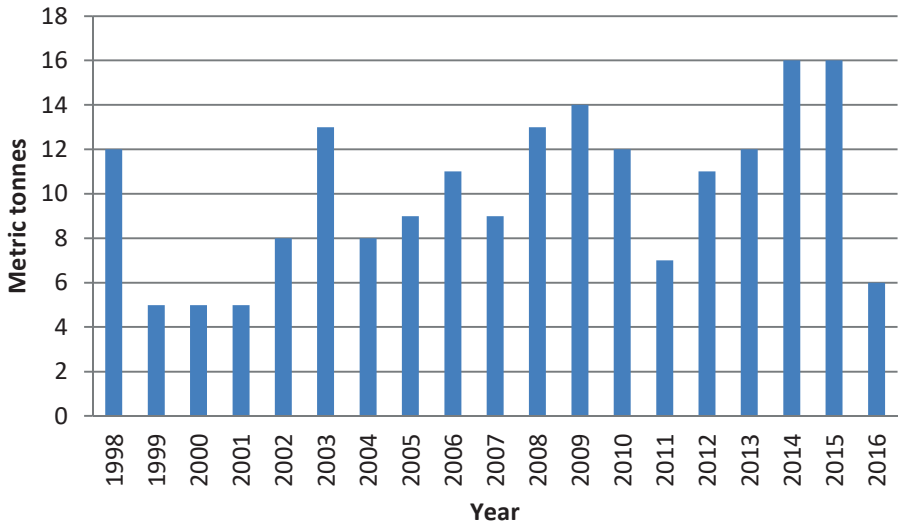


Figure 2: Historical lobster landings from LFA 28 (the Bras D'Or Lake). Graph generated from 2017 Stock Status Update (DFO, 2017). Landings for LFA 28 are no longer shared for confidentiality reasons due to the low number of LFA 28 licence holders. (DFO, 2022)

The lobster industry in LFA 28 is small relative to that of Nova Scotia in general. The mean landings for 2013-2015 for LFA 28 represent 0.8% of the mean landings for Nova Scotia for the same period, as calculated from data within the 2017 Stock Status Update (DFO, 2017).

Oyster

Oysters were an important harvest for local Mi'kmaq and, likely, non-native settlers of the Bras D'Or Lake region (Tremblay et al., 2002). Traditional knowledge of the area indicates that oyster populations were all along the north, west, and south west coasts of Whycocomagh Bay at one time (Eskasoni Fish and Wildlife Commission and Dept. of Fisheries and Oceans. 1996, cited not seen). However, populations declined due to over-fishing, degradation of habitats and the appearance of the MSX parasite (*Haplosporidium nelsonii)* in 2002 (Stephenson et al., 2003).

Traditional Mi'kmaw Fishery

We'koqma'q First Nation has traditionally fished in Whycocomagh Bay for a number of species including cod, hake, smelts, trout (speckled and brown), herring, mackerel, gaspereau, cod, eels, flounder, lobster, softshell clams, mussels and oysters. Currently smelts, trout (speckled, brown and rainbow), eels, winter flounder, striped bass, softshell clams, mussels and oysters are fished (Joe Googoo, We'koqma'q Elder, personal communication).

Moderate Livelihood Fishery

There is some moderate livelihood fishing expected in the main Bras d'Or Lake for lobster. No moderate livelihood fishing is anticipated for Whycocomagh Bay, the body of water for this requested site (Bobby Gould, Fishery Manager at We'koqma'q First Nation, personal communication).

3.2 Impacts on fisheries activities

Recreational

Trout

Although rainbow trout are not indigenous to the Bras d'Or Lake area, it has a resident population that has developed from stocking efforts for the sport fishery, with the first trout introduced in 1899. These introduced fish have been shown to be successfully reproducing in some regions in the wild and are contributing to the fishery numbers (Madden et al., 2010). Rainbow trout continue to be stocked by the province through an enhancement program. Other trout populations do not seem to be affected by this enhancement, as exemplified by the fact that speckled trout populations are thought to be recovering in the Whycocomagh area (CEPI, 2006; Joe Googoo, We'koqma'q Elder, personal communication).

Rainbow trout aquaculture operations have been operating in Whycocomagh Bay for several decades and issues regarding the trout fishery have not been raised. Anglers of the area have historically been supportive of the trout operations. Robin Stuart, a previous manager of the fish farm, was approached to collaborate with anglers to increase rainbow trout populations in the lake[7].

WFN will conduct their operations under strict containment management procedures, disease and biosecurity procedures and environmental monitoring procedures as described below under "Mitigating Fisheries Impacts through Operational Procedures".

The successful historical co-existence of the recreational trout fishery with trout aquaculture operations combined with WFN's intended enhanced management procedures suggest that there will be minimal impacts on the recreational trout fishery.

[7] See page 6 of Report on Public Engagement During Scoping.

Non-salmonid species

As stated for the recreational trout fishery, rainbow trout aquaculture operations have been operating in Whycocomagh Bay for decades and issues regarding the sport fishery have not been raised. As also stated previously, WFN will conduct their operations under strict containment management procedures, disease and biosecurity procedures, and environmental monitoring procedures as described below under "Mitigating Fisheries Impacts through Operational Procedures".

Because of the successful historical co-existence of rainbow trout aquaculture operations with the sport fishery and the enhanced fishery risk mitigation efforts, there are no impacts on recreational fisheries activities anticipated for any species.

Atlantic salmon

Interactions with Atlantic salmon are described in Section 7 of the Development Plan.

Commercial Fishery

Lobster

Although lobsters were in Whycocomagh Bay in the mid 60's they have disappeared from the Bay since that time (Joe Googoo, We'koqma'q Elder, personal communication). Traditional knowledge collected in 1996 (Eskasoni Fish and Wildlife Commission and Dept. of Fisheries and Oceans. 1996, cited not seen) and trawl surveys from 1999 indicate no lobster inhabit Whycocomagh Bay (Tremblay et al., 2002). This proposed finfish aquaculture site will, therefore, likely not impact the commercial lobster fishery.

Oyster

Some populations of oysters remain in the lake today, including in Whycocomagh Bay; and initiatives are underway to understand why these populations survive. This knowledge will be used to develop stocks or culture practices that allow rejuvenation of the oyster populations (Vercaemer et al., 2010; Robin Stuart, personal communication). We'koqma'q First Nation is part of these efforts, have a vested interest in the rejuvenation of the oyster populations, and will continue to support developments along this line.

Traditional Mi'kmaw Fishery

As stated for the recreational fishery, rainbow trout aquaculture operations have been operating in Whycocomagh Bay for decades and issues regarding the traditional fishery have not been raised. As also stated previously, WFN will conduct their operations under strict containment management procedures, disease and biosecurity procedures, and environmental monitoring procedures as described below under "Mitigating Fisheries Impacts through Operational Procedures".

Because of the successful historical co-existence of rainbow trout aquaculture operations with the traditional fishery and the enhanced fishery risk mitigation efforts, there are no impacts on traditional fisheries activities anticipated for any species. This aquaculture development will be managed in

association with the other Mi'kmaw activities in the waters, including fishing. A single group manages both the fisheries and aquaculture portfolio of the Band and will ensure that they are complementary.

Moderate Livelihood Fishery

Because there is no moderate livelihood fishing expected in Whycocomagh Bay, the location for the proposed lease, there is no impact expected on this fishery.

General

It is notable that there were no fisheries concerns raised during the public scoping process conducted for this application.

Fish Habitat

In determining the potential for impact of an aquaculture site, the risks to fish habitat for the chosen site must be considered. WFN gathered information about the habitat beneath the proposed site and collated published descriptions of the area. This information is described below and is intended to assist with determination of fish habitat risks by DFO and others.

Habitat beneath the proposed site - summary of baseline monitoring

This summary is provided only to describe the habitat observed beneath the proposed site. Complete baseline monitoring results were submitted to DFO and NSDFA for their review as per Section 4.2.

Location Name	**Coordinates**	**Benthic sediment description**	**Station Classification**
Whycocomagh, Center Lease 1	Lat: 45.95050; Long: -61.12716	Black mud with strong sulfurous odor	Oxic B by sulfide level, Anoxic by redox value
Whycocomagh, Center Lease 2	Lat: 45.95047; Long: -61.12773	Brown/black mud or brown mud with strong sulfurous odor	Oxic A by sulfide level, Oxic B by redox value
Whycocomagh, Center Lease 3	Lat: 45.95039; Long: -61.12804	Black or brown mud with strong sulfurous odor	Oxic A by sulfide level, Oxic B by redox value
Whycocomagh, Center Lease 4	Lat: 45.95045; Long: -61.12853	Brown mud, no odor	Oxic A

Location Name	Coordinates	Benthic sediment description	Station Classification
Whycocomagh, Corner Lease 1[8]	Lat: 45.95094; Long: -61.11714	Sediment could not be retrieved according to required standard. Hard bottom video transect was completed in its stead with video taken every 10m. Video revealed a brown sediment of rock, cobble, hard packed sand, and some silt in varying degrees along transect. Starfish and small bivalves were seen at every location. Crab shells seen at one location. Green algae, filamentous algae and kelp each seen at one station along transect.	
Whycocomagh, Corner Lease 2	Lat: 45.94359; Long: -61.13391	Brown mud, no odor	Oxic A
Whycocomagh, Corner Lease 3	Lat: 45.94746; Long: -61.13477	Black mud, no odor	Oxic A
Whycocomagh, Corner Lease 4	Lat: 45.95312; Long: -61.12462	Black mud with very strong sulfurous odor	Oxic A by sulfide level, Hypoxic A by redox value
Whycocomagh, Reference A	Lat: 45.94560 Long: -61.13488	Brown mud, some rocks with slight sulfurous odour	Oxic A
Whycocomagh Reference B	Lat: 45.94744; Long: -61.12128	Black mud with strong sulfurous odour	Oxic A by sulfide level, Oxic B by redox value
Whycocomagh Reference C	Lat: 45.94785; Long: -61.11970	Black brown or brown mud with slight sulfurous odour	Oxic A

Published descriptions of the benthos of Whycocomagh Bay

As extracted from Parker et al., 2007: "Whycocomagh Bay has two deep basins and a flushing time of approximately two years. This slow water exchange facilitates the unique anoxic and hypoxic character of the deep basins within the Bay (Petrie and Bugden 2002). The eastern basin in Whycocomagh Bay, immediately west of St. Patricks Channel, has DO levels as low as 38% at the bottom (38 m) (Strain and Yeats 2002). The 48 m deep western basin has only 47% saturation at 15 m depth, and is typically anoxic below 25 m (Krauel 1975), a characteristic that appears consistent over the year and over time (Strain and Yeats 2002). Black's (1958) observation of only a few organisms of two shallow water species of mysid shrimp in Whycocomagh Bay is a further indication that low dissolved oxygen levels have likely existed for some time in the deeper waters at this location." In the same review paper, a limited diversity of copepods was also noted for Whycocomagh Bay, with only the four most common copepod species typically being found.

[8] This corner was modified since the original application was made. It was moved to the southwest. See Appendix G for final coordinates.

Previous internal studies on the site area

Several years ago, baseline information on the benthos of this area was conducted. Although the environmental monitoring data did not meet the QA/QC guidelines of the Nova Scotia Department of Fisheries and Aquaculture, the information is still relevant. The internal report produced as a result of this study is attached as Appendix A. This study indicated that the benthic flora and fauna in the area of the site were limited in diversity.

Mitigating Fisheries Impacts through Operational Procedures

Three of the greatest perceived risks of finfish aquaculture operations to fisheries and fisheries' habitats are fish escape, disease, and impact on the benthos and water quality. WFN will institute operational procedures to mitigate these risks as described below.

Fish Escape

All of the WFN finfish aquaculture operations will follow the fish containment management requirements described in their Farm Management Plan (FMP) as defined by the Nova Scotia Aquaculture Management Regulations. This containment management plan includes:

- Described and approved operating procedures that limit the risk of a breach, including the identification of critical control points, critical control limits, monitoring and corrective actions. The controls are identified through conducting a site-specific hazard analysis.
- Described and approved procedures for site management if unusual events or severe weather occurs.
- Minimum infrastructure requirements, and minimum infrastructure maintenance and inspection requirements –including proof of a professional engineer's approval of the design of the structures in place for containment management.
- Described and approved responses to breaches or suspected breaches, including mandatory reporting.

The above plan will be approved for implementation by NSDFA and operators will be audited for adherence to the plan according to NSDFA's requirements.

FMP Containment Requirements Instituted after 2019

In addition to the minimum requirements that were in place for marine finfish operators at the time of the original lease application submission (2019) and described therein, the Containment Management Framework of the FMP was expanded and further clarified in 2021. A significant piece of this clarification was the requirement of "approved/certified engineering documentation pertaining to the integrity of the site's infrastructure. In essence, the site infrastructure design and construction must have been deemed as being satisfactory to reasonably withstand the prevailing oceanographic and meteorological conditions (e.g., weather, currents, ice flow, etc.) at the site's location to ensure the fish stay contained."

WFN has engineering approvals for its current experimental lease installations in North and South Aberdeen. In addition, WFN has been working with Gael Force[9] since March, 2023 to enhance modelling of mooring systems at the new lease sites to detect the weakest points and target these areas for reinforcement. This work is ongoing (April 2024). These models for the new proposed lease sites will be submitted to NSDFA, once completed and will add an additional layer of diligence regarding the integrity of the infrastructure regarding fish containment. It is notable that WFN's infrastructure has been updated with more robust equipment, and procedures have been updated as a result of the FMP requirements, with enhanced quality control checks and increased training. The containment structures have withstood the strain of Hurricane Fiona and other major wind and weather events with no issues for the past several years.

FMP Status at WFN

The FMP was still relatively new to the industry in 2019, when the original applications were submitted. Since that time, WFN has used the FMP as a foundation for establishment of best practices. The execution of these best practices is facilitated by increased personnel capacity described in a later section. Additionally, the implementation of the FMP has been enhanced by the creation of a new position of Records Technician, to better enable the tracking of records and to increase assurances that standard procedures are followed.

BAP Certification

WFN's finfish operation is working to become certified to the Global Aquaculture Alliance's Best Aquaculture Practices (BAP). This science-based and continuously-improved global performance standard is third party audited and assures "healthful foods produced through environmentally and socially responsible means". The BAP standard requires the application of a written "Containment Plan" to prevent fish escape. This would be above and beyond the FMP containment requirements described above and it would be third party audited. The relevant BAP Farm Standard (Issue 3.1) is attached as Appendix B. Since 2021, WFN has successfully had its processing plant certified to the BAP seafood processing standard and continues the groundwork required for certification of the hatchery and marine farm.

Use of Triploid Stocks

As mentioned in Section 2.1, for the past several years, WFN has trialed the use of triploid rainbow trout stocks. Providing the triploid fish are able to thrive at the marine farm, WFN intends to use triploid fish in the future since such stocks are sterile. This is a mitigation measure to reduce risks associated with a fish escape. Effectively, if an escape event were to occur, reproduction of the escaped triploid could not occur.

Technical Capacity

Finally, the regulatory and certification minimum requirements will be enhanced with the extensive practical knowledge and experience of the managers responsible for WFN's finfish aquaculture operations. Resumes for senior management are attached as Appendix C.

[9] https://www.gaelforcegroup.com/ Accessed March 31,2024

A brief synopsis of their most relevant qualifications and experience follows:

- Manager of Aquaculture Operations: Wade Skinner – more than 15 years of fish farm experience, at a variety of locations and from a range of perspectives, from operations to infrastructure.
- Farm Manager: Anthony Phillips – four years of operational experience at WFN, significant leadership experience within the community.
- Hatchery Manager: Trissa Dunham – a decade of salmonid hatchery experience, formally trained as a biologist (BSc)
- Processing Plant Manager: Wayne Fowlie – decades of seafood processing experience, aquaculture experience, formally trained as a biologist/biochemist (BSc)
- VP Sales: Steve French – more than thirty years of seafood sales experience, formal business training (BBA)

This group meets frequently to discuss and coordinate production planning from egg to plate. They are a solid leadership team with extensive experience in aquaculture and related industries.

Additionally, since the original applications were submitted, personnel capacity at the farm has been greatly enhanced, both in terms of acquiring new people, as well as in terms of training retained persons.

Recent training programs delivered to employees which are incremental to mandated safety and operations requirements are listed below:

- NSCC Aquaculture Operations Certificate (2023) - 4 persons
- FishTalk Farm Management software (2023) – 1 person
- Occupational SCUBA Diver Certification (2021) – 5 persons
- Operational Training (2021, 2022) – 4 persons
- Road to BAP Certification Training (2019, 2020) – 36 persons

Disease and Biosecurity

All of WFN's finfish aquaculture operations will follow the fish health requirements within their Farm Management Plan as defined by the Nova Scotia Aquaculture Management Regulations. These requirements include:

- Described and approved finfish husbandry and welfare, veterinary care and disease surveillance practices. These practices include following the NSDFA marine finfish disease surveillance program and adhering to the multi-governmental agency (NSDFA, DFO, CFIA) Introductions and Transfers disease screening and permitting requirements.
- Described and approved biosecurity measures appropriate to the operation and its risk.
- Prescribed mortality and disease reporting requirements.
- Prescribed reporting of antibiotic and products used to treat sea lice.
- Described and approved procedures and measures to be followed in the case of a disease outbreak.

The above elements will be approved for implementation by NSDFA and operators will be audited for adherence to the plan according to NSDFA's requirements.

FMP Status at WFN

As stated previously for Fish Escape mitigation, the FMP was still relatively new to the industry in 2019, when the original applications were submitted. Since that time, WFN has used the FMP as a foundation for establishment of best practices. The execution of these best practices is facilitated by increased personnel capacity described in an earlier section.

Disease and Welfare-Specific Updates to Procedures

In addition to the fish health aspects within the FMP that were described in the original applications, WFN has implemented elements to increase fish welfare, and subsequently reduce fish health and disease risks, including the following:

- Stocking with a larger juvenile to reduce time at sea and ensure a stronger, more resilient fish at sea pen entry.
- Use of passive grading, when applicable, prior to harvest, to reduce unnecessary fish handling and facilitate the reduction of densities.
- In-house, five-member crew of certified occupational SCUBA divers for inspecting fish and retrieving mortalities in a timely manner.
- Increased use of underwater cameras for observing fish.
- Creation of Records Technician position to encourage timely inspections, water quality monitoring, and procedures with appropriate recording.
- Creation of Fish Welfare position to execute required monitoring and oversight of fish handling activities.

BAP Certification

As stated previously, WFN is working to become certified to the Global Aquaculture Alliance's Best Aquaculture Practices. This certification includes sections addressing minimum animal health and welfare and biosecurity requirements. These requirements would be above and beyond the FMP fish health requirements and require third party auditing. The relevant BAP Farm Standard (Issue 3.1) is attached as Appendix B. Since 2019, WFN has successfully had its processing plant certified to the BAP seafood processing standard and continues the groundwork required for certification of the hatchery and marine farm.

Unique Biophysical Conditions in the Bras D'Or

An additional relevant aspect regarding disease relates to the unique low salinity waters of Whycocomagh Bay, the region of the proposed site. Salinity measurements of 17-18 ppt are recorded at the surface and approximately 20 ppt within a few meters. This has a number of fish health advantages that mitigate disease risk. Sea lice, which are ectoparasites of salmonids that may transfer between cultured and wild fish populations, and are often a great concern for salmonid fisheries enthusiasts, do not thrive in lower salinity waters (R. Wooten and C. Sommerville, personal communication). Bricknell, et al., 2006 demonstrated that sea lice (*Lepeoptheirus salmonis*) actively

avoid low salinities (<27ppt) and even short-term exposure to low salinity water (<27ppt) severely compromised sea lice survival and host infectivity. Low salinity waters are also known to reduce the risk of amoebic gill disease (AGD) (Mitchell & Rodger, 2011), another disease of concern for salmonid culturalists. Finally, the low salinity water reduces osmotic transfer stress from the hatchery, thereby reducing fish health and welfare risks.

Environmental Impacts

All of WFN's finfish's aquaculture operations will follow the Environmental Monitoring Program requirements dictated by NSDFA as required by the Aquaculture Management Regulations, as well as the environmental monitoring requirements required by DFO according to the Aquaculture Activities Regulations (AARs). These monitoring requirements focus primarily on potential impacts on the surrounding marine benthic environment, a primary concern regarding marine finfish aquaculture sites. They apply a risk-based approach to determine monitoring requirements. Monitoring requirements for marine finfish sites include:

- A site-specific benthic sampling and monitoring regime customized according to production level, site configuration, species cultured, past environmental performance of the site, and site specific oceanographic and biophysical characteristics. This must be pre-approved by NSDFA prior to the monitoring.
- Provincial and Federal review and approval of records of observations taken during monitoring and of the monitoring conducted, including Quality Assurance and Quality Control records that demonstrate adherence to procedures and protocols defined by NSDFA in their EMP Standard Operating Procedures (SOPs) and DFO within the AARs.
- Provincial and Federal review and approval of records of lab results, including Quality Assurance and Quality Control records that demonstrate adherence to procedures and protocols defined by NSDFA in their EMP Standard Operating Procedures (SOPs) and DFO within the AARs.
- Reporting of the results to NSDFA and DFO within defined timelines.

The environmental program also requires the provision of a mitigation plan which is to be applied when poor environmental performance is indicated by the monitoring.

WFN contributes to the Environmental Monitoring Program's ongoing development through representation on the Nova Scotia Aquaculture Environmental Coordinating Committee. This committee, which is co-chaired by NSDFA and DFO, is a forum for industry and regulators to provide input and exchange ideas regarding the environmental monitoring program for marine sites in Nova Scotia.

Proactive Environmental Impact Modelling

In addition to mandated benthic sampling, WFN has participated in an enhanced environmental monitoring program at one of their experimental finfish aquaculture sites. This program collected environmental monitoring data to proof and hone a model (FINS) developed to predict sulfide levels below a finfish aquaculture operation. FINS uses a diagenesis[10] model (DIGENIX) that incorporates a

[10] Diagenesis refers to the physical, chemical, and biological changes in sediments after deposition.

hydrodynamic model (FVCOM) and depositional model (ORGANIX) to predict expected sulfide level outcomes based on stocking densities, feed rates, cage arrangements and hydrodynamics of the site. It is anticipated that such a model will help WFN to proactively minimize impacts on the benthos when planning future fish farming activities.

Additional Environmental Impact Reduction Procedures

Specific operational practices to reduce benthic impact are planned for WFN's commercial finfish aquaculture activities. Having more available lease area, as will be achieved in part with this amendment will enable greater fallowing times of sections of the leases. This strategy will be combined with increased training of staff on the use of feeding cameras and feeding techniques to try to improve food conversion and reduce benthic impacts.

BAP Certification

As stated previously, WFN is working to become certified to the Global Aquaculture Alliance's Best Aquaculture Practices. This certification includes sections addressing minimum environmental monitoring requirements. These requirements would be above and beyond the FMP environmental monitoring requirements. For the WFN's finfish aquaculture sites in the Bras D'Or Lake, this environmental monitoring has to include monitoring the water column itself for quality parameters including total suspended solids, dissolved oxygen, chlorophyll a, total phosphorous, and phytoplankton. WFN has started this monitoring. The relevant BAP Farm Standard (Issue 3.1) is attached as Appendix B. Since 2021, WFN has successfully had its processing plant certified to the BAP seafood processing standard and continues the groundwork required for certification of the hatchery and marine farm.

Mitigating Fisheries Impacts through Research and Development

WFN is committed to monitoring and mitigating impacts of its finfish aquaculture activities on the environment, including fisheries and fisheries' habitat. In this regard, WFN has historically supported and will continue to support researchers as they assess and develop techniques to monitor impacts.

Efforts have included collaborating with Peter Cranford, of DFO Science, and NSDFA to evaluate alternative means for monitoring benthic environmental impacts. WFN has also supported research to complete a carrying capacity analysis for finfish aquaculture in Whycocomagh Bay. This study, led by Dr. Christopher Algar (Dept. of Oceanography, Dalhousie University), developed a model that captured carbon, oxygen, and sulfur dynamics in the sediments of Whycocomagh Bay, both with and without the influence of fish cages. The model was used to assess the impact of aquaculture on the Whycocomagh Bay benthic ecosystem and investigate how changes in fish-rearing practices, such as increased stocking levels, may affect these impacts. Additional information regarding this work can be found in Appendix D. WFN was a partner on this project, providing site access, logistics assistance, personnel, historical environmental monitoring data and production data.

SECTION 4: OCEANOGRAPHIC AND BIOPHYSICAL CHARACTERISTICS OF THE PUBLIC WATERS

4.1 Oceanographic environment

The proposed site is in Whycocomagh Bay of the Bras D'Or Lake - referred to as "Bras D'Or Lakes" by some. The following excerpt from Lambert, 2002, gives excellent background information on the unique oceanographic environment of the Bras D'Or Lake:

"The Bras d'Or Lakes are situated in Cape Breton Island at the northern end of Nova Scotia. This body of water of about 1,100 km^2 is essentially an enclosed estuary with three outlets to the sea. The Great Bras d'Or Channel and the Little Bras d'Or Channel connect with Sydney Bight to the north, and St. Peter's Canal gives access to Chedabucto Bay to the south. Only the Great Bras d'Or Channel is large enough to permit any significant exchange of water. The Bras d'Or Lakes watershed is about 2500 km^2; this area added to that of the Lakes themselves gives a total catchment area of 3600 km^2 (Krauel, 1976).

Input from six rivers and restricted access to the ocean keeps salinity in the range of 20 to 26, whereas, sea water just outside the Lakes in Sydney Bight ranges from about 28 to 32. The Lakes are usually ice covered in the winter and surface waters often exceed 20°C in the late summer, particularly in smaller, shallow bays (Petrie and Bugden, 2002).

The waters of the Bras d'Or Lakes are characterised by a two-layer system; a low salinity surface layer which has a wide annual range in temperature and a lower layer of higher salinity in which temperature range is much less pronounced. In general, surface water moves toward the entrance of the Lakes and out into Sydney Bight and is replaced with outside oceanic water which enters the Lakes near the bottom and flows underneath the surface layer (Krauel, 1976; Petrie and Bugden, 2002). With the exception of restricted channels, there is little mixing between these layers except for winter months when higher winds and wave action disrupt the stability of this system. In some areas where currents and exchange rates are very low, the amount of dissolved oxygen can become quite depressed and in Whycocomagh Bay, anoxic (no oxygen) conditions exist (Petrie and Bugden, 2002; Strain and Yeats, 2002)."

The biophysical characteristics of the site environment are summarized in the table below with supporting figures and tables provided, as relevant.

Characteristic	Value	Reference	Comments
Wind speed (km/hr)	14.45 average, 98.2 max	Cape Breton Mesonet (Whycocomagh weather station)[11]	Derived from measurements taken from weather station in Whycocomagh Bay since November 2020.
Average wind speed (km/hr) (30m height)	31.0	Canada.ca Wind Atlas[12]	Value derived from wind atlas for GPS coordinate at center of lease.
Wind speed class rating (10m height)	Low to Moderate	Keys et al., 2017. Digital Wind Exposure Map for NS. Forest Research Report FOR 2017-15	Wind speed class rated from "Very Low" to "Very High" based on estimated annual maximum wind speeds across Nova Scotia. Value/rating stated is for shoreline adjacent to proposed site.
Maximum wave height (m)	This data was not available for this area at the time of writing this development plan. It is notable however that the site is not subject to large waves since it is well protected on all sides due to the lay of the land, except southeast. Maximum wave height data was collected for North Aberdeen, a more exposed site 9km away. Here, the maximum height was 1.08m with the direction of maximum wave of 244° (WSW) – an unlikely wave direction for this site due to the shelter of the shore. Additional wave information can be found in Appendix F.		
Direction of maximum wave			
Annual minimum tide (m)	The Bras D'Or Lake has very small lunar tidal fluctuations. Whycocomagh Bay, in particular, shows limited change. As extracted from Parker et al., 2007: "A 21-day record from the western end of Whycocomagh Basin indicated no detectable semidiurnal or diurnal tides (Dupont et al. 2003; Petrie 1999)." Local persons have observed an increasing tidal range in recent years, for example with exceptionally large tides of 0.5m observed in the fall of 2018 (personal communication, Robin Stuart).		
Annual maximum tide (m)			
Current speed range and averages (m/sec)[13]	See Figure 3 a,b,c,d and statistics summary table (Table 1) that follow.		

[11] https://capebretonweather.ca/archive.php?id=001D0A80898D Accessed April 1, 2024

[12] http://www.windatlas.ca/rose-en.php?field=E1&height=30&season=ANU&no=6&lat=46.94924444&lon=-61.12801389 Accessed April 13, 2024

[13] The oceanographic characteristics of this area were collected over the summer months of 2018 (May 31, 2018 to July 3, 2018) via deployment of an ADCP (Acoustic Doppler Current Profiler) near the site. This monitored a number of variables associated with currents at multiple levels in the water column. Although only summaries are depicted within this plan, all of the data derived from this monitoring will be used in the engineering of the cage and infrastructure for this site.

Characteristic	Value	Reference	Comments
Annual minimum salinity (ppt)	Upper 10m: 15 ppt Below 10m: 17 ppt	Tremblay, 2002	Throughout the Bras d'Or Lakes salinities are lower in the 0-10 m depth interval than in the 10-50 m depth interval and in the upper metre of the Whycocomagh and Denys Basins maybe 5 after rainfall (Petrie, 2001). There is also a seasonal difference in salinity, with lower salinities in spring compared to summer. Tremblay, 2002). The salinities of the area are shown in Figure 4 which was adapted from figures within Tremblay, 2002
Annual maximum salinity (ppt)	Upper 10m: 25 ppt Below 10m: 27 ppt	Tremblay, 2002	
Annual minimum temperature (°C)	-0.591°C	Raw data obtained from David Cook (NSDFA)	Value stated is the lowest temperature measured July 12, 2016 to May 29, 2018. See also summary temperature plot (Figure 5).
Annual maximum temperature (°C)	22.6°C	Raw data obtained from David Cook (NSDFA)	Value stated is the greatest temperature measured July 12, 2016 to May 29, 2018. See also summary temperature plot (Figure 5).
Depth of water at each corner of the site (m)	Corner 1[14]: 1.8m Corner 2: 7.4m Corner 3: 28m Corner 4: 6.3m Center Lease: 1: 23m, 2: 13.1m, 3: 12.0m, 4: 8.2m	Depths taken during baseline EMP sampling	

Since the original submission of the Development Plan, a report on the wind and wave conditions at the site was prepared for CMAR by DSA Engineering: Wind and Wave Conditions – Whycocomagh Bay – Marine Finfish Leases 0814x, 0814, 0600, 1431, 5010, 1430. This has been added as a new Appendix to this development plan (Appendix F).

[14] As indicated previously, this corner was modified since the original application was made. It was moved to the southwest. See Appendix G for final coordinates.

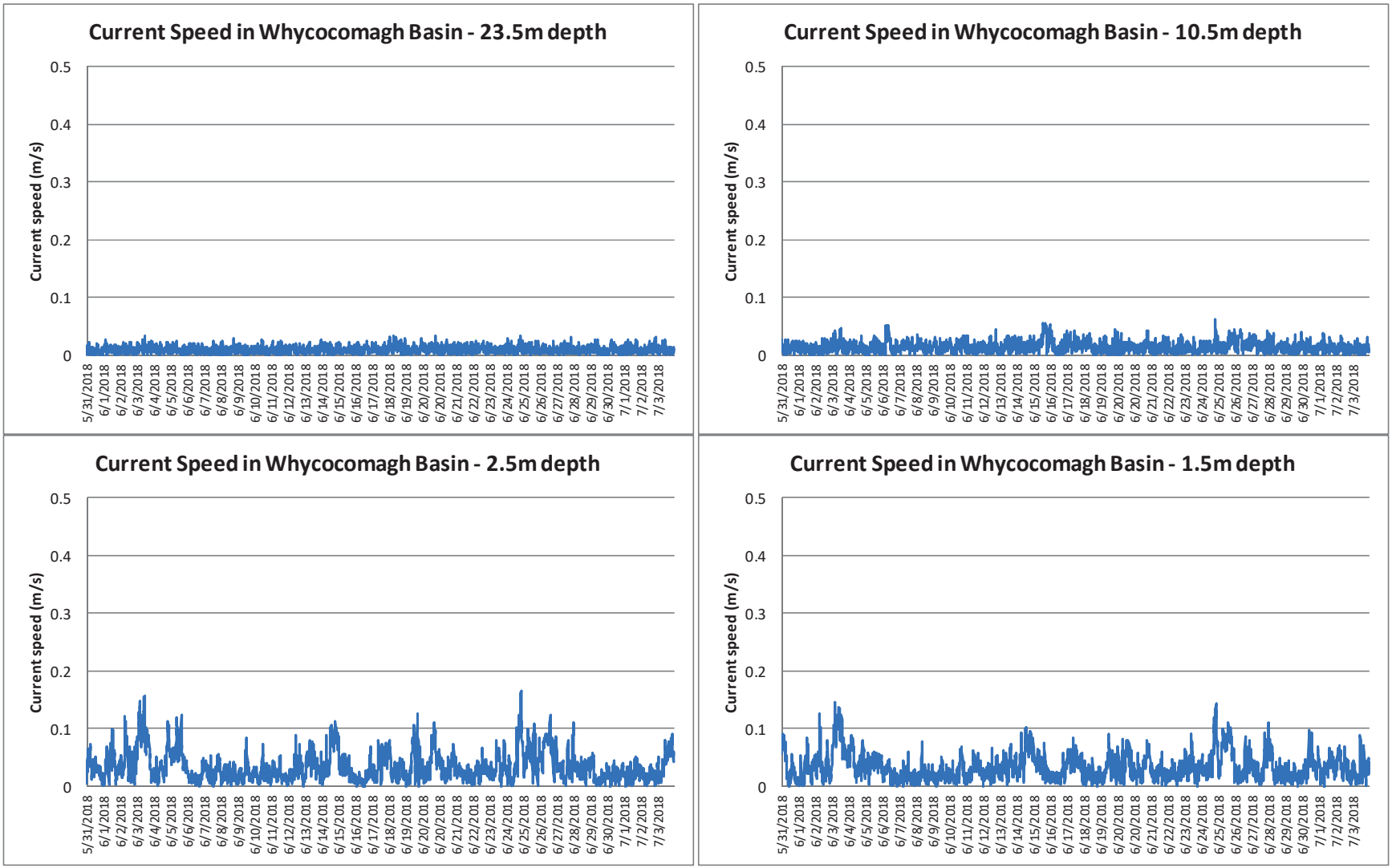


Figure 3 a,b,c,d: Current speeds measured in 2018 (May 31 to July 3, 2018). Raw data obtained from David Cook (NSDFA) from ADCP deployment. Estimated depths calculated from sensor deployment data.

Table 1: Summary table of current speeds statistics determined from data derived from ADCP deployed May 31, 2018 to July 3, 2018. Raw data obtained from David Cook (NSDFA).

Estimated depth* (m)	23.5	20.5	15.5	10.5	8.5	6.5	4.5	2.5	1.5
Min speed (m/s)	0	0	0	0	0	0	0	0	0
Max speed (m/s)	0.035	0.049	0.05	0.062	0.096	0.123	0.182	0.165	0.145
Mean speed (m/s)	0.0105	0.0128	0.0121	0.0152	0.0206	0.0247	0.0325	0.0354	0.0344

*Calculated from sensor deployment data.

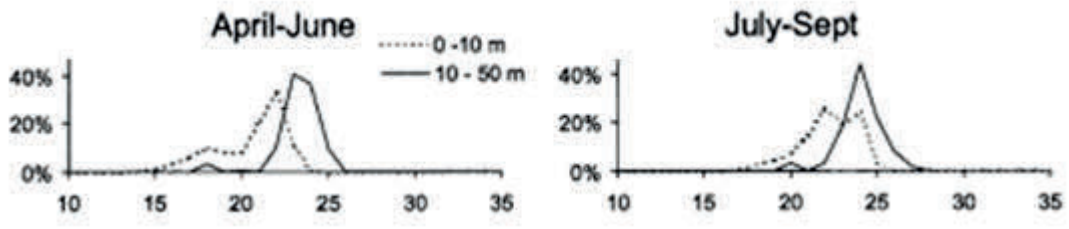


Figure 4: Frequency distribution of salinity measurements taken from Baddeck Bay, including Whycocomagh Basin, Baddeck Bay and St. Patrick's Channel. Figure adapted from Figures within Tremblay, 2002.

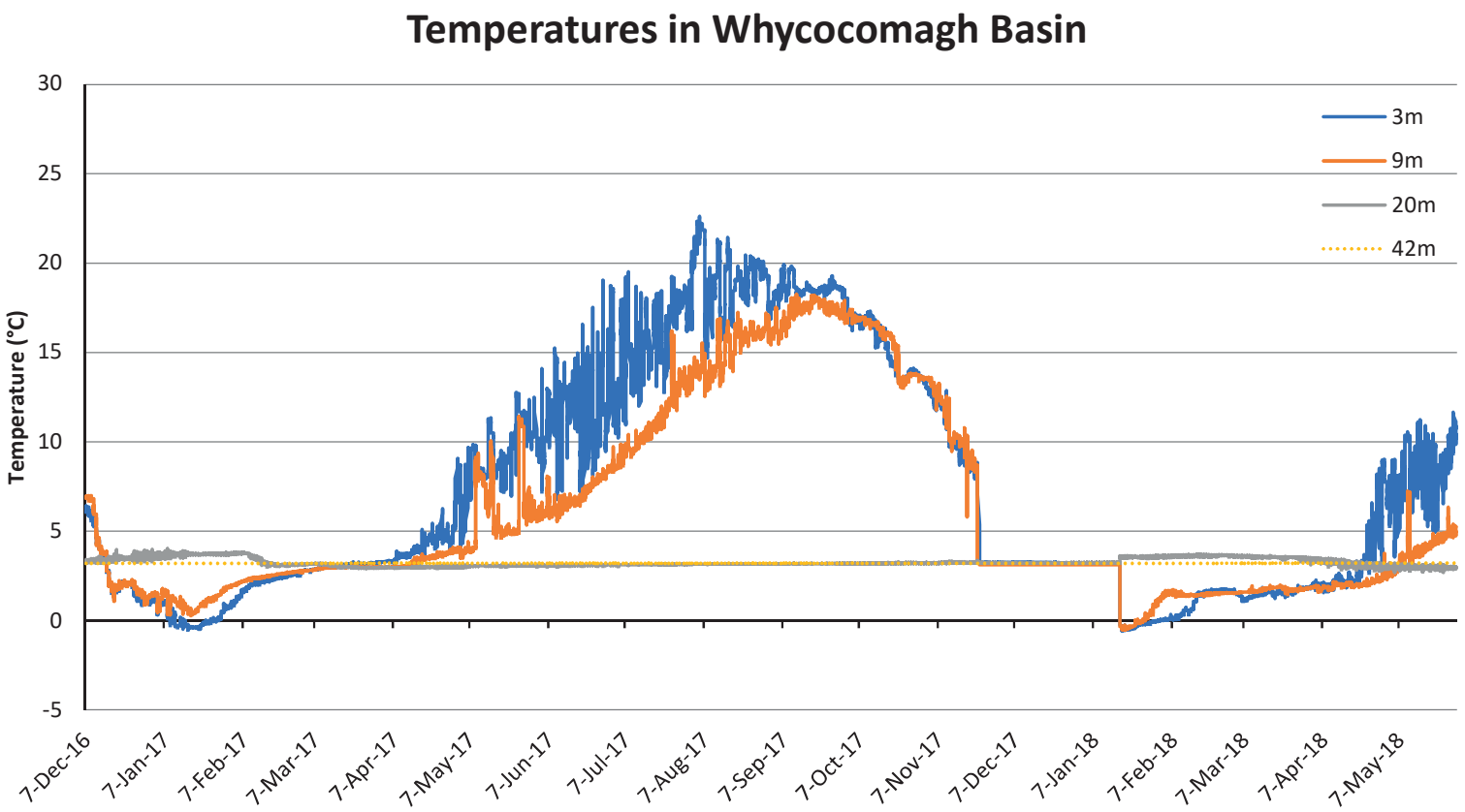


Figure 5: Whycocomagh Basin temperatures July 12, 2016 to May 29, 2018 at depths from surface. Raw data obtained from David Cook, NSDFA.

4.2 Baseline environmental monitoring

The baseline monitoring package has been submitted separately.

4.3 Site design

This site has hosted finfish aquaculture for over 30 years. Data and experience acquired throughout that time period, along with published studies on the area and data collected recently during scoping activities all contribute to how the site will be managed and operated.

Anoxic water

Whycocomagh Bay is separated from the east (St. Patrick's Channel) via a sill less than 12 m deep. Whycocomagh Bay itself has a pair of deep basins of 38 and 46 m deep separated by a sill of approximately 7 m depth. These sills inhibit flushing below sill depth, preventing a horizontal exchange of deep water and partly isolating the physical and biological processes of one basin from the other and inhibit biota movement (Parker et al, 2007). This makes for a unique oceanographic environment that must be considered in site design and operation. In particular, significant thermoclines and haloclines are known to exist and much of the benthic layer is known to be naturally anoxic (Parker et al, 2007). Recent research in Whycocomagh Bay, including monitoring conducted by WFN, indicate that the thermocline and oxycline move seasonally and can become quite shallow (<8m). Published reports indicate there is no upwelling in the bay (Parker et al, 2007). However, some upwelling of low oxygen "fingers" of water has been experienced in fish farming operations near this site in the past. These events are thought to be caused by deep water currents caused by tide. As the deep water is pushed in by a moon tide, the low oxygen water at depth pushes to the surface and oxygen levels decline in the fish rearing layer. The recorded moving thermocline and oxycline and anecdotal evidence of upwelling must be considered in operational procedures. In response to this risk, oxygen monitoring occurs on a regular basis and increases around wind and tidal events. An oxygen supplementation system will be part of the infrastructure for the cages in susceptible areas, as determined by the oxygen profiles.

Ice cover

Another feature of Whycocomagh Bay that must be managed is the presence of ice over the bay during winter. The bay begins icing over after mid-December and generally stays covered with ice until March/April. The ice is actually an advantage since it provides a physical barrier to winds as well as an insulating layer to cold air. However, special management conditions are required for the period when the ice cover is present, particularly for the over-wintering period on this lease.

- Some surface access will need to be available for the fish to fill their swim bladders. A trout is physostomous, meaning that it maintains a connection between its swim bladder and alimentary canal for its entire life. It will gulp air at the surface to provide gas to fill the swim bladder. If surface access is not provided, a trout will be challenged to maintain its buoyancy, particularly in times of stress.

- Oxygen will be provided to fish below ice. The ice barrier reduces gas exchange with the atmosphere and consequently oxygen levels in the water may become reduced due to fish respiration. Supplementing with pure oxygen via release of small oxygen bubbles into the depth of the cage will replenish the oxygen removed from the water by the fish.
- Cages will be over-wintered at the wharves (within the amended lease area) to be more physically accessible, to have access to power, and to be out of the areas of ice movement. The fish will not be feeding or growing during this over-wintering period since temperatures will be too low. The moorings that hold the cages in place at other areas on the lease during the spring/summer/fall production period will stay in place over the winter but the large spar buoys may be replaced with temporary buoys to mark the site for the winter period. These temporary buoys will allow the ice to travel over them when it moves out in the spring. If left out, the large buoys may be dragged with the ice when it breaks up in the spring, as was experienced for three successive years (Robin Stuart, personal communication). This area is not navigable at this time due to the presence of the ice so that a navigation hazard is not created by the removal of the larger buoys.
- The risk of ice damaging the cages that are at the over-wintering location next to the wharf will be reduced by having a physical barrier in the water around the cages.
- A 2m tarp will be hung on the outside of the cages prior to freeze up. Tarping the upper part of the water column will serve two purposes. It will allow the upwellers that keep a part of the surface clear of ice (see the first bullet) to work more effectively. It will also prevent the spring algae from entering the cages. In the spring, microalgae have a tendency to grow in the fresh water layer that exists under the ice. The algae may be toxic to the fish. A fish kill from such an exposure has been experienced in the past in Whycocomagh Bay. The tarps will ensure that this fresh water layer of high microalgae concentration does not infiltrate the cages.

Water currents

The current data collected in 2018 via deployment of an ADCP (Acoustic Doppler Current Profiler) and summarized in Section 4.1 and Appendix F have been used to engineer the cage and infrastructure for this site. Note that the raw data is also available for this purpose.

Water temperature

As shown in Section 4.1, temperature was monitored at successive depths (3m, 9m, 20m, 42m) at a location close to the site from December 2016 to May 2018. This is not a true picture of what the fish will experience since some distance separated the recorders and the fish cages; but it gives a good general profile of the seasonal variations near the surface versus the constant low temperature of the deep water. Such a thermocline was expected and is a well-recognized phenomenon for Whycocomagh Bay. Within these plots, some upper-water temperatures recorded below 0°C could cause a superchill concern. However, temperatures closer to the over-wintering area did not reach these lows - as experienced by We'koqma'q who were holding fish on the lease near the wharves during this period.

The temperature profiles of the water depths the fish will inhabit have been incorporated into the growth model of the fish to predict feeding rates and days to harvest.

Infrastructure for the site

As a result of experimental work conducted by WFN since 2019 and the biophysical data collected, the intended infrastructure for the production site will be 100m (circumference) cages in a 2X5 grid array. The intended cages and grid system are shown in the amended application to Transport Canada for the Navigable Waters permit (Section 6.1).

SECTION 5: THE OTHER USERS OF THE PUBLIC WATERS SURROUNDING THE PROPOSED AQUACULTURAL OPERATION

5.1 Description of other users

The leases we propose to amalgamate into a single lease have been used for finfish aquaculture for over 30 years. The area is located south of the town of Whycocomagh and immediately south of an Island which is We'koqma'q land. Highway 105 runs along the shoreline adjacent to the site although the site is not highly visible from the highway because of the aspect of the shoreline and wooded nature of the shoreline.

Users within 1 km radius

As shown in Figure 6, to the west of the site is We'koqma'q land with a small residential development area on the inland side of the highway and other homes off the highway on the inland side. The only major development on the shore side are the buildings and driveway that are used by WFN for site activities. North of the site is an uninhabited island, which is also We'koqma'q land. It is open water to the south east.

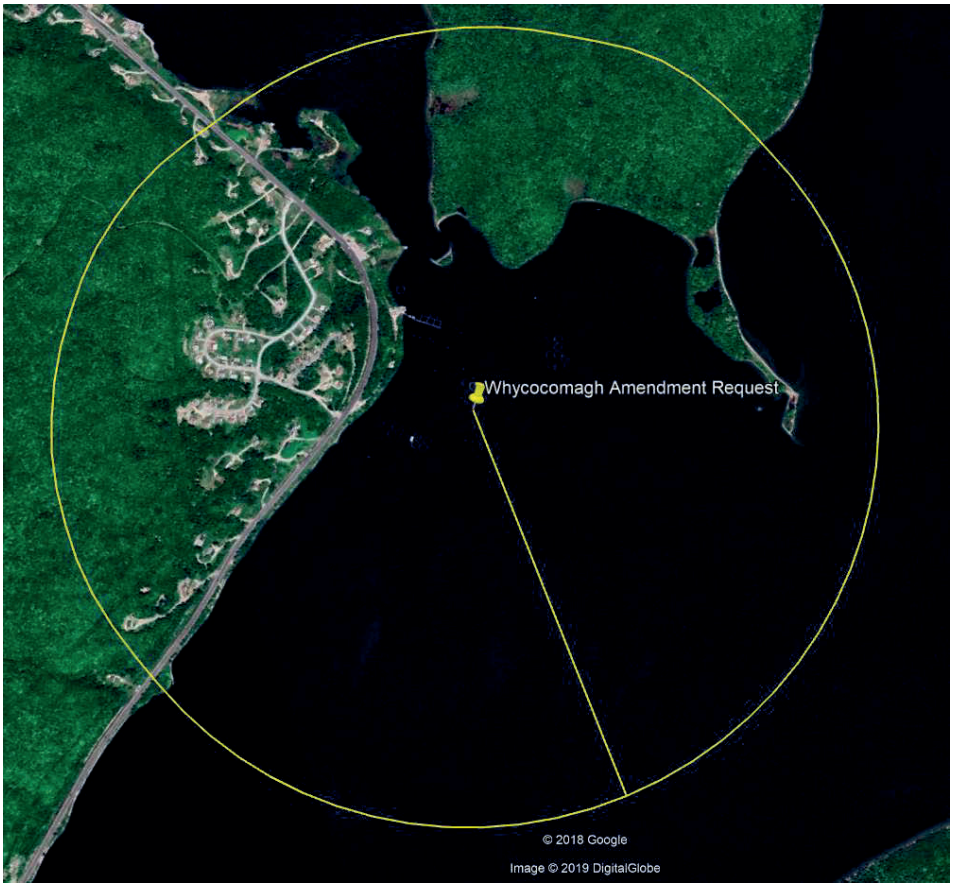


Figure 6: Google Earth image of the proposed site area with a 1 km radius drawn (yellow circle).

Users within 3 km

As shown in Figure 7, We'koqma'q First Nation and the Whycocomagh community is within 3 km of the site.

We'koqma'q First Nation (Whycocomagh 2 Reserve) is a Mi'kmaw community in the middle of Whycocomagh with a registered population of approximately 1000 persons according to Indigenous and Northern Affairs Canada. The We'koqma'q Nation has traditionally used the public waters for fisheries activities as described in Section 3.2. Whycocomagh and Whycocomagh Bay are recognized areas of cultural, recreational, and social significance (CEPI, 2006). It is notable that We'koqma'q has been involved in shellfish and finfish aquaculture activities in the local waters for decades. The proposed aquaculture site is a significant part of the First Nation's business development plans.

The Whycocomagh community has a population of approximately 850 residents and has several small businesses that support the local residents, including gas stations, a pharmacy, grocery store, bank, several bakeries and restaurants, accommodations (Keltic Quay, Fair Isle Motel, Aberdeen Motel), farmer's market, school (P-8, population<200), fire department, community center and other amenities and tourist features. Although the town is in close proximity to the site, even shoreline users in the town (B&B, residents, etc.) cannot see the site as it is sheltered by the Island.

In Whycocomagh, a main user group of the public waters is the Whycocomagh Waterfront Centre Association which supports both a community center as well as a marina. The marina is gated access with piers and a launch ramp to the Bras D'Or, a pump station, fresh water and washrooms. Floating docks and moorings are available for member rental.

Whycocomagh Provincial Park is located east of Whycocomagh. The park features hiking (5 km of trails), camping (40 sites) and picnicking. It overlooks the Skye River Valley and the Bras D'Or Lake. The main park straddles the Trans-Canada Highway and has areas of access to the Bras D'Or Lake. As for the town, even shoreline users of the park cannot see the site as it is sheltered by the Island.

The closest point of the south shore of Whycocomagh Bay in this area is 1.4km away. It is rarely used and almost un-inhabited.

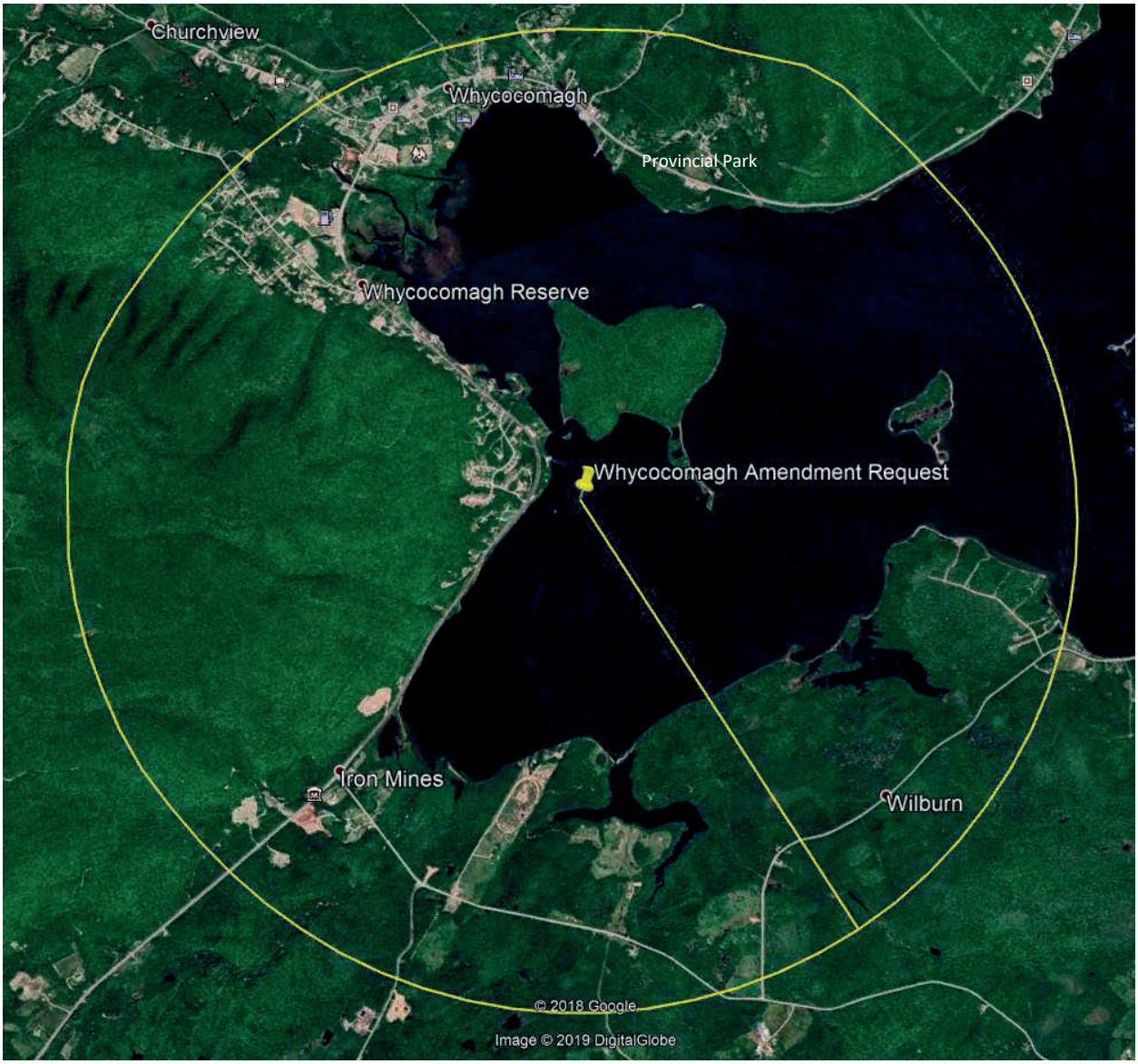


Figure 7: Google Earth image of the proposed site area with a 3 km radius (yellow circle).

Users within 5 km and 10km

As shown in Figures 8 and 9, outside of Whycocomagh, the shoreline is very sparsely inhabited. To the northeast, the highway runs along much of the shoreline with few shoreline properties. To the south, there is very little development and limited access. Beyond Whycocomagh, the main developments are in the northeast section of Whycocomagh Bay more than 10 km away.

Because of the distance between the proposed site and these users, it is unlikely that there will be significant visual or other impacts.

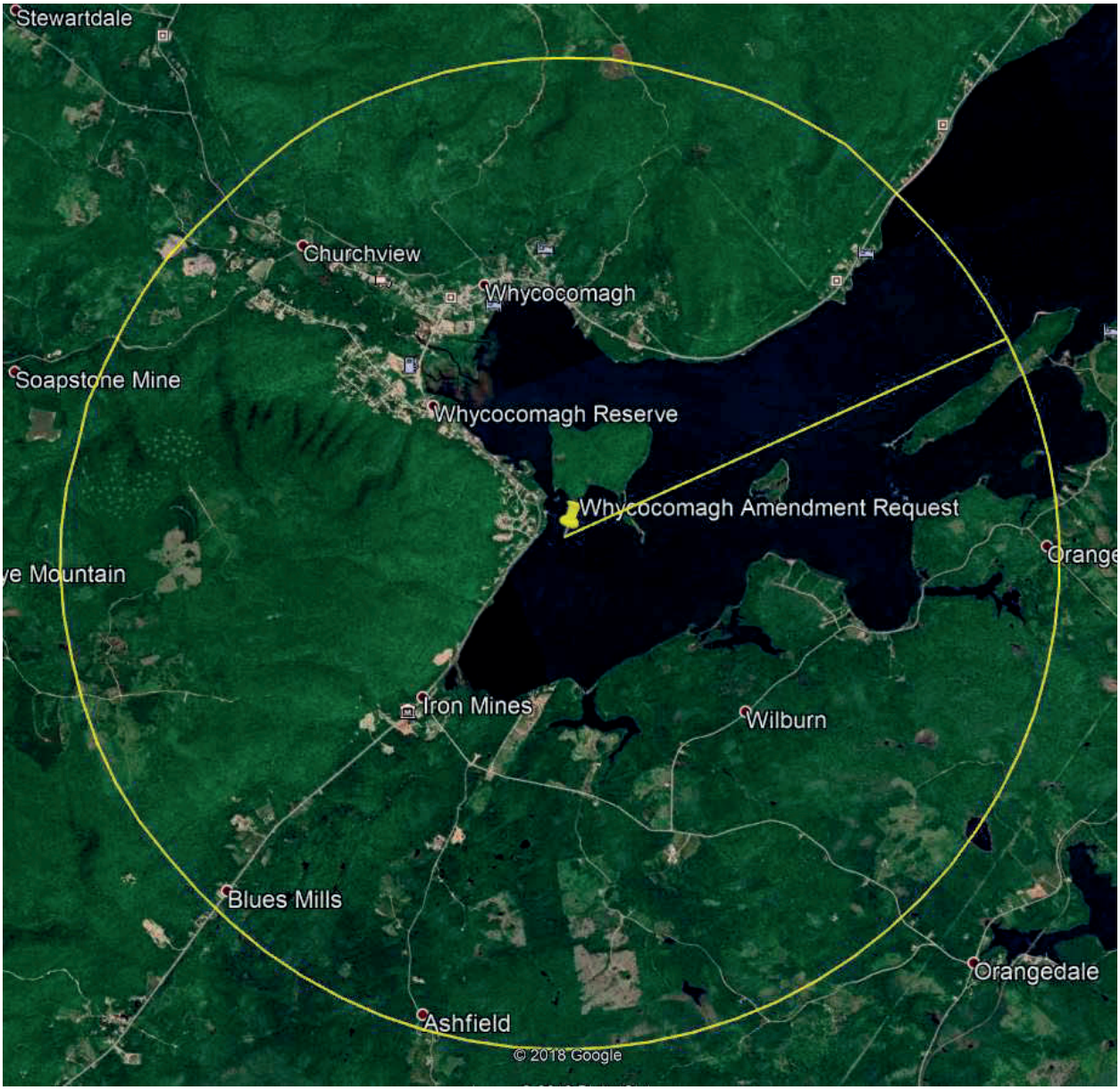


Figure 8: Google Earth image of the proposed site area with a 5 km radius (yellow circle).

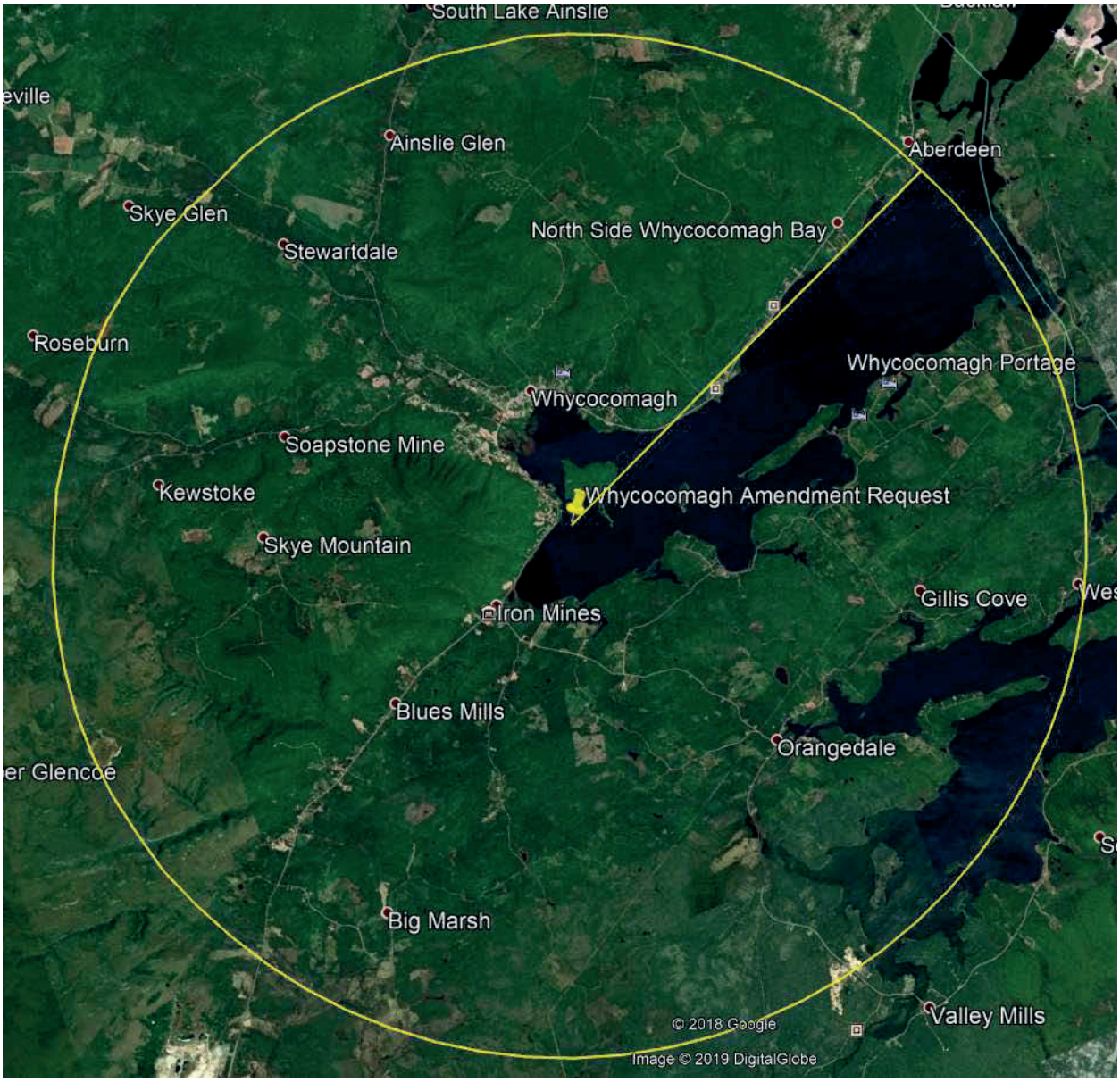


Figure 9: Google Earth image of the proposed site area with a 10 km radius (yellow circle).

Other regional users or parties interested in the public waters

The Bras D'Or Lake is a popular cruising location for pleasure crafts. Whycocomagh Bay is open to the Bras D'Or Lake only via Little Narrows Channel and yet is a popular spot, particularly for small sailing vessels, kayakers, canoeists and small fishing vessels. These may be local residents or seasonal users.

Other parties interested in the area in terms of conservation include:

Bras D'Or Stewardship Society: a non-profit organization established in 1998 committed to promoting stewardship of the Bras D'Or Lakes and their watershed. The proposed site is within the Society's area of interest.

Bras D'Or Lake Biosphere Reserve Association: a registered charity that oversees the UNESCO designated Bras D'Or Lake Biosphere Reserve[15]. Its mission is "to engage all peoples in the balanced and sustainable development of the exceptional cultural, environmental and economic assets within the Bras d'Or Lake watershed." The proposed site is within the Biosphere Reserve.

Bras d'Or Lakes Collaborative Environmental Planning Initiative (CEPI). CEPI is an alliance of federal, provincial, municipal, and First Nations governments and other interests who have signed a charter that represents "the collective intent, or "will", of the relevant governments with responsibilities for the management and protection of the Bras d'Or Lakes and its watershed".

5.2 Significance of proposed area to wildlife

Significant terrestrial habitats

Significant land habitats recognized by NSDNR along the shoreline of Whycocomagh Bay are shown in Figure 10 and include the following:

- IN418: deer wintering
- IN21: deer wintering
- IN142: bald eagle nest
- VI207: common loon habitat
- IN192: bald eagle nest
- IN17: bald eagle nest
- IN433: bald eagle nest
- IN22: bald eagle nest
- IN51: bald eagle nest
- IN37: bald eagle nest
- IN49: bald eagle nest

[15] In 2011, the Bras d'Or Lake and its watershed area were designated a UNESCO Biosphere Reserve, recognizing that the locals live in harmony with nature and work to promote a healthy environment, economy and culture.

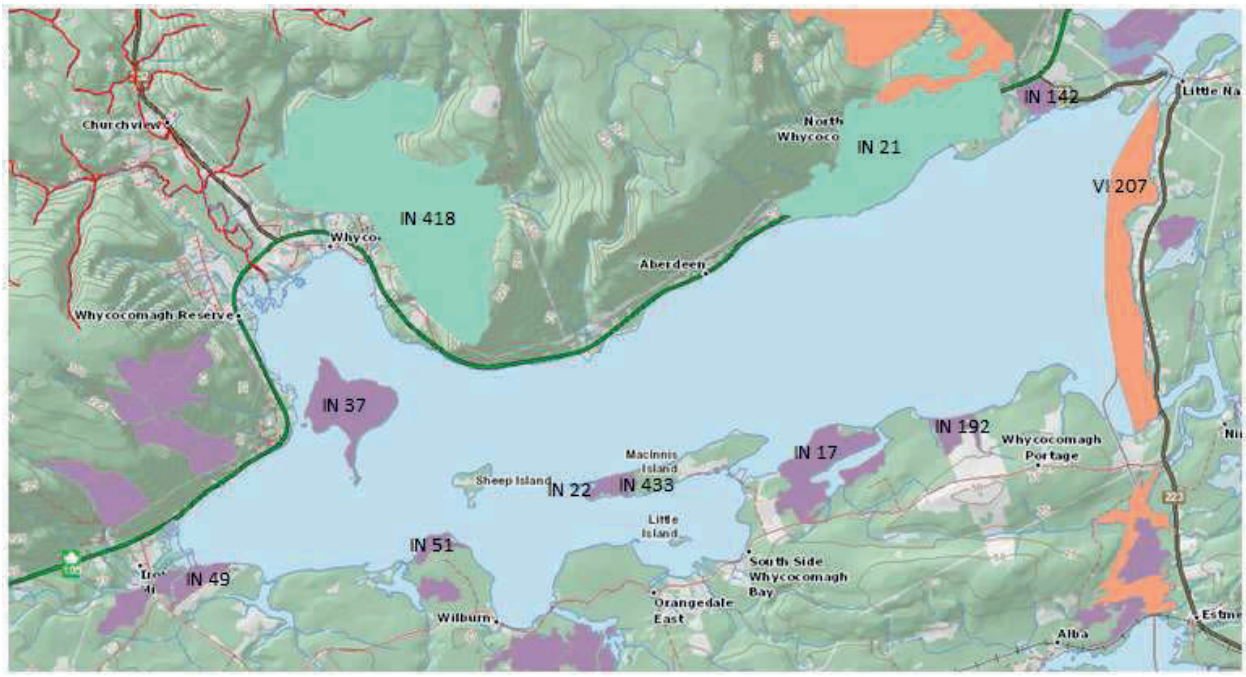


Figure 10: Significant land habitats[16] on the shoreline of Whycocomagh Bay

Rare and endangered species

A data report from the Atlantic Canada Conservation Centre provided more in-depth detail on the possibility of the presence of rare and endangered species that may use the proposed development area as well as special wildlife areas of the region. The complete report generated for the proposed site location is attached as Appendix E. A summary of the report follows:

Rare species list

Within 5 km of the site center, records indicate the presence of 31 species of rare or endangered vascular plants, 3 species of rare or endangered nonvascular plants, 23 species of rare or endangered vertebrates, and 2 species on invertebrate animals. Shoreside or water dwelling plants or animals are considered those that may be most likely to be affected.

Within this list of species, three are aquatic, including:

- American eel,
- Alewife,
- Brook trout.

Shoreside species of plants include:

- Ray's knotweed,
- Seaside brookweed.

[16] Adapted from https://nsgi.novascotia.ca/plv/ Accessed April 12, 2024; used with permission. Additional information provided by Frances MacKinnon.

Shoreside species of animals or water birds include:

- Nelson's sparrow,
- Cliff swallow,
- Killdeer,
- Spotted sandpiper,
- Greater yellowlegs,
- Blue winged teal,
- Common goldeneye.

Species at Risk

Five Species at Risk are on record as being in the region. They are listed in the table below. None are water dwelling or expected to be found shoreside.

Table 2: Species at risk within 5 km radius of proposed site[17]

Scientific name	Common name	SARA status	Habitat, other comments
Hirundo rustica	Barn swallow	Threatened	Nests in barns, garages, houses, bridges and culverts near open areas. Part of the agricultural landscape in Nova Scotia.[18]
Contopus cooperi	Olive-sided Flycatcher	Threatened	Spruce and fir swamps and bogs[19]
Contopus virens	Eastern Wood-Pewee	Special Concern	Woodlands[20]
Degella plumbea	Blue felt lichen	Special Concern	Hardwoods in woodlands[21]
Glyptemys insculpta	Wood turtle	Threatened	Clear, moderately moving rivers and tributaries in forests or flood plains.[22]

Location sensitive species

Two location sensitive species have been recorded in the region:

- Black ash: Black ash grows in swampy, low-lying areas that are very wet and marshy.[23]
- Wood turtle: See Species at Risk table.

Neither are lake dwelling or expected to be found shore side.

---

[17] Species list extracted from Atlantic Canada Conservation Center Report 6336. Species habitat and other comments obtained from sources referenced in footnotes.

[18] http://www.farmbiodiversity.ca/species-at-risk-2/birds/barn-swallow/ Accessed April 9, 2024

[19] https://novascotia.ca/natr/wildlife/biodiversity/species-list.asp Accessed April 9, 2024

[20] https://novascotia.ca/natr/wildlife/biodiversity/species-list.asp Accessed April 9, 2024

[21] https://sarguide.speciesatrisk.ca/sites/sarguide.speciesatrisk.ca/files/SAR_Guide_Edition2%20-%20Blue%20Felt%20Lichen%2075-76_0.pdf Accessed April 9, 2024

[22] http://www.sarguide.speciesatrisk.ca/sites/sarguide.speciesatrisk.ca/files/SAR_Guide_Edition2%20-%20Wood%20Turtle%2059-60_0.pdf Accessed April 9, 2024

[23] http://www.uinr.ca/black-ash/ Accessed April 9, 2023

Culturally significant flora and fauna

The sweet flag is a medicinal plant in the Whycocomagh area that is of significance for the Mi'kmaw people (CEPI, 2006). CEPI, 2006 also mentioned barrows goldeneye which have been seen near Whycocomagh Bay shore and bald eagles which are more commonly seen.

General marine life

The Bras D'Or Lake marine environment is known for its uniqueness in terms of reduced salinities, limited physical exchange with the open ocean, diversity of seasonal temperature regimes, and low tides. One of the most often reported attributes of the lake is the fact that both warm water and cold-water species are found in the same water system (Lambert, 2002).

Within Whycocomagh Bay, the diversity of marine life is more limited than other areas of the lake. It is a low salinity region with large basins of low oxygen levels. It has been suggested that these characteristics limit benthic organisms in many parts of the bay, with the exception of micro-organisms (Lambert, 2002). Low abundance of mysids, copepods (Petrie & Bugden, 2002; Strains & Yeats, 2002) have been noted. Many invertebrate species such as lobsters and rock crab are unlikely to be in this area due to its low salinity. Similarly, scallops are unlikely to be in this area. (Tremblay, 2002)

Studies have shown that herring and gaspereau occur in Whycocomagh Bay and the presence of winter flounder, cod, skate, and windowpane flounder was evidenced by their appearance in trawl catches in Whycocomagh Bay in 1999-2000, which were similar to findings from tows conducted in 1967. The cod population in this bay is thought to be unique from other cod populations in the lake. This is based on the low incidence of the sealworm (*Pseudoterranova decipiens*) in cod of the bay relative to adjacent areas. This segregation is thought to be due to the restricted passageway at Little Narrows, which may discourage the movement of cod between the bay and St. Patrick's Channel. Local knowledge suggests that cod populations are significantly reduced over previous levels (personal communication, Joe Googoo, We'koqma'q Elder).

Grey seals and harbor seals are the only marine mammals known to inhabit Whycocomagh Bay (Robin Stuart, personal communication).

5.3 Impacts to other users including wildlife

Impacts to human users of the public waters surrounding the proposed development

Tourist operators, local and seasonal residents

The village of Whycocomagh and a number of businesses within the region rely heavily on tourism. A key draw to the region is the Bras D'Or Lake. And local and seasonal residents enjoy the public waters surrounding the proposed development for its beauty, nature and recreational opportunities. Concerns that these groups of the community may have are discussed below.

Visual impact

The area is well known for the attractiveness of its landscape, including the views of the Bras D'Or Lake. WFN recognizes this value to the area's tourism industry as well as to the local community members in general.

The site is located in an area that is protected from view by most of the residents and business owners of Whycocomagh. During the scoping process,[24] one of the site's nearby residents suggested moving the cages "behind" the adjacent island in order to reduce visual impact. However, the location suggested could prove to increase the visibility of the site, expose the site to higher winds (north easterly), and not provide enough depth for the culture activities. The site location was originally chosen because of its unique shelter and depth attributes.

In recognition of the importance of appearance, WFN is committed to ensuring that the cages are maintained in an orderly fashion to ensure that they properly represent the opportunity that they are bringing to the community and do not negatively impact the visual landscape. The regular inspection and maintenance of cages is a best practice of the company that is mandated under the Nova Scotia Aquaculture Management Regulations within the Farm Management Plan as mentioned in Section 3.2 (*Mitigating Fisheries Impacts through Operational Procedures*). In addition to the Farm Management Plan requirements explained previously regarding infrastructure maintenance, all of the WFN finfish aquaculture operations will follow the Farm Operations requirements also defined by the Nova Scotia Aquaculture Management Regulations. These requirements acknowledge that the responsible operation of a marine finfish site includes consideration of neighbors and other users of shared resources, including aspects affecting visual impact. To this effect, the Farm Management Plan must include the following:

- Described and approved management practices for removing and disposing of accumulated refuse and decommissioned farm supplies and equipment;
- Described and approved management practices for retrieving any gear or debris from the aquacultural operation that has broken loose; including timelines for completion;
- Described and approved management practices for maintaining the site in good order.

The above elements will be approved for implementation by NSDFA and operators will be audited for adherence to the plan according to NSDFA's requirements.

Smell and Noise

Part of the appeal of the region pertains to the rural landscape in terms of low noise pollution and high air quality. WFN recognizes the value of maintaining these local attributes and will apply and document practices that reduce noise, particularly outside of working hours, and reduce odors in general.

[24] Refer to Page 8 of the Report on Public Engagement During Scoping

A concern about the smell of WFN's finfish operation in Whycocomagh was brought up during the scoping process [25]. It is recognized by WFN that they had an incident where smell was a problem for a couple of days in the summer of 2018. This was due to an interruption in trucking that required offal transfer during an excessively hot day (>30°C). Normal procedures for WFN's finfish operations include removing organic waste on a bi-weekly basis for transport to the Guysborough facility which is equipped to deal with such waste. Increased oversight of this procedure now occurs to ensure that the transportation will not be disrupted. And the shipping containers are lined and sealed on site prior to transport so that spillage will not occur *en-route*.

Other aspects of the operation that may be a risk for causing odors will be described and documented in the Farm Management Plan. This includes the storing and disposal of feed, mortalities and other organic waste. Addressing these are part of the Farm Operations requirements of the Nova Scotia Aquaculture Management Regulations.

It is notable that the Farm Management Plan also requires the description, application, and documentation of procedures that minimize noise. These will be approved for implementation by NSDFA and operators will be audited for adherence to the plan according to NSDFA's requirements.

As mentioned previously, WFN's finfish operation hopes to become certified to the Global Aquaculture Alliance's Best Aquaculture Practices (BAP). Section 3K of this standard requires safe and responsible storage and disposal of farm supplies and waste. Procedures required for this would be above and beyond the Farm Management Plan requirements described above and would be third party audited. The relevant BAP Farm Standard (Issue 3.1) is attached as Appendix B.

It is notable that finfish aquaculture operations have been operating in the community for more than 30 years and the relationships with local residents have been very positive.

Navigation for marina users, recreational boaters, fishers and others

Recreational boaters, fishers, marina users and other local residents or passersby who use the waterways for travel need to have clear delineation of safe travel paths when in or below water structures, such as finfish cages, exist. WFN has ensured this by completing a Notice of Works form to Transport Canada, as required under Section 6 of this Development Plan. WFN will mark their sites in accordance with these requirements.

Miscellaneous concerns raised during scoping

During the public meeting held in the community, an attendee mentioned his concern that WFN's current aquaculture operation in Whycocomagh is causing the build-up of dead seaweed along the shore which is interfering with angling from the shore.[26] The association between the dead seaweed and the finfish culture activities is not clear; nor is it clear that changes to the operations would make an impact on this phenomenon. Regardless, WFN is dedicated to monitoring and measuring the environmental impact of its finfish aquaculture operations, including eutrophication. This is

[25] Refer to Page 12 of the Report on Public Engagement During Scoping
[26] Refer to Page 8 of the Report on Public Engagement During Scoping

demonstrated by WFN's partnership in research that modeled and measured nutrient level changes in the water resulting from its operations. This was previously described in Section 3.2 ("*Mitigating Fisheries Impacts through Research and Development*").

Ensuring the proper disposal of sewage waste was brought up during the scoping process.[27] Storage and disposal of human waste must be described and documented in the Farm Management Plan as part of the Farm Operations requirements of the Nova Scotia Aquaculture Management Regulations.

Impacts to wildlife users of the public waters surrounding the proposed development

There are no identified rare or endangered species that are expected to be directly impacted by the operation of this site. Mitigation measures applied to reduce fisheries impacts are described in Section 3.2 and will also mitigate impacts to other wildlife in the bay in general.[28] Measures applied to support the sustainability of wild salmon are described in section 7.2.

As described in Section 5.2, there are no SARA listed species expected to interact with the proposed site since all known SARA species in the area are terrestrial.

Any risks to aquatic rare and endangered species will be mitigated with the fish escape, disease and biosecurity, and environmental impact management[29] procedures described in Section 3.2 (*Mitigating Fisheries Impacts through Operational Procedures*). Potential risks to shoreline species and water birds, particularly those known to be rare or endangered, will be mitigated within a wildlife interaction plan. This plan will describe procedures that ensure least interference with surrounding wildlife while supporting their habitat. This will include a requirement that boat travel to and from the site is via the most direct route possible, without travelling near the shore or near wildlife. An exception to this will occur during a weekly sweep of the shoreline to look for debris that may inadvertently have been released during operation of the site. This will enable the upkeep of the shoreline to a level of cleanliness that promotes wildlife habitat. For these procedures, employees will be cautioned to not approach wildlife and not travel through marsh areas where sensitive species may be harbored. An annual shoreline clean-up will also occur for the adjacent area. This clean-up will not be conducted at times of the year when shoreline birds are nesting.

A wildlife interaction plan must be described in an operator's Farm Management Plan as defined by the Nova Scotia Aquaculture Management Regulations. It must be approved for implementation by NSDFA and operators will be audited for adherence to the plan according to NSDFA's requirements. The BAP certification standard also requires a Wildlife Interaction Plan. The relevant BAP Farm Standard (Issue 3.1) is attached as Appendix B.

[27] Refer to Page 8 of the Report on Public Engagement During Scoping

[28] The potential benthic environmental impacts were brought up during scoping. See page 8 of Report on Public Engagement During Scoping.

[29] The potential benthic environmental impacts were brought up during scoping. See page 8 of Report on Public Engagement During Scoping.

Complements to other users

Support of the local economy

Development of WFN's finfish aquaculture operations is anticipated to bring a significant number of local direct and indirect jobs to the community (see Sections 2.3, 2.4, and 2.5).

Support of conservation efforts

WFN will work with the conservation groups active in the area to help collect information on the oceanographic and ecological characteristics of this area of the Bras D'Or Lake. On this front, WFN has an established relationship with Dr. Bruce Hatcher and will continue to assist Dr. Hatcher as he collects information to: characterize the dynamics in the cline of Whycocomagh Bay, explore ice cover changes and effects in Whycocomagh Bay, explore anthropogenic effects on the Bay's characteristics, and other research efforts. WFN will also assist the Stewardship Society and Biosphere Reserve Association to collect information and educate people on the unique ecology of the Whycocomagh region, when requested.

Robin Stuart, a previous Manager of Aquaculture Operations for WFN, who does periodic consulting for WFN, is a representative on CEPI and will help to communicate any concerns the group may have with the fish farm.

5.4 Impacts by other users including wildlife

Generally speaking, WFN's finfish operations have, and hope to continue to have, an excellent and mutually beneficial relationship with the local communities.

A possible negative impact of people on the operations needs mentioning. This refers to vandalism of the fish nets. In the past, one of the nets was released manually by a non-resident. This resulted in fish release. Fishing within the pens has also occurred. Since this time, WFN has hired security to patrol their sites and mitigate these risks.

Fish-eating birds (herons, hawks, kingfisher, eagles, and other species) can be common-place in regions that support finfish aquaculture operations. If not properly managed, such birds can prey on the fish in the cages, causing stress and physical damage. WFN finfish aquaculture operations will use bird nets on their cages during seasons when bird predation is a problem. These nets will cover the surface of the water at a height from the water surface so that bird predation cannot occur. The procedures for their use and maintenance are required as part of the Farm Management Plan.

SECTION 6: THE PUBLIC RIGHT OF NAVIGATION

6.1 Navigation Protection Act approval

A copy of a revised Notice of Works form and required attachments follow as Appendix G.[30]

[30] Concern regarding impediments to navigation were brought up during scoping. See page 9 of Report on Public Engagement During Scoping.

SECTION 7: THE SUSTAINABILITY OF WILD SALMON

7.1 Identification of local salmon populations

(Reference: CSAS Science Response 2017/20, 2020/031)

This proposed site amalgamation (AQ 0814x) is within Salmon Fishing Area 19, also called the Eastern Cape Breton Designatable Unit by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Closest salmon bearing rivers that have direct connections to the body of water that contains the proposed site include Skye River (mouth within 2 km of the site), Middle River (mouth more than 23 km from the site), and Baddeck River (mouth more than 26 km from the site). Only the Skye River opens into the Whycocomagh Bay subwatershed. The Middle and Baddeck Rivers open into an adjacent watershed (St. Patricks Channel) which is somewhat separated from the Whycocomagh Bay subwatershed via a sill less than 12 m deep. Since 2006, Middle and Baddeck Rivers have had their salmon populations enhanced through a Provincial stocking program which includes broodstock collection on these rivers. This enhancement is intended to offset anticipated catch and release mortalities on these rivers and has allowed an open catch and release fall season on the Middle and Baddeck Rivers. Food, Social and Ceremonial (FSC) allocations are also available on these rivers. Middle and Baddeck Rivers are index populations. As for all index rivers in Eastern Cape Breton, the populations were assessed to be below conservation egg requirements in 2018.

The approximate locations of all salmon bearing rivers in the vicinity of the site, as reported in the 2017 and 2020 CSAS Stock Status Update for SFAs 19-21 and 23 are shown below in Figure 11.

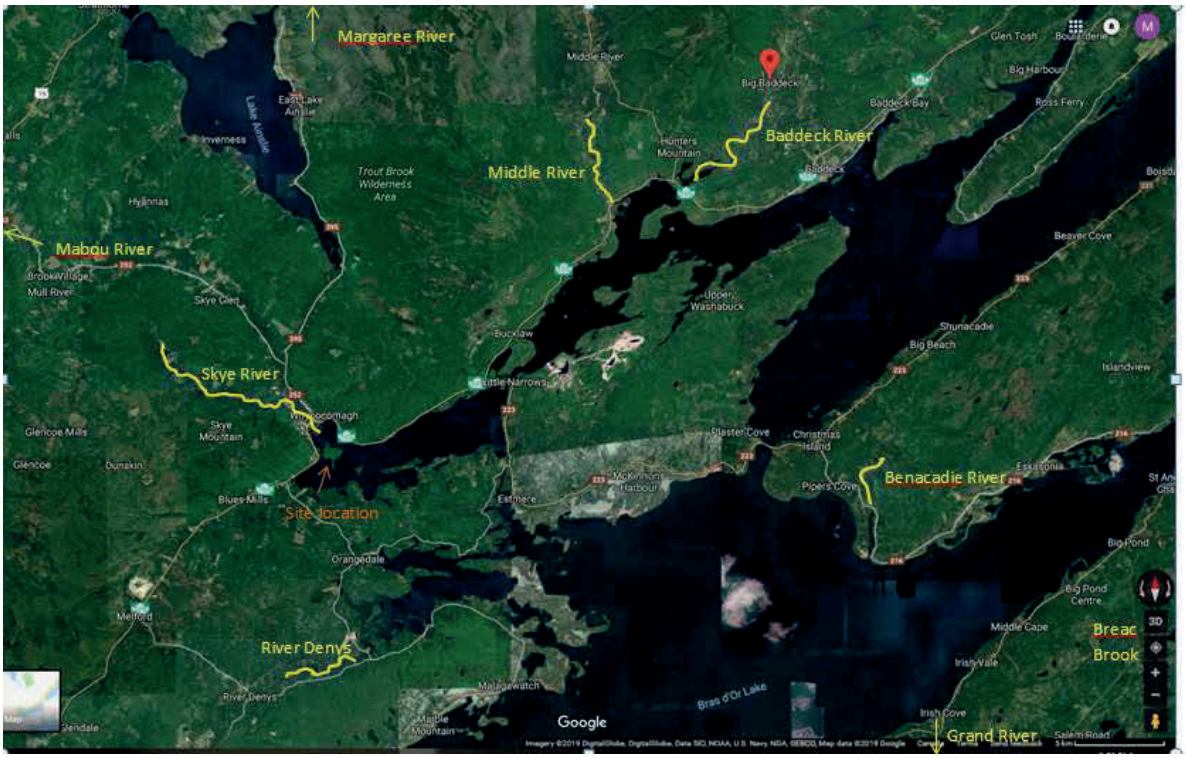


Figure 11: Salmon bearing rivers within the region of the site.

7.2 Support of the sustainability of wild salmon

Although rainbow trout are not indigenous to the Bras d'Or Lake area, it has a resident population that has developed from stocking efforts for the sport fishery, with the first trout introduced in 1899. These introduced fish have been shown to be successfully reproducing in the wild and are contributing to the fishery numbers (Madden et al., 2010). Rainbow trout continue to be stocked by the province through an enhancement program. This would suggest that there is little concern that the presence of rainbow trout affects the sustainability of wild salmon.

Furthermore, WFN will institute operational procedures to mitigate the greatest perceived risks of finfish aquaculture operations to wild salmon populations; these being fish escape, disease and biosecurity, and environmental impact risks. These have been described in Section 3.2.

As indicated in Section 7.1, Middle and Baddeck Rivers have had their salmon populations enhanced through a Provincial stocking program which includes broodstock collection on these rivers. Approval of this lease amendment is not anticipated to affect these efforts.

The environmental and oceanographic data collection in the bay that is supported by WFN (Section 5.3 Support of conservation efforts*)* is intended to improve understanding of the local ecosystem as a whole, as well as more broadly with regards to global warming. Although there is no direct intent to use this data to support Atlantic salmon conservation measures, an increased understanding of the environment may contribute to conservation practices in general.

SECTION 8: THE NUMBER AND PRODUCTIVITY OF OTHER AQUACULTURE SITES IN THE PUBLC WATERS SURROUNDING THE PROPOSED AQUACULTURAL LOCATION

8.1 Identification of other aquaculture sites[31]

WFN or We'koqma'q First Nation Band Council is presently the lease holder for all aquaculture sites within Whycocomagh Bay, both finfish and shellfish. There are a few oyster sites of other operators that are in close proximity distance-wise, but the waters are not directly connected to Whycocomagh Bay.

WFN is making two requests for new commercial finfish sites within Option 1413 in the eastern end of Whycocomagh Bay (one on the north side, AQ 1430, and one on the south side, AQ 1431), and a request for the amalgamation and enlargement of leased areas in the west end of Whycocomagh Bay (AQ 0814x) – this application. Since 2019, We'koqma'q was assigned a previously active finfish/shellfish site in the region which will likely be used for oyster aquaculture in the future (AQ 0193).

All of the sites planned for the area are shown in Figure 12, as they can be seen on the NSDFA site mapping tool. Figure 12 also shows other existing aquaculture sites in the area.

Collectively, the requested sites will allow a financially viable rainbow trout aquaculture operation while availing enough area to increase fallowing times. Increased fallowing will reduce fish health risks and minimize potential environmental impacts of the operations.

[31] The potential for aquaculture in the area was brought up during scoping. See page 4 of Report on Public Engagement During Scoping.

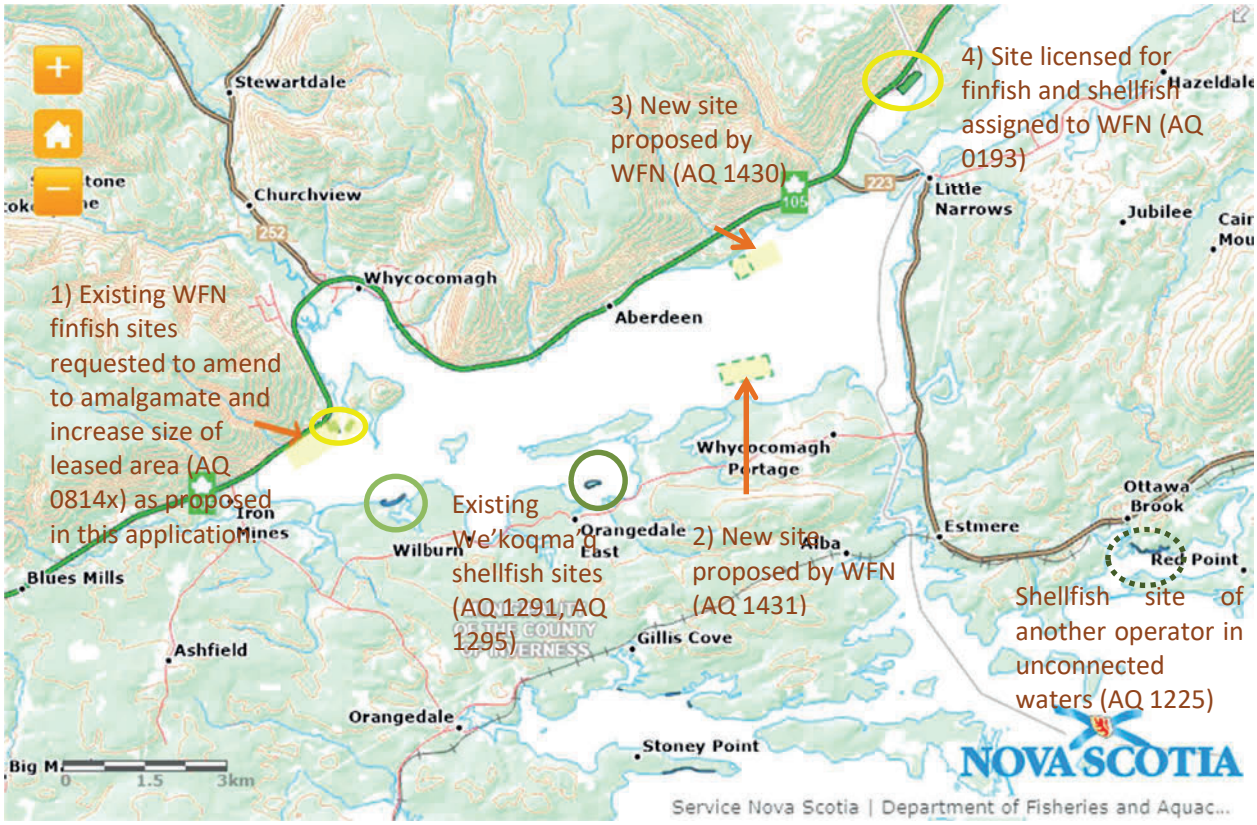


Figure 12: Map of the region of the proposed site showing existing aquaculture sites as well as sites proposed in other applications. The base map was acquired from https://novascotia.ca/fish/aquaculture/site-mapping-tool/ Accessed April 8, 2024.

As shown in Figure 12, Site 1 is the region where WFN is currently the lease holder for three small finfish leases; WFN is requesting an amendment to amalgamate and enlarge this area in this application (AQ 0814x). Site 2 is a new commercial finfish site proposed by WFN in another application (AQ 1431). Site 3 is a new commercial finfish site described in another application (AQ 1430). Site 4 is the finfish/shellfish site assigned to WFN since 2019 (AQ 0193); the future use of this site is being explored, including its potential use for oyster aquaculture. Two of We'koqma'q's existing shellfish sites in Whycocomagh Bay are also shown in the map (circled in green), along with a shellfish site in unconnected waters (hashed circle in green).

8.2 Interactions with other aquaculture operations

WFN's three proposed finfish sites (AQ 1430, AQ 1431, AQ 0814x) will be managed as a single farm to promote optimal fallowing regimes. Final stocking plans will be developed in conjunction with NSDFA and DFO to maximize fish health and minimize environmental impacts. When all sites are available for use, a rotating fallowing cycle is anticipated.

These three sites and their relative location to each other, along with grid arrays intended within the sites are shown in Figure 13.

In the past, the proposed sites AQ 1430 and AQ 1431 and the outer area ("production area") of AQ 0814x have been exposed to moving ice in the spring. As a result, cages are not left here over the winter and these production areas are used in the ice-free period, from April to December, only. For the winter months, cages are pulled into a sheltered area that is part of the requested 0814x site. Here, the ice floes do not push through. This is why 0814x has a designated production area and a designated over-wintering area, as explained further below.

A summary of the purpose for each site and array follows as per current plans. Actual site stocking will depend on EMP results, I&T permissions and Stocking Level Approvals.

0814x

As shown in Figure 13, AQ 0814x will have both an over-wintering location and a production location. The overwintering location for all fish is shown as 0814x OW. The separate, single production array at 0814x #1 will regularly receive small fish in late fall. This production array at 0814x may also be occasionally used for small scale experimental trials (e.g. testing stocks, feeds). Biomass at this site will be kept low.

1430

As shown in Figure 13, AQ 1430 will house two arrays of 2 X 5 cages each. A single array will receive spring juveniles as well as the juveniles received the previous fall at AQ 0814x. The second array will be fallow. The array used will alternate between years.

1431

As shown in Figure 13, AQ 1431 will house two arrays of 2 X 5 cages each. A single array will receive second-year fish to be harvested in that year. The second array will be fallow. The array used will alternate between years.



Figure 13: Requested commercial leases are outlined in orange. Projected locations of cage arrays for the production season within the leases are the white polygons. Projected location for over-wintering cages is the light blue polygon.

Overview of all sites

The production plan for all sites for the next few years is shown below in a table format. This stocking plan is projected, and actual site stocking will be directed by fish performance, environmental monitoring results, fish health results, and introductions and transfers permissions.

Application No.	**Maximum site biomass (MT)**	**Maximum cage density (kg/m3)**	**Size(s) of cages, including net volumes**	**Maximum cage number**	**Maximum number of fish per cage (at harvest size)**
1430 ("North Aberdeen")	940 MT	20	100m circumference, 6,350 m^3	10	56,000
1431 ("South Aberdeen")	1146 MT	20	100m circumference, 6,350 m^3	10	56,000
0814x ("Inner Bay"): production area	200 MT	20	100m circumference, 6,350 m^3	10	56,000
0814x ("Inner Bay"): over-wintering area	2000 MT (winter months only, no feed inputs)	20	100m circumference, 6,350 m^3	30	56,000

Fallowing:

As explained previously, the plan is to rotate the production area within each of AQ 1430 and AQ 1431 on an annual basis to allow a fallowing time of a production area of 15 months. The requested site areas are large enough to house two grids and enable this to occur.

For AQ 0814x, the production array will be fallowed for eight months and the over-wintering location will be fallowed for 9 months. The entire lease will be fallowed for five months.

The production plan for all sites is shown below as a Gantt chart (Figure 14) to demonstrate array fallowing and lease fallowing plans. The colored blocks represent times when a specific array is stocked. The black blocks represent times when a specific array is fallow, with no fish stocked.

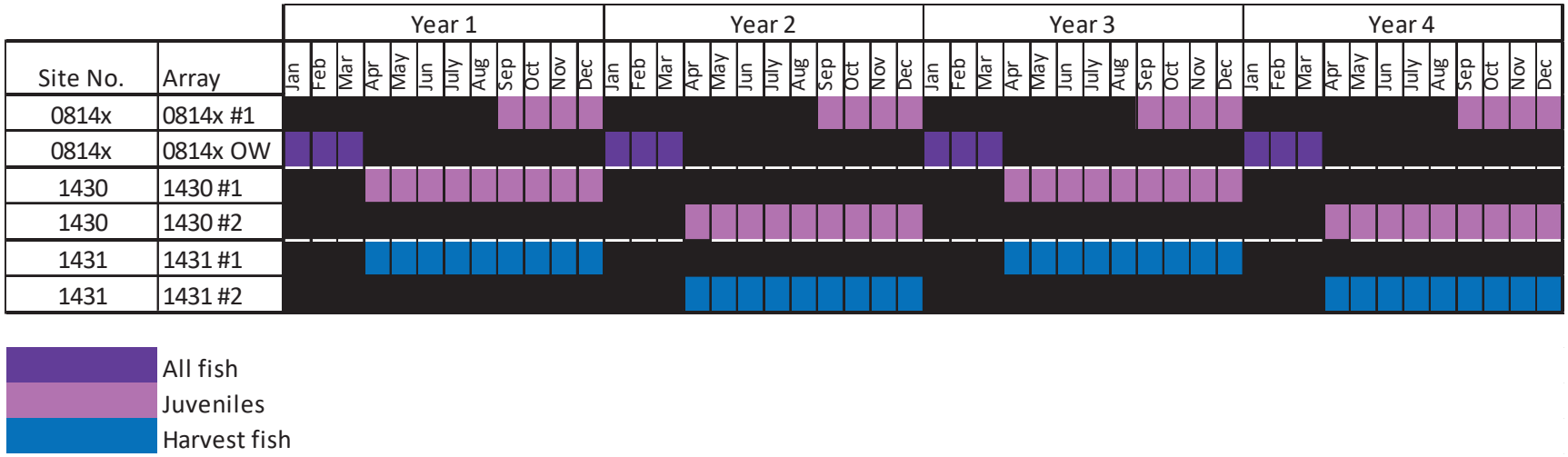


Figure 14: Gantt chart showing stocking and fallow periods for all of WFN finfish sites in Whycocomagh Bay. The black blocks represent times when a specific array is fallow, with no fish stocked.

References

Black, W.F. 1958. Biology of mysids of the Great Bras d'Or. MS. Rept. Fish. Res. BoardCan. #671. (Cited, not seen.)

Bricknell, I., Dalesman, S., O'Shea, B., Pert, C.C., and Mordue Luntz, A.J. 2006. Effect of environmental salinity on sea lice *Lepeoptheirus salmonis* success. Dis. Aquat. Org. 71(3):201-212.

CEPI. 2006. Bras D'Or Lakes Traditional Ecological Knowledge Workshop Proceedings. CEPI Workshop May 3-4, 2006, Eskasoni, NS.

DFO. 2017. Lobster (Homarus americanus) off the Atlantic Coast of Nova Scotia (Lobster Fishing Areas 27-33): 2017 Stock Status Update. DFO Can. Sci. Advis. Sec. Sci. Resp. 2017/026.

DFO. 2017. Stock Status Update of 4VWX Herring. DFO Can. Sci. Advis. Sec. Sci. Resp. 2017/037.

DFO. 2017. Stock Status Update of Atlantic Salmon in Salmon Fishing Areas (SFAs) 19-21 and 23. DFO Can. Sci. Advis. Sec. Sci. Resp. 2017/020.

DFO. 2021. Stock Status Update of Atlantic Salmon in Salmon Fishing Areas (SFAs) 19-21 and 23. DFO Can. Sci. Advis. Sec. Sci. Resp. 2020/031.

DFO. 2022. Lobster Fishing Areas 27 – 38: Integrated Fisheries Management Plan. https://www.dfo-mpo.gc.ca/fisheries-peches/ifmp-gmp/maritimes/2022/inshore-lobster-homard-cotiere-eng.html#toc2 Accessed April 11, 2024.

Dupont, F., Petrie B., and Chaffey, J. 2003. Modeling the Tides of the Bras d'Or Lakes. Can. Tech. Rep. Hydrogr. Ocean Sci. ISSN 0711-6721. viii+53 p

Eskasoni Fish and Wildlife Commission and Dept. of Fisheries and Oceans. 1996. The Bras d'Or Lake Coastal Resources Mapping Project, managed by the Unama'ki Institute of Natural Resources (UINR), 4123 Shore Rd. Eskasoni, Nova Scotia B0A-1J0. Unpublished maps. (Cited, not seen.)

Foster, M. 2019. Economic Impact Study The Aquaculture Industry in Nova Scotia. Presentation at Sea Farmers Conference 2019, Halifax, NS.

Krauel, D. 1976. A summary of the physical oceanography of the Bras d'Or Lake system. IN The proceedings of the Bras d'Or Lakes aquaculture conference, Sydney, Cape Breton. (Ed. M.G. McKay) College of Cape Breton Press, Sydney, N.S., 29-43. (Cited, not seen.)

Lambert, T.C. 2002. Overview of the ecology of the Bras d'Or Lakes with emphasis on the fish. Proc. N.S. Inst. Sci. 42:65-100.

Madden, J.R., MacMillan, J.L., and Apaloo, J. 2010. Examining the occurrence of wild rainbow trout in the Bras d'Or Lakes, Nova Scotia: using scale pattern analysis to differentiate hatchery and wild populations. In Proceedings of Wild Trout Symposium X, Conserving Wild Trout, Bozeman, Mont., 28–30 September 2010. pp. 184–195. Available from www.wildtroutsymposium.com/proceedings-10.pdf. Google Scholar

Mitchell S.O., and Rodger H.D. 2011. A review of infectious gill disease in marine salmonid fish. Journal of Fish Diseases. 34(6):411–32

Parker, M., Westhead, M., Doherty, P. and Naug., J. 2007. Ecosystem Overview and Assessment Report for the Bras d'Or Lakes, Nova Scotia. Can. Manuscr. Rep. Fish. Aquat. Sci. 2789: xxii + 223 pp.

Petrie, B. 1999. Sea level variability in the Bras d'Or Lakes. Atmos.-Ocean37,221-239. (Cited, not seen.)

Petrie, B. and Bugden, G. 2002. The Physical Oceanography of the Bras d'Or Lakes. Proc. N. S. Inst. Sci . 42: 11-38.

Smith, J., Grant, J., and Stuart, R. 2002. Design of the Environmental Monitoring Program for the Marine Aquaculture Industry in Nova Scotia.

Stephenson M.F., McGladdery, S.E., Maillet, M., Veniot, A., and Meyer, G. 2003. First reported occurrence of MSX in Canada. J. Shellfish Res. 22: 355

Strain, P. and Yeats, P. 2002. The Chemical Oceanography of the Bras d'Or Lakes. Proc. N .S. Inst. Sci. 42: 39-66.

Tremblay, W.J. 2002. Large epibenthic invertebrates in the Bras D'Or Lakes. Proc. N.S. Inst. Sci. 42:65-100.

Vercaemer, B., MacIsaac, A., and Drinnan, P. 2010. Initiation of a Bras d'Or lake oyster breeding program and broodstock management for resistance to MSX. Aquaculture Collaborative Research and Development Program (ACRDP) 2005-2008. Part 1. Initiation of a Bras d'Or lake oyster breeding program for resistance to MSX. Part 2. Broodstock management for the Bras d'Or lake oyster breeding program - resistance to MSX. Can. Tech. Rep. Fish. Aq. Sci. 2871

2.2 AQ#1430 Development Plan

Updated Development Plan for AQ 1430, North Aberdeen, Option to Lease 1413

WFN Fish Farm Limited Partnership
April 23, 2024

INTRODUCTION

In February, 2019, We'koqma'q First Nation submitted three application packages for commercial finfish aquaculture sites in the Bras D'Or Lake near their Mi'kmaw community. These packages requested two new commercial marine finfish leases[1] and a boundary amendment to amalgamate three existing small commercial marine finfish leases. These proposed sites are within the Option to Lease # 1413 and are located on: the northeast side of Whycocomagh Bay near Aberdeen, the southeast side of Whycocomagh Bay, near Whycocomagh Portage, and in the west end of Whycocomagh Bay, south of the village of Whycocomagh. The sites are intended to operate together, as a single farm. These aquaculture sites and activities they will permit will promote We'koqma'q First Nation's long-term objectives of achieving financial stability for their community, sustaining employment for band members and developing a vertically integrated business that can see success for generations.

In the years previous to these applications, We'koqma'q focused on building an egg-to-plate steelhead trout aquaculture operation. This included acquiring and investing in a hatchery with historical success with salmonid production, investing in sea pen infrastructure and capacity, and modernizing the local processing plant. The next logical step became expanding their steelhead trout farming activities in the lake.

At the time of the applications, We'koqma'q had seven years of experience operating marine finfish sites, three as a contract grower and four as the business owner. This informed the original applications. However, more than five years have passed since the original application submissions, and We'koqma'q has been working hard to better understand the fish, the environment's capacity for aquaculture, and how best to sustainably farm the waters of their local community. Since the original applications in 2019, We'koqma'q First Nation has successfully acquired and operated experimental finfish leases in areas overlapping AQ 1430 and AQ 1431, where the commercial leases are being sought. This experimental work is allowing We'koqma'q to investigate new technology, including the effectiveness and efficiency of 100m polar circle cages and camera-monitored feed barges and the suitability of triploid stocks for rainbow trout aquaculture in the Bras D'Or Lake. It is also enabling development of a diagenesis model (FINS) to predict sulfide levels below a finfish aquaculture operation. Over these years, We'koqma'q also worked with Dalhousie University to model farm interactions with the environment and evaluate the commercial performance of a new

[1] Within this document the term "lease" is intended to refer to both the lease and licence required for marine finfish aquaculture production in Nova Scotia. It is sometimes also referred to as a "site".

strain of rainbow trout. All of this development work has informed production plans and will continue to inform the direction that We'koqma'q takes in the future.

As a result of this additional time and experience, the original development plans within the three application packages for commercial finfish aquaculture sites were updated several times according to business planning, information gleaned from fish production and monitoring operations on experimental sites in the area, and in response to network review questions and concerns.

This document submission represents a revision of the development plan for one of these three commercial finfish aquaculture sites: denoted as AQ 1430, otherwise known as "North Aberdeen". The intention of this submission is to collate all changes into a single development plan document to facilitate review of the application. A similar revised development plan has been prepared for the other two commercial finfish lease applications that are part of We'koqma'q's vision for a sustainable steelhead trout farm.

One general point is the change in the applicant's name to WFN Fish Farm Limited Partnership. Since submission of the applications in 2019, We'koqma'q First Nation Band Council established a new limited partnership to hold the fish farm operations. This limited partnership includes a general partner (WHI General Partner Incorporated) and a limited partner (We'koqma'q First Nation). Therefore, the name WFN Fish Farm Limited Partnership as the applicant better reflects the operational status of the fish farm since it includes the mind and management of the business. WFN Fish Farm Limited Partnership has been abbreviated to WFN throughout this document.

Changes in content to the original development plan are listed by section in the table below, along with the reasons for the modifications.

Section (s)	Brief description of change	Date of submission requesting change	Reason for the modification
General	Updated the site references to the numbers designated by NSDFA in their review process (i.e. AQ 0814x, AQ 1430, AQ 1431).	April 23, 2024	To add clarity on the site being described.
General	Replaced applicant name to WFN Fish Farm Limited Partnership (WFN) throughout the documents.	March 7, 2024	To reflect the formation of the Limited Partnership created to operate and govern the finfish farm activities.
General	Replaced BAP Standards reference to "BAP Farm Standard, Issue 3.1" throughout the document.	April 23, 2024	To reflect the current BAP standard applicable for the site.
General	Added sub-headings in various places in the document.	April 23, 2024	Intended to better organize the information provided.
General	Made text adjustments according to change of people, status of activities, etc.	April 23, 2024	Small corrections were made to verb tenses and wording to accommodate the completion of projects and changing of people that have occurred since 2019.
Introduction	New Introduction section added to the Development Plan.	April 23, 2024 (Similar introductory sections appear in the previous Development Plan Update submissions.)	To provide context for the updated Development Plan.
Section 1.0	Reworded to reflect changes made to other sections of the Development Plan.	April 23, 2024	To accurately reflect plans and current knowledge.
2.1 Production Plan	Added strains of trout to be used	August 30, 2019	Response to a request for additional information from NSDFA.

Section (s)	Brief description of change	Date of submission requesting change	Reason for the modification
2.1 Production Plan	Changed the production plan, including the "Maximum site biomass", description of infrastructure to be used (cage size, cage number), number of fish per cage, stocking density, stocking date and fallow plan. Added a note on the use of triploid stocks.	July 20, 2023, February 26, 2024, April 23, 2024	Business planning, advice from consultants, information gleaned from fish production and monitoring on the experimental site in the area, and network responses informed a new production plan that was better suited to sustainably farm in the area.
2.1 Production Plan	Added a Gantt chart to explain fallowing at AQ 1430. The addition of this figure required changing the numbering of all subsequent figures.	April 23, 2024	To clarify intended fallowing schedule.
2.2 Infrastructure	Added equipment and infrastructure acquired since 2019.	September 9, 2020; July 20, 2023; February 26, 2024, April 23, 2024	To demonstrate investment in major capital acquisitions that will support the technical capability and business outcomes for the farm's operations.
2.4 Employment	Updated text.	April 23, 2024	To reflect updated employment plans.
2.5 Other economic contribution to the local community and Province	Updated text.	April 23, 2024	To improve clarity and update expectations.
3.1 Status of fisheries activities	Updated recreational fishing season and species fished in the local area.	April 24, 2020 (Response to network comments for AQ 0814x)	To correct content according to NSDFA Inland Division's input regarding an application for the affiliated site AQ 0814x.
3.1 Status of fisheries activities	Added reference to latest CSAS for salmon in Salmon Fishing Area 19 and added reference to latest available information for LFA 28 (lobster). Neither updated reference changed the status of these fisheries.	April 23,2024	To recognize updated information was available on the status of the Atlantic salmon fishery and the lobster fishery in the local area.

Section (s)	Brief description of change	Date of submission requesting change	Reason for the modification
3.1 Status of fisheries activities.	Added description of Moderate Livelihood Fishery in the region.	April 23, 2024	To update potential fisheries activities in the area with the acknowledgement of the Moderate Livelihood Fishery.
3.2 Impacts on fisheries activities	Added expected impact on Moderate Livelihood Fishery.	April 23, 2024	To update potential fisheries activities in the area with the acknowledgement of the Moderate Livelihood Fishery.
3.2 Impacts on fisheries activities *(Mitigating Fisheries Impacts through Operational Procedures – Fish Escape)*	Updated FMP containment requirements and their application at WFN.	July 20, 2023; April 23, 2024	To advise of FMP containment requirements enhanced since the original development plan submission in 2019 and their application at WFN.
3.2 Impacts on fisheries activities *(Mitigating Fisheries Impacts through Operational Procedures – Fish Escape)*	Updated status of BAP certification.	July 20, 2023; April 23, 2024	To reflect current certification status.
3.2 Impacts on fisheries activities *(Mitigating Fisheries Impacts through Operational Procedures – Fish Escape)*	Added reference to trialing triploid stocks for their application at the farm and intention to use in the future, if these stocks thrive.	July 20, 2023	To describe an enhanced biological containment measure being trialed to mitigate risks associated with a fish escape.

Section (s)	Brief description of change	Date of submission requesting change	Reason for the modification
3.2 Impacts on fisheries activities *(Mitigating Fisheries Impacts through Operational Procedures – Fish Escape)*	Updated the technical capacity of WFN with a revised list of management personnel and description of recent investments in training of employees.	July 20, 2023	To reflect the current management team and enhanced technical capacity of WFN.
3.2 Impacts on fisheries activities *(Mitigating Fisheries Impacts through Operational Procedures – Disease and Biosecurity)*	Addition of description of WFN's application of the FMP and updates to operational procedures that address Disease and Biosecurity.	July 20, 2023	To describe improvements to procedures that mitigate Disease and Biosecurity risks.
3.2 Impacts on fisheries activities *(Mitigating Fisheries Impacts through Operational Procedures – Environmental Impacts)*	Added description of FINS modelling work (Proactive Environmental Impact Modelling).	July 20, 2023	To describe research efforts initiated after 2019 that target the development of a model intended to predict environmental impact below a finfish operation in order to assist with planning stocking levels for a site (FINS).
3.2 Impacts on fisheries activities *(Mitigating Fisheries Impacts through Operational Procedures – Environmental Impacts)*	Updated water column quality parameters monitoring requirements for BAP certification and the status of BAP certification.	April 23, 2024	To reflect current applicable BAP standard requirements and WFN's status regarding BAP certification.

Section (s)	Brief description of change	Date of submission requesting change	Reason for the modification
4.1 Oceanographic environment	Updated hyperlinks and values for wind speeds. Added reference to report entitled "Wind and Wave Conditions – Whycocomagh Bay – Marine Finfish Leases 0814x, 0814, 0600, 1431, 5010, 1430." (Appendix F).	April 23, 2024	Hyperlinks replaced to current references. Old links for wind speed no longer worked, so all information was updated to more recent listings and known available information.
4.3 Site design (*Anoxic water)*	Updated knowledge about the thermocline and oxycline.	April 23, 2024	To ensure information in the plan is current with research and monitoring outcomes.
4.3 Site design (*Ice cover)*	Slight rewording. No change to procedure.	April 23, 2024	To better clarify that cages are moved from exposed areas to protected areas in the winter to avoid moving ice.
4.3 Site design (*Infrastructure for the site*)	Updated cage size and grid design.	September 9, 2020; with additional revisions April 23, 2024	To ensure information in the plan is current with intended infrastructure plans that have evolved from work at experimental sites in the area as well as engagement with engineers.
6.1 Navigation Protection Act Approval	Updated submission to Transport Canada of drawings of gear on site. Note that there were no changes to site boundaries requested for this site (AQ 1430). See also Appendix G.	April 23, 2024	To reflect change in infrastructure required for production plan modifications described in Section 2.1 and 4.3.
7.1 Identification of local salmon populations	Added a reference to the latest CSAS (2020). There was no change to the information regarding local salmon.	April 23,2024	To recognize updated information on the status of Atlantic salmon in the local area.
8.1 Identification of other aquaculture sites	Updated listing of other aquaculture sites in the area.	April 23, 2024	To clarify and update the current status of nearby aquaculture sites.

Section (s)	Brief description of change	Date of submission requesting change	Reason for the modification
8.2 Interactions with other aquaculture operations	Added information regarding how the three commercial finfish sites intended for the area will work together to provide the production level required for financial sustainability.	February 26, 2024	To reflect production plan modifications described in Section 2.1 and to clarify the fallowing period for rotating between cage arrays on the sites as well as complete lease fallowing.
Appendix B	Updated Appendix B (BAP Farm Standard).	April 23,2024	Updated to current applicable BAP standard (BAP Farm Standard Issue Number 3.1).
Appendix C	Updated Appendix C (Resumes of Senior Personnel)	July 20, 2023	Updated to reflect current management team.
Appendix D	Updated Appendix D with addition of a citation for a Master of Science thesis.	April 23, 2024	To provide a reference to outcomes of modelling research work completed since 2019.
Appendix F	Added a new Appendix: “Wind and Wave Conditions – Whycocomagh Bay – Marine Finfish Leases 0814x, 0814, 0600, 1431, 5010, 1430”.	April 23, 2024	To provide updated information regarding wind and wave conditions relevant for site design.
Appendix G	Added CNWA Notice of Works application as Appendix G.	April 23, 2024	To ensure current site design information is included as part of the Development Plan.

SECTION 1: THE OPTIMUM USE OF MARINE RESOURCES

WFN Fish Farm Limited Partnership (WFN) is requesting a new marine finfish lease in the Bras D'Or Lake in Inverness County, NS: AQ 1430. This proposed site is within the Option to Lease # 1413 and is located on the northeast side of Whycocomagh Bay near Aberdeen. This lease application is one part of WFN's larger plan to achieve a trout aquaculture production level that promotes financial viability while ensuring social and environmental sustainability. WFN has been successfully conducting rainbow trout aquaculture in this region for several years, first as a contract grower, and for the past nine years as the business owner. The proposed site is 35 hectares in size and expected to support the grow-out of 940 tons of rainbow trout annually.

AQ 1430 will share employment with two other proposed commercial finfish aquaculture sites in Whycocomagh Bay (AQ 1431 and AQ 0814x), while supporting the continuity of WFN's finfish operations as a whole by optimizing use of its local infrastructure, including a processing plant, a land-based storage facility, a land-based hatchery, management offices and farm management software. WFN is expected to directly employ 67 people with all proposed sites in operation. It will also promote the installation of new infrastructure and investment in new equipment - not only for the finfish cage operation, but also for WFN's processing plant and hatchery.

An examination of the habitat below the proposed site, published studies from the area and knowledge collected during scoping for the proposed activities suggest that this development can proceed in harmony with fishery activities in the public waters surrounding the proposed aquacultural operation. Management measures will be in place to mitigate the most significant risks of finfish aquaculture to the environment, these being fish escape, disease and biosecurity, and benthic environmental impacts. These measures are supplemented by partnering on research projects aimed to model impacts of different production levels and determine suitable environmental monitoring of WFN's finfish aquaculture activities.

The oceanographic and biophysical characteristics of the public waters surrounding the aquaculture operation were reviewed. This included data collected within the scoping activities, published studies, as well as the local knowledge and extensive experience of researchers, employees and contractors of the company. This information supports the feasibility of a finfish aquaculture operation at the proposed site and provides the best knowledge to inform a site design. This knowledge has been used to develop the infrastructure, procedures and production plans for the site.

Consideration and respect for the other users of the public waters surrounding the site will be demonstrated by WFN's responsible farm practices which include high standards for site maintenance, noise reduction, and waste management. It is the intent of WFN that other users of the waters see the finfish aquaculture site as an opportunity for the region rather than a negative development. Risks to wildlife users of the region will be mitigated via the management measures intended to reduce risk of fish escape, disease and biosecurity, and benthic environmental impacts. These will be further supplemented with a wildlife interaction plan that recognizes the most susceptible wildlife of the region.

A Notice of Works application accompanies this development plan. Outcomes from Transport Canada's assessment will be applied to ensure the public right of navigation through compliance with the Canadian Navigable Waters Act (CNWA).

The region is one of a handful of regions in Nova Scotia where Atlantic salmon populations still exist. It is also the region that has experienced the longest history of net pen rainbow trout aquaculture. The mitigation measures intended to reduce risk of fish escape, disease and biosecurity, and benthic environmental impacts; and the forward-looking environmental monitoring research WFN is partnering on can assist in the continued successful coexistence of wild Atlantic salmon with WFN's rainbow trout operations. Furthermore, there is environmental and oceanographic data collection in the bay being conducted by other researchers that is supported by WFN which is intended to improve understanding of the local ecosystem as a whole, as well as more broadly with regards to global warming. Although there is no direct intent to use this data to support Atlantic salmon conservation measures, an increased understanding of the environment may contribute to conservation practices in general.

With regards to the number and productivity of other aquaculture sites in the public waters surrounding the proposed aquacultural operation, WFN is currently the only finfish aquaculture producer in Whycocomagh Bay and will manage its sites as a collective in order to ensure that fish health risks and environmental impacts are minimized. Having an increased number of commercial sites will allow financial viability of the steelhead farm while availing enough area to increase fallowing.

This site is one request of three that will enable sustainable operation of WFN's finfish aquaculture operations. Activities will contribute to economic development of We'koqma'q First Nation and the local region in general. Site location considerations and mitigation practices will reduce impacts to other users of the local waters, including the fishery, wildlife (including Atlantic salmon), local residents, and seasonal visitors. This includes the public right to navigation. Ongoing environmental monitoring along with the support of local research efforts should ensure that these practices are effective now, and in the future.

As summarized above and detailed in this development plan, this proposed commercial finfish aquaculture lease should have minimal negative impacts on the factors to be considered in decisions related to marine aquaculture sites; but there are significant positive impacts. Therefore, this request should represent an optimum use of marine resources.

SECTION 2: THE CONTRIBUTION OF THE PROPOSED OPERATION TO COMMUNITY AND PROVINCIAL ECONOMIC DEVELOPMENT

2.1 Production plan

Species: Rainbow trout, *Oncorhynchus mykiss* (called "steelhead" when grown in salt water).

Strain or potential strain: The rainbow trout will be all-female from either or both of two egg sources:

1. Trout Lodge: "Silver Steelhead" or "Winter and Fall Strain" (Now referred to collectively as "Steelhead".)[2]
2. Riverence: "Steelhead Trout" which were developed from the "Donaldson strain"

Triploid stocks: For the past several years, WFN has been trialing the use of triploid rainbow trout stocks. At this time, the triploid fish are showing similar performance as diploid, but it is still early in the evaluation process. In 2024, only triploid fish will be stocked. Provided triploid stocks continue to perform well, WFN intends to use triploid fish in the future.

Maximum site biomass (kg): 940,000kg, according to environmental monitoring results and modelling.

Maximum cage density during grow-out period (kg/m^3): 20 kg/m^3

Expected time to achieve maximum production: Minimum of 9 months from stocking

Size(s) of cages, including net volumes (m^3): 100-m (circumference) polar circle; 8 m depth; 6,350m^3 per cage

Maximum stocked cage number, maximum total stocked net volume (m^3): 1 active array of 10 cages = 63,500m^3

Maximum number of fish per cage during grow out period: Current plans are for up to 56,000 per cage at harvest size. The numbers initially stocked per cage will be informed from fish performance and environmental monitoring results.

Intended initial stocking date and seed source: April 2025, Big Falls Hatchery (AQ 1028) and over-wintering stock held at Lease AQ # 0814x in Whycocomagh Bay, south of We'koqma'q Reserve.

Expected grow out period: As early as April start, as late as December end, according to ice conditions.

Expected fallow period: The lease has been sized to allow the placement of two arrays of 2X5 100-m (circumference) cages each. See Sections 6.1 and 8.2. The plan is to rotate the array used on an annual basis to enable fallowing of an array for 15 months. The entire site will be fallowed for at least 3 months each year.[3] This fallowing plan is depicted in the Gantt chart below (Figure 1), where

[2] https://www.troutlodge.com/en/trout-genetics/trout-eggs/ Accessed March 31, 2024

[3] In the past, this site (AQ 1430) has been exposed to moving ice in the spring. As long as this occurs, cages will not be left here over the winter and this production area will be used in the ice-free period, from April to December, only. For the winter months (January to March), cages will be pulled into a sheltered area that is part of the AQ 0814x lease, requested in an affiliated application.

months with fish on each array are shown in pink; months with no fish on each array are shown in black.

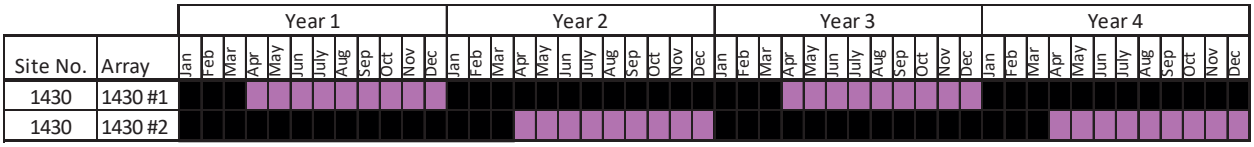


Figure 1: Gantt chart showing timing of fish stocking on each of two arrays at AQ 1430. Months with fish on each array are shown in pink; months with no fish on each array are shown in black.

Additional notes: As previously stated, this site represents one site of three new or amended leases planned for WFN's finfish aquaculture operations. Use of all sites, as described in the development plans, is required to enable WFN to reach financial viability. A summary of the overall expected plans for sites can be found in Section 8.2.

2.2 Infrastructure

This site is to be serviced by WFN's facilities in and around Whycocomagh and Aberdeen. These services include the land-based facilities for holding and managing nets and feed in Whycocomagh; barges, boats and vehicles based in Whycocomagh; management offices at the We'koqma'q Fisheries and Band offices, a FishTalk farm management database housed at the We'koqma'q Fisheries office; and other supporting infrastructure and services. Additional investments in infrastructure and equipment for the fish farm that have occurred since the application was originally made in 2019 include:

- a winter harvest system and oxygenation system for the over-wintering location;
- two new engineered grids;
- more robust containment equipment: 400 mm SDR 17 Polar Cirkel cages of 100 m diameter, certified to the Norwegian NS 9415 Standard[4]; as well as STAR knotless containment nets of polyolefin fibres[5] - designed to withstand frequent net cleaning;
- a built-for-purpose harvest boat;
- a passive grading system;
- two remotely operated net cleaners;
- two state-of-the-art feeding barges that enable pan-camera viewing and remote feeding of fish.

Additional new nets, a Lift Up mort retrieval system; an improved net cleaner; an oxygen monitoring, production and delivery system; and modifications to existing vessels are planned for 2024. Pending this application, a new work barge as well as new grid systems are intended for 2025 or 2026. WFN's business plan projects additional significant capital investments at the farm over the next several years.

[4] https://www.akvagroup.com/plastic-pens/ Accessed March 31, 2024
[5] https://www.garwarefibres.com/products/smolt-grow-out-cages/star Accessed March 31,2024

WFN owns and operates the processing facility that handles their fish. This facility acquired BAP certification in 2021. Since the original site development plans were submitted in 2019, the processing facility has undergone a 2000 sq ft expansion; the roof to the pre-existing section of the building has been replaced; external storage facilities, including cold storage have been added; and a state-of- the art Baader 581 fillet machine has been installed and commissioned. Most recently, the processing facility purchased a vacuum system to add to the pin-boning machine. In 2024, a new raw material weighing system that will give enhanced yield capability will be added, along with a slurry ice system, and new heading and gutting machines.

Just previous to the original application submission, WFN acquired Big Falls Fish Growers in Wolfville, NS, in order to have full control over juvenile production for the aquaculture operations. The hatchery facility has since acquired: bulk oxygen storage; two boiler units for improved hatchery water temperature control; a tractor for farm operations; and is in its second phase of significant water treatment and distribution upgrades for conversion to a water re-use system. The primary focus of these upgrades is to enable the production of a larger fish for distribution to the lake sites and thereby reduce the time required in the net pens.

WFN has the facilities and infrastructure for egg to plate production of high-quality steelhead trout. It is focused on optimizing its business. It has made, and plans to continue to make, significant investments in infrastructure to do so.

2.3 Services and suppliers

Local (NS) service requirements in terms of contractors (welders, carpenters, others) and suppliers of general merchandise will be necessary to support the finfish operations. The scale of these requirements will be reflected by the scale of the operations. Processing will occur at WFN's facility in Aberdeen, NS, upgraded as described above. Juveniles will come from the improved Big Falls Hatchery in Wolfville, NS, described above. Feed will be purchased from outside of the province (Skretting in NB) because of the requirement that the feed mill be BAP certified in order to assist WFN's goal of achieving four-star BAP certification. Eggs will be purchased from an international supplier since there is no local supply. (The development of a local broodstock is under investigation and achieving a critical production mass will be imperative for its success.)

2.4 Employment

AQ 1430 will share employment with two other proposed farming sites (AQ 1431 and AQ 0814x), directly requiring 28 positions. These direct employees include a Director of Farming Operations, Farm Manager, Security team, Records Technician, Fish Welfare Lead, Technical Maintenance team, Harvesting & Logistics team, Feed team, Dive and Underwater Maintenance team, and Operations team. Each of the three proposed marine sites are vital to ensuring the security of employment of the rest of WFN since it will optimize the use of the processing facility in Aberdeen, NS (28 employees)

and the hatchery in Wolfville, NS (7FT + 4 seasonal employees). In total, WFN's fish farming activities will directly support 67 employees[6].

2.5 Other economic contributions to the local community and Province

Spin off economic benefits to the local communities would be expected to occur as well. A 2019 report on the economic impact of aquaculture in Nova Scotia indicated that 1.55 indirect jobs result from every person directly employed at an aquaculture operation (Foster, 2019). That suggests that an additional 104 indirect jobs depend on the success of this and the other two commercial finfish lease applications. Combining the 67 jobs that are directly tied to WFN and the estimated indirect jobs (104), this represents a total impact of 171 jobs, mostly in rural Nova Scotia.

2.6 Financial viability

WFN's business development plan has been submitted as a separate document.

2.7 Adverse economic impacts

There are no adverse economic impacts expected from fulfillment of this request.

[6] The potential economic benefits to the area were brought up during scoping. See page 5 of Report on Public Engagement During Scoping.

SECTON 3: FISHERIES ACTIVITIES IN THE PUBLIC WATERS SURROUNDING THE PROPOSED AQUACULTURAL OPERATION

3.1 Status of fisheries activities

Recreational fishery

Trout

(Reference: https://novascotia.ca/fish/documents/Anglers-Handbook-2018.pdf and feedback from NSDFA Inland Fisheries)
The proposed aquaculture site is located in NS Recreational Fishing Area 1: Cape Breton, Inverness, Richmond and Victoria Counties, specifically within the Bras D'Or Lake. Here the speckled (brook) trout recreational fishing season is open in the tidal waters of the Bras D'Or Lake, including Whycocomagh Bay in which the proposed site is located, from April 1 to September 30, with some restrictions. The recreational fishing season for brown trout and rainbow trout is year-round. Skye River which feeds into the subwatershed of Whycocomagh Bay of the Bras D'Or approximately 9 km away from the proposed site is open for the same period. Other major recreational fishing rivers in the area feed into different subwatersheds. These include River Denys which feeds into the Denys Basin, and Middle River and Baddeck River which feed into the St. Patricks Channel. River Denys, Middle and Baddeck Rivers are Special Trout Management Areas with minimum size and bag limits. For further reference, the locations of these rivers are shown on a map in Section 7.1 (Figure 12).

A resident population of rainbow trout exists in the Bras D'Or Lake area. This is enhanced every year by the release of juveniles reared in provincial hatcheries to support the above-described rainbow trout sport fishery.

Non-salmonid species

(Reference: https://novascotia.ca/fish/documents/Anglers-Handbook-2018.pdf and feedback from NSDFA Inland Fisheries)
Recreational fishing for the following species is also conducted in the Bras D'Or Lake: white perch, yellow perch, brown bullhead, white sucker, chain pickerel, lake whitefish, striped bass, shad, gaspereau, smelt, and eel.

Atlantic salmon

(Reference: CSAS Science Response 2017/20, 2020/031)
The proposed site is located within Salmon Fishing Area 19. There is no recreational salmon fishing permitted in Whycocomagh Bay, where the proposed site is located. The Middle and Baddeck Rivers, which feed into the Bras D'Or to an adjacent subwatershed (St. Patricks Channel), have an open catch and release fall season for Atlantic salmon. Social and Ceremonial (FSC) allocations are also available on these rivers. For more discussion on this site and these rivers relative to the salmon populations, see Section 7.

Commercial Fishery

Historically, the Bras D'Or Lake has supported some limited fisheries activities. The bottom trawl fishery was banned in the Bras D'Or Lake in 1992. The local herring fishery closed in 1999. This left only lobster and oyster fishing.

Lobster

In 2016, there were 14 licences for commercial lobster fishing in the Bras D'Or Lake (Lobster Fishing Area (LFA) 28), with a trap limit of 250 and a minimum legal-size limit of 84mm. The season runs annually from April 30 to June 30 (DFO, 2017). This was unchanged, as of 2022 (DFO, 2022).

Historical landings from LFA 28 are shown in Figure 2.

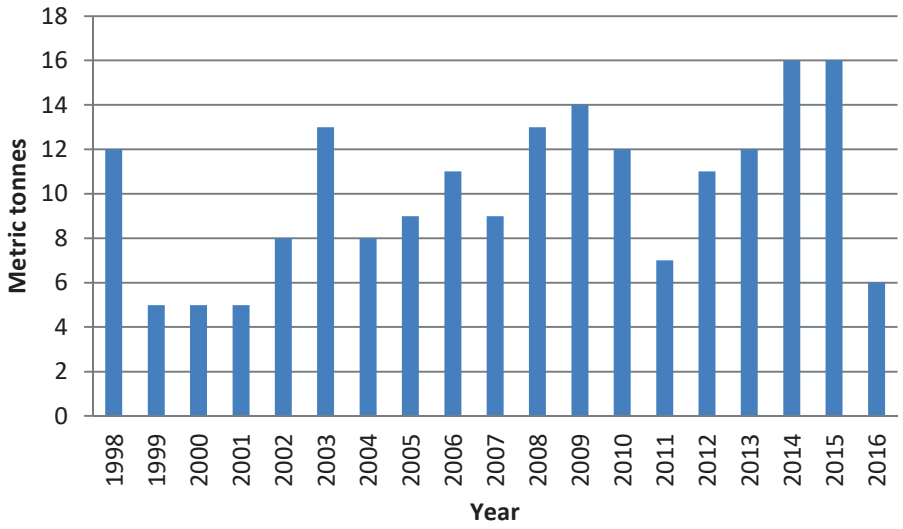


Figure 2: Historical lobster landings from LFA 28 (the Bras D'Or Lake). Graph generated from 2017 Stock Status Update (DFO, 2017). Landings for LFA 28 are no longer shared for confidentiality reasons due to the low number of LFA 28 licence holders. (DFO, 2022)

The lobster industry in LFA 28 is small relative to that of Nova Scotia in general. The mean landings for 2013-2015 for LFA 28 represent 0.8% of the mean landings for Nova Scotia for the same period, as calculated from data within the 2017 Stock Status Update (DFO, 2017).

Oyster

Oysters were an important harvest for local Mi'kmaq and, likely, non-native settlers of the Bras D'Or Lake region (Tremblay et al., 2002). Traditional knowledge of the area indicates that oyster populations were all along the north, west, and south west coasts of Whycocomagh Bay at one time (Eskasoni Fish and Wildlife Commission and Dept. of Fisheries and Oceans. 1996, cited not seen). However, populations declined due to over-fishing, degradation of habitats and the appearance of the MSX parasite (*Haplosporidium nelsonii)* in 2002 (Stephenson et al., 2003).

Traditional Mi'kmaw Fishery

We'koqma'q First Nation has traditionally fished in Whycocomagh Bay for a number of species including cod, hake, smelts, trout (speckled and brown), herring, mackerel, gaspereau, cod, eels, flounder, lobster, softshell clams, mussels and oysters. Currently smelts, trout (speckled, brown and rainbow), eels, winter flounder, striped bass, softshell clams, mussels and oysters are fished (Joe Googoo, We'koqma'q Elder, personal communication).

Moderate Livelihood Fishery

There is some moderate livelihood fishing expected in the main Bras d'Or Lake for lobster. No moderate livelihood fishing is anticipated for Whycocomagh Bay, the body of water for this requested site (Bobby Gould, Fishery Manager at We'koqma'q First Nation, personal communication).

3.2 Impacts on fisheries activities

Recreational

Trout

Although rainbow trout are not indigenous to the Bras d'Or Lake area, it has a resident population that has developed from stocking efforts for the sport fishery, with the first trout introduced in 1899. These introduced fish have been shown to be successfully reproducing in some regions in the wild and are contributing to the fishery numbers (Madden et al., 2010). Rainbow trout continue to be stocked by the province through an enhancement program. Other trout populations do not seem to be affected by this enhancement, as exemplified by the fact that speckled trout populations are thought to be recovering in the Whycocomagh area (CEPI, 2006; Joe Googoo, We'koqma'q Elder, personal communication).

Rainbow trout aquaculture operations have been operating in Whycocomagh Bay for several decades and issues regarding the trout fishery have not been raised. Anglers of the area have historically been supportive of the trout operations. Robin Stuart, a previous manager of the fish farm, was approached to collaborate with anglers to increase rainbow trout populations in the lake[7].

WFN will conduct their operations under strict containment management procedures, disease and biosecurity procedures and environmental monitoring procedures as described below under "Mitigating Fisheries Impacts through Operational Procedures".

The successful historical co-existence of the recreational trout fishery with trout aquaculture operations combined with WFN's intended enhanced management procedures suggest that there will be minimal impacts on the recreational trout fishery.

[7] See page 6 of Report on Public Engagement During Scoping.

Non-salmonid species

As stated for the recreational trout fishery, rainbow trout aquaculture operations have been operating in Whycocomagh Bay for decades and issues regarding the sport fishery have not been raised. As also stated previously, WFN will conduct their operations under strict containment management procedures, disease and biosecurity procedures, and environmental monitoring procedures as described below under "Mitigating Fisheries Impacts through Operational Procedures".

Because of the successful historical co-existence of rainbow trout aquaculture operations with the sport fishery and the enhanced fishery risk mitigation efforts, there are no impacts on recreational fisheries activities anticipated for any species.

Atlantic salmon

Interactions with Atlantic salmon are described in Section 7 of the Development Plan.

Commercial Fishery

Lobster

Although lobsters were in Whycocomagh Bay in the mid 60's they have disappeared from the Bay since that time (Joe Googoo, We'koqma'q Elder, personal communication). Traditional knowledge collected in 1996 (Eskasoni Fish and Wildlife Commission and Dept. of Fisheries and Oceans. 1996, cited not seen) and trawl surveys from 1999 indicate no lobster inhabit Whycocomagh Bay (Tremblay et al., 2002). This proposed finfish aquaculture site will, therefore, likely not impact the commercial lobster fishery.

Oyster

Some populations of oysters remain in the lake today, including in Whycocomagh Bay; and initiatives are underway to understand why these populations survive. This knowledge will be used to develop stocks or culture practices that allow rejuvenation of the oyster populations (Vercaemer et al., 2010; Robin Stuart, personal communication). We'koqma'q First Nation is part of these efforts, have a vested interest in the rejuvenation of the oyster populations, and will continue to support developments along this line.

Traditional Mi'kmaw Fishery

As stated for the recreational fishery, rainbow trout aquaculture operations have been operating in Whycocomagh Bay for decades and issues regarding the traditional fishery have not been raised. As also stated previously, WFN will conduct their operations under strict containment management procedures, disease and biosecurity procedures, and environmental monitoring procedures as described below under "Mitigating Fisheries Impacts through Operational Procedures".

Because of the successful historical co-existence of rainbow trout aquaculture operations with the traditional fishery and the enhanced fishery risk mitigation efforts, there are no impacts on traditional

fisheries activities anticipated for any species. This aquaculture development will be managed in association with the other Mi'kmaw activities in the waters, including fishing. A single group manages both the fisheries and aquaculture portfolio of the Band and will ensure that they are complementary.

Moderate Livelihood Fishery

Because there is no moderate livelihood fishing expected in Whycocomagh Bay, the location for the proposed lease, there is no impact expected on this fishery.

General

It is notable that there were no fisheries concerns raised during the public scoping process conducted for this application.

Fish Habitat

In determining the potential for impact of an aquaculture site, the risks to fish habitat for the chosen site must be considered. WFN gathered information about the habitat beneath the proposed site and collated published descriptions of the area. This information is described below and is intended to assist with determination of fish habitat risks by DFO and others.

Habitat beneath the proposed site - summary of baseline monitoring

This summary is provided only to describe the habitat observed beneath the proposed site. Complete baseline monitoring results were submitted to DFO and NSDFA for their review as per Section 4.2.

Location Name	Coordinates	Benthic sediment description	Flora/Fauna description	Station Classification
Northside Aberdeen, Center Lease	Lat: 45.97832; Long: -61.02455	Brown/black mud; two samples spongy	holes in mud (bivalves or worms) bivalve shells; bivalves in one sample	Oxic A
Northside Aberdeen, Corner Lease 1	Lat: 45.97538; Long: -61.03527	Dark brown/black mud	n/a	Oxic A
Northside Aberdeen, Corner Lease 2	Lat: 45.97778; Long: -61.03096	Brown mud	n/a	Oxic A
Northside Aberdeen, Corner Lease 3	Lat: 45.97507; Long: -61.02795	Brown/black mud	holes in mud (bivalves or worms) bivalve shells; clam shells in one sample	Oxic A

Location Name	Coordinates	Benthic sediment description	Flora/Fauna description	Station Classification
Northside Aberdeen, Corner Lease 4	Lat: 45.97821; Long: -61.01829	Brown/black mud with rust specks	holes in mud (bivalves or worms); clam shells; mussel shells, dead eel grass; worm	Oxic A
Northside Aberdeen, Reference 1	Lat: 45.98206; Long: -61.01464	Sediment could not be retrieved according to required standard. Hard bottom video transect was completed in its stead with video taken every 10m. Video revealed a brown or brown/black sediment along entire transect consisting of layer of silt; hard packed sand; and cobble (only at 10m). Starfish were seen at each transect point, as were leaves, dead or loose eel grass.		
Northside Aberdeen, Reference 2	Lat: 45.97538; Long: -61.03527	Dark brown mud	n/a	Oxic A

Published descriptions of the benthos of Whycocomagh Bay

As extracted from Parker et al., 2007: "Whycocomagh Bay has two deep basins and a flushing time of approximately two years. This slow water exchange facilitates the unique anoxic and hypoxic character of the deep basins within the Bay (Petrie and Bugden 2002). The eastern basin in Whycocomagh Bay, immediately west of St. Patricks Channel, has DO levels as low as 38% at the bottom (38 m) (Strain and Yeats 2002). The 48 m deep western basin has only 47% saturation at 15 m depth, and is typically anoxic below 25 m (Krauel 1975), a characteristic that appears consistent over the year and over time (Strain and Yeats 2002). Black's (1958) observation of only a few organisms of two shallow water species of mysid shrimp in Whycocomagh Bay is a further indication that low dissolved oxygen levels have likely existed for some time in the deeper waters at this location." In the same review paper, a limited diversity of copepods was also noted for Whycocomagh Bay, with only the four most common copepod species typically being found.

Previous internal studies on the site area

Several years ago, baseline information on the benthos of this area was conducted. Although the environmental monitoring data did not meet the QA/QC guidelines of the Nova Scotia Department of Fisheries and Aquaculture, the information is still relevant. The internal report produced as a result of this study is attached as Appendix A. This study indicated that the benthic flora and fauna in the area of the site were limited in diversity.

Mitigating Fisheries Impacts through Operational Procedures

Three of the greatest perceived risks of finfish aquaculture operations to fisheries and fisheries' habitats are fish escape, disease, and impact on the benthos and water quality. WFN will institute operational procedures to mitigate these risks as described below.

Fish Escape

All of the WFN finfish aquaculture operations will follow the fish containment management requirements described in their Farm Management Plan (FMP) as defined by the Nova Scotia Aquaculture Management Regulations. This containment management plan includes:

- Described and approved operating procedures that limit the risk of a breach, including the identification of critical control points, critical control limits, monitoring and corrective actions. The controls are identified through conducting a site-specific hazard analysis.
- Described and approved procedures for site management if unusual events or severe weather occurs.
- Minimum infrastructure requirements, and minimum infrastructure maintenance and inspection requirements –including proof of a professional engineer's approval of the design of the structures in place for containment management.
- Described and approved responses to breaches or suspected breaches, including mandatory reporting.

The above plan will be approved for implementation by NSDFA and operators will be audited for adherence to the plan according to NSDFA's requirements.

FMP Containment Requirements Instituted after 2019

In addition to the minimum requirements that were in place for marine finfish operators at the time of the original lease application submission (2019) and described therein, the Containment Management Framework of the FMP was expanded and further clarified in 2021. A significant piece of this clarification was the requirement of "approved/certified engineering documentation pertaining to the integrity of the site's infrastructure. In essence, the site infrastructure design and construction must have been deemed as being satisfactory to reasonably withstand the prevailing oceanographic and meteorological conditions (e.g., weather, currents, ice flow, etc.) at the site's location to ensure the fish stay contained."

WFN has engineering approvals for its current experimental lease installations in North and South Aberdeen. In addition, WFN has been working with Gael Force[8] since March, 2023 to enhance modelling of mooring systems at the new lease sites to detect the weakest points and target these areas for reinforcement. This work is ongoing (April 2024). These models for the new proposed lease sites will be submitted to NSDFA, once completed and will add an additional layer of diligence regarding the integrity of the infrastructure regarding fish containment. It is notable that WFN's infrastructure has been updated with more robust equipment, and procedures have been updated as a result of the FMP requirements, with enhanced quality control checks and increased training.

[8] https://www.gaelforcegroup.com/ Accessed March 31,2024

The containment structures have withstood the strain of Hurricane Fiona and other major wind and weather events with no issues for the past several years.

FMP Status at WFN

The FMP was still relatively new to the industry in 2019, when the original applications were submitted. Since that time, WFN has used the FMP as a foundation for establishment of best practices. The execution of these best practices is facilitated by increased personnel capacity described in a later section. Additionally, the implementation of the FMP has been enhanced by the creation of a new position of Records Technician, to better enable the tracking of records and to increase assurances that standard procedures are followed.

BAP Certification

WFN's finfish operation is working to become certified to the Global Aquaculture Alliance's Best Aquaculture Practices (BAP). This science-based and continuously-improved global performance standard is third party audited and assures "healthful foods produced through environmentally and socially responsible means". The BAP standard requires the application of a written "Containment Plan" to prevent fish escape. This would be above and beyond the FMP containment requirements described above and it would be third party audited. The relevant BAP Farm Standard (Issue 3.1) is attached as Appendix B. Since 2021, WFN has successfully had its processing plant certified to the BAP seafood processing standard and continues the groundwork required for certification of the hatchery and marine farm.

Use of Triploid Stocks

As mentioned in Section 2.1, for the past several years, WFN has trialed the use of triploid rainbow trout stocks. Providing the triploid fish are able to thrive at the marine farm, WFN intends to use triploid fish in the future since such stocks are sterile. This is a mitigation measure to reduce risks associated with a fish escape. Effectively, if an escape event were to occur, reproduction of the escaped triploid could not occur.

Technical Capacity

Finally, the regulatory and certification minimum requirements will be enhanced with the extensive practical knowledge and experience of the managers responsible for WFN's finfish aquaculture operations. Resumes for senior management are attached as Appendix C.

A brief synopsis of their most relevant qualifications and experience follows:

- Manager of Aquaculture Operations: Wade Skinner – more than 15 years of fish farm experience, at a variety of locations and from a range of perspectives, from operations to infrastructure.
- Farm Manager: Anthony Phillips – four years of operational experience at WFN, significant leadership experience within the community.
- Hatchery Manager: Trissa Dunham – a decade of salmonid hatchery experience, formally trained as a biologist (BSc)

- Processing Plant Manager: Wayne Fowlie – decades of seafood processing experience, aquaculture experience, formally trained as a biologist/biochemist (BSc)
- VP Sales: Steve French – more than thirty years of seafood sales experience, formal business training (BBA)

This group meets frequently to discuss and coordinate production planning from egg to plate. They are a solid leadership team with extensive experience in aquaculture and related industries.

Additionally, since the original applications were submitted, personnel capacity at the farm has been greatly enhanced, both in terms of acquiring new people, as well as in terms of training retained persons.

Recent training programs delivered to employees which are incremental to mandated safety and operations requirements are listed below:

- NSCC Aquaculture Operations Certificate (2023) - 4 persons
- FishTalk Farm Management software (2023) – 1 person
- Occupational SCUBA Diver Certification (2021) – 5 persons
- Operational Training (2021, 2022) – 4 persons
- Road to BAP Certification Training (2019, 2020) – 36 persons

Disease and Biosecurity

All of WFN's finfish aquaculture operations will follow the fish health requirements within their Farm Management Plan as defined by the Nova Scotia Aquaculture Management Regulations. These requirements include:

- Described and approved finfish husbandry and welfare, veterinary care and disease surveillance practices. These practices include following the NSDFA marine finfish disease surveillance program and adhering to the multi-governmental agency (NSDFA, DFO, CFIA) Introductions and Transfers disease screening and permitting requirements.
- Described and approved biosecurity measures appropriate to the operation and its risk.
- Prescribed mortality and disease reporting requirements.
- Prescribed reporting of antibiotic and products used to treat sea lice.
- Described and approved procedures and measures to be followed in the case of a disease outbreak.

The above elements will be approved for implementation by NSDFA and operators will be audited for adherence to the plan according to NSDFA's requirements.

FMP Status at WFN

As stated previously for Fish Escape mitigation, the FMP was still relatively new to the industry in 2019, when the original applications were submitted. Since that time, WFN has used the FMP as a foundation for establishment of best practices. The execution of these best practices is facilitated by increased personnel capacity described in an earlier section.

Disease and Welfare-Specific Updates to Procedures

In addition to the fish health aspects within the FMP that were described in the original applications, WFN has implemented elements to increase fish welfare, and subsequently reduce fish health and disease risks, including the following:

- Stocking with a larger juvenile to reduce time at sea and ensure a stronger, more resilient fish at sea pen entry.
- Use of passive grading, when applicable, prior to harvest, to reduce unnecessary fish handling and facilitate the reduction of densities.
- In-house, five-member crew of certified occupational SCUBA divers for inspecting fish and retrieving mortalities in a timely manner.
- Increased use of underwater cameras for observing fish.
- Creation of Records Technician position to encourage timely inspections, water quality monitoring, and procedures with appropriate recording.
- Creation of Fish Welfare position to execute required monitoring and oversight of fish handling activities.

BAP Certification

As stated previously, WFN is working to become certified to the Global Aquaculture Alliance's Best Aquaculture Practices. This certification includes sections addressing minimum animal health and welfare and biosecurity requirements. These requirements would be above and beyond the FMP fish health requirements and require third party auditing. The relevant BAP Farm Standard (Issue 3.1) is attached as Appendix B. Since 2019, WFN has successfully had its processing plant certified to the BAP seafood processing standard and continues the groundwork required for certification of the hatchery and marine farm.

Unique Biophysical Conditions in the Bras D'Or

An additional relevant aspect regarding disease relates to the unique low salinity waters of Whycocomagh Bay, the region of the proposed site. Salinity measurements of 17-18 ppt are recorded at the surface and approximately 20 ppt within a few meters. This has a number of fish health advantages that mitigate disease risk. Sea lice, which are ectoparasites of salmonids that may transfer between cultured and wild fish populations, and are often a great concern for salmonid fisheries enthusiasts, do not thrive in lower salinity waters (R. Wooten and C. Sommerville, personal communication). Bricknell, et al., 2006 demonstrated that sea lice (*Lepeoptheirus salmonis*) actively avoid low salinities (<27ppt) and even short-term exposure to low salinity water (<27ppt) severely compromised sea lice survival and host infectivity. Low salinity waters are also known to reduce the risk of amoebic gill disease (AGD) (Mitchell & Rodger, 2011), another disease of concern for salmonid culturalists. Finally, the low salinity water reduces osmotic transfer stress from the hatchery, thereby reducing fish health and welfare risks.

Environmental Impacts

All of WFN's finfish's aquaculture operations will follow the Environmental Monitoring Program requirements dictated by NSDFA as required by the Aquaculture Management Regulations, as well

as the environmental monitoring requirements required by DFO according to the Aquaculture Activities Regulations (AARs). These monitoring requirements focus primarily on potential impacts on the surrounding marine benthic environment, a primary concern regarding marine finfish aquaculture sites. They apply a risk-based approach to determine monitoring requirements. Monitoring requirements for marine finfish sites include:

- A site-specific benthic sampling and monitoring regime customized according to production level, site configuration, species cultured, past environmental performance of the site, and site specific oceanographic and biophysical characteristics. This must be pre-approved by NSDFA prior to the monitoring.
- Provincial and Federal review and approval of records of observations taken during monitoring and of the monitoring conducted, including Quality Assurance and Quality Control records that demonstrate adherence to procedures and protocols defined by NSDFA in their EMP Standard Operating Procedures (SOPs) and DFO within the AARs.
- Provincial and Federal review and approval of records of lab results, including Quality Assurance and Quality Control records that demonstrate adherence to procedures and protocols defined by NSDFA in their EMP Standard Operating Procedures (SOPs) and DFO within the AARs.
- Reporting of the results to NSDFA and DFO within defined timelines.

The environmental program also requires the provision of a mitigation plan which is to be applied when poor environmental performance is indicated by the monitoring.

WFN contributes to the Environmental Monitoring Program's ongoing development through representation on the Nova Scotia Aquaculture Environmental Coordinating Committee. This committee, which is co-chaired by NSDFA and DFO, is a forum for industry and regulators to provide input and exchange ideas regarding the environmental monitoring program for marine sites in Nova Scotia.

Proactive Environmental Impact Modelling

In addition to mandated benthic sampling, WFN has participated in an enhanced environmental monitoring program at one of their experimental finfish aquaculture sites. This program collected environmental monitoring data to proof and hone a model (FINS) developed to predict sulfide levels below a finfish aquaculture operation. FINS uses a diagenesis[9] model (DIGENIX) that incorporates a hydrodynamic model (FVCOM) and depositional model (ORGANIX) to predict expected sulfide level outcomes based on stocking densities, feed rates, cage arrangements and hydrodynamics of the site. It is anticipated that such a model will help WFN to proactively minimize impacts on the benthos when planning future fish farming activities.

Additional Environmental Impact Reduction Procedures

Specific operational practices to reduce benthic impact are planned for WFN's commercial finfish aquaculture activities. Having more available lease area, as will be achieved in part with this new site, enable greater fallowing times of sections of the leases. This strategy will be combined with

[9] Diagenesis refers to the physical, chemical, and biological changes in sediments after deposition.

increased training of staff on the use of feeding cameras and feeding techniques to try to improve food conversion and reduce benthic impacts.

BAP Certification

As stated previously, WFN is working to become certified to the Global Aquaculture Alliance's Best Aquaculture Practices. This certification includes sections addressing minimum environmental monitoring requirements. These requirements would be above and beyond the FMP environmental monitoring requirements. For the WFN's finfish aquaculture sites in the Bras D'Or Lake, this environmental monitoring has to include monitoring the water column itself for quality parameters including total suspended solids, dissolved oxygen, chlorophyll a, total phosphorous, and phytoplankton. WFN has started this monitoring. The relevant BAP Farm Standard (Issue 3.1) is attached as Appendix B. Since 2021, WFN has successfully had its processing plant certified to the BAP seafood processing standard and continues the groundwork required for certification of the hatchery and marine farm.

Mitigating Fisheries Impacts through Research and Development

WFN is committed to monitoring and mitigating impacts of its finfish aquaculture activities on the environment, including fisheries and fisheries' habitat. In this regard, WFN has historically supported and will continue to support researchers as they assess and develop techniques to monitor impacts.

Efforts have included collaborating with Peter Cranford, of DFO Science, and NSDFA to evaluate alternative means for monitoring benthic environmental impacts. WFN has also supported research to complete a carrying capacity analysis for finfish aquaculture in Whycocomagh Bay. This study, led by Dr. Christopher Algar (Dept. of Oceanography, Dalhousie University), developed a model that captured carbon, oxygen, and sulfur dynamics in the sediments of Whycocomagh Bay, both with and without the influence of fish cages. The model was used to assess the impact of aquaculture on the Whycocomagh Bay benthic ecosystem and investigate how changes in fish-rearing practices, such as increased stocking levels, may affect these impacts. Additional information regarding this work can be found in Appendix D. WFN was a partner on this project, providing site access, logistics assistance, personnel, historical environmental monitoring data and production data.

SECTION 4: OCEANOGRAPHIC AND BIOPHYSICAL CHARACTERISTICS OF THE PUBLIC WATERS

4.1 Oceanographic environment

The proposed site is in Whycocomagh Bay of the Bras D'Or Lake - referred to as "Bras D'Or Lakes" by some. The following excerpt from Lambert, 2002, gives excellent background information on the unique oceanographic environment of the Bras D'Or Lake:

"The Bras d'Or Lakes are situated in Cape Breton Island at the northern end of Nova Scotia. This body of water of about 1,100 km^2 is essentially an enclosed estuary with three outlets to the sea. The Great Bras d'Or Channel and the Little Bras d'Or Channel connect with Sydney Bight to the north, and St. Peter's Canal gives access to Chedabucto Bay to the south. Only the Great Bras d'Or Channel is large enough to permit any significant exchange of water. The Bras d'Or Lakes watershed is about 2500 km^2; this area added to that of the Lakes themselves gives a total catchment area of 3600 km^2 (Krauel, 1976).

Input from six rivers and restricted access to the ocean keeps salinity in the range of 20 to 26, whereas, sea water just outside the Lakes in Sydney Bight ranges from about 28 to 32. The Lakes are usually ice covered in the winter and surface waters often exceed 20°C in the late summer, particularly in smaller, shallow bays (Petrie and Bugden, 2002).

The waters of the Bras d'Or Lakes are characterised by a two-layer system; a low salinity surface layer which has a wide annual range in temperature and a lower layer of higher salinity in which temperature range is much less pronounced. In general, surface water moves toward the entrance of the Lakes and out into Sydney Bight and is replaced with outside oceanic water which enters the Lakes near the bottom and flows underneath the surface layer (Krauel, 1976; Petrie and Bugden, 2002). With the exception of restricted channels, there is little mixing between these layers except for winter months when higher winds and wave action disrupt the stability of this system. In some areas where currents and exchange rates are very low, the amount of dissolved oxygen can become quite depressed and in Whycocomagh Bay, anoxic (no oxygen) conditions exist (Petrie and Bugden, 2002; Strain and Yeats, 2002)."

The biophysical characteristics of the site environment are summarized in the table below with supporting figures and tables provided, as relevant.

Characteristic	Value	Reference	Comments
Wind speed (km/hr)	14.45 average, 98.2 max	Cape Breton Mesonet (Whycocomagh weather station)[10]	Derived from measurements taken from weather station in Whycocomagh Bay since November 2020.
Average wind speed (km/hr) (30m height)	20.5	Canada.ca Wind Atlas[11]	Value derived from wind atlas for GPS coordinate at center of lease.
Wind speed class rating (10m height)	Low to Moderate	Keys et al., 2017. Digital Wind Exposure Map for NS. Forest Research Report FOR 2017-15	Wind speed class rated from "Very Low" to "Very High" based on estimated annual maximum wind speeds across Nova Scotia. Value/rating stated is for shoreline adjacent to proposed site.
Maximum wave height (m)[12]	1.08	Raw data obtained from David Cook (NSDFA) from ACDP deployment.	Value stated is the greatest Hmax measured with the ACDP during October 31, 2018 to December 11, 2018 deployment.
Direction of maximum wave	244° (WSW)	Raw data obtained from David Cook (NSDFA) from ACDP deployment.	Direction stated is the direction of the maximum wave listed above.
Annual minimum tide (m)	The Bras D'Or Lake has very small lunar tidal fluctuations. Whycocomagh Bay, in particular, shows limited change. As extracted from Parker et al., 2007: "A 21-day record from the western end of Whycocomagh Basin indicated no detectable semidiurnal or diurnal tides (Dupont et al. 2003; Petrie 1999)." Results from an ADCP (Acoustic Doppler Current Profiler) deployed in the site region from October 2018 to December 2018 supports this observation with little measured change in depth. Local persons have observed an increasing tidal range in recent years, for example with exceptionally large tides of 0.5m observed in the fall of 2018 (personal communication, Robin Stuart).		
Annual maximum tide (m)			
Current speed range and averages (cm/sec)	See Figure 3 a,b,c,d and statistics summary table (Table 1) that follow.		

[10] https://capebretonweather.ca/archive.php?id=001D0A80898D Accessed April 1, 2024

[11] http://www.windatlas.ca/rose-en.php?field=EU&height=30&season=ANU&no=6&lakes=1&lat=45.978069&lon=-61.024739 Accessed April 1, 2024

[12] The oceanographic characteristics of this area were collected over the autumn months and early winter months of 2018 (October 31, 2018 to December 11, 2018) via deployment of an ADCP (Acoustic Doppler Current Profiler) within the proposed site's boundaries. This monitored a number of variables associated with currents and waves at multiple levels in the water column. Although only summaries are depicted within this plan, all of the data derived from this monitoring will be used in the engineering of the cage and infrastructure for this site.

Characteristic	Value	Reference	Comments
Annual minimum salinity (ppt)	Upper 10m: 15 ppt Below 10m: 17 ppt	Tremblay, 2002	Throughout the Bras d'Or Lakes salinities are lower in the 0-10 m depth interval than in the 10-50 m depth interval and in the upper metre of the Whycocomagh and Denys Basins maybe 5 after rainfall (Petrie, 2001). There is also a seasonal difference in salinity, with lower salinities in spring compared to summer. Tremblay, 2002). The salinities of the area are shown in Figure 4 which was adapted from figures within Tremblay, 2002
Annual maximum salinity (ppt)	Upper 10m: 25 ppt Below 10m: 27 ppt	Tremblay, 2002	
Annual minimum temperature (°C)	3°C	Raw data obtained from David Cook (NSDFA) from ACDP deployment.	Value stated is the lowest ADCP temperature measured during October 31, 2018 to December 11, 2018 probe deployment. See also summary temperature plot (Figure 5).
Annual maximum temperature (°C)	25°C	Raw data obtained from David Cook (NSDFA)	Value stated is the greatest "cage level" temperature measured during June 1, 2018 to August 19, 2018 probe deployment. See also summary plots (Figure 6).
Depth of water at each corner of the site (m)	Corner 1: 14.6m Corner 2: 26.6m Corner 3: 26.6m Corner 4: 26.4m Center Lease: 26.4m	Depths taken during baseline EMP sampling	

Since the original submission of the Development Plan, a report on the wind and wave conditions at the site was prepared for CMAR by DSA Engineering: Wind and Wave Conditions – Whycocomagh Bay – Marine Finfish Leases 0814x, 0814, 0600, 1431, 5010, 1430. This has been added as a new Appendix to this development plan (Appendix F).

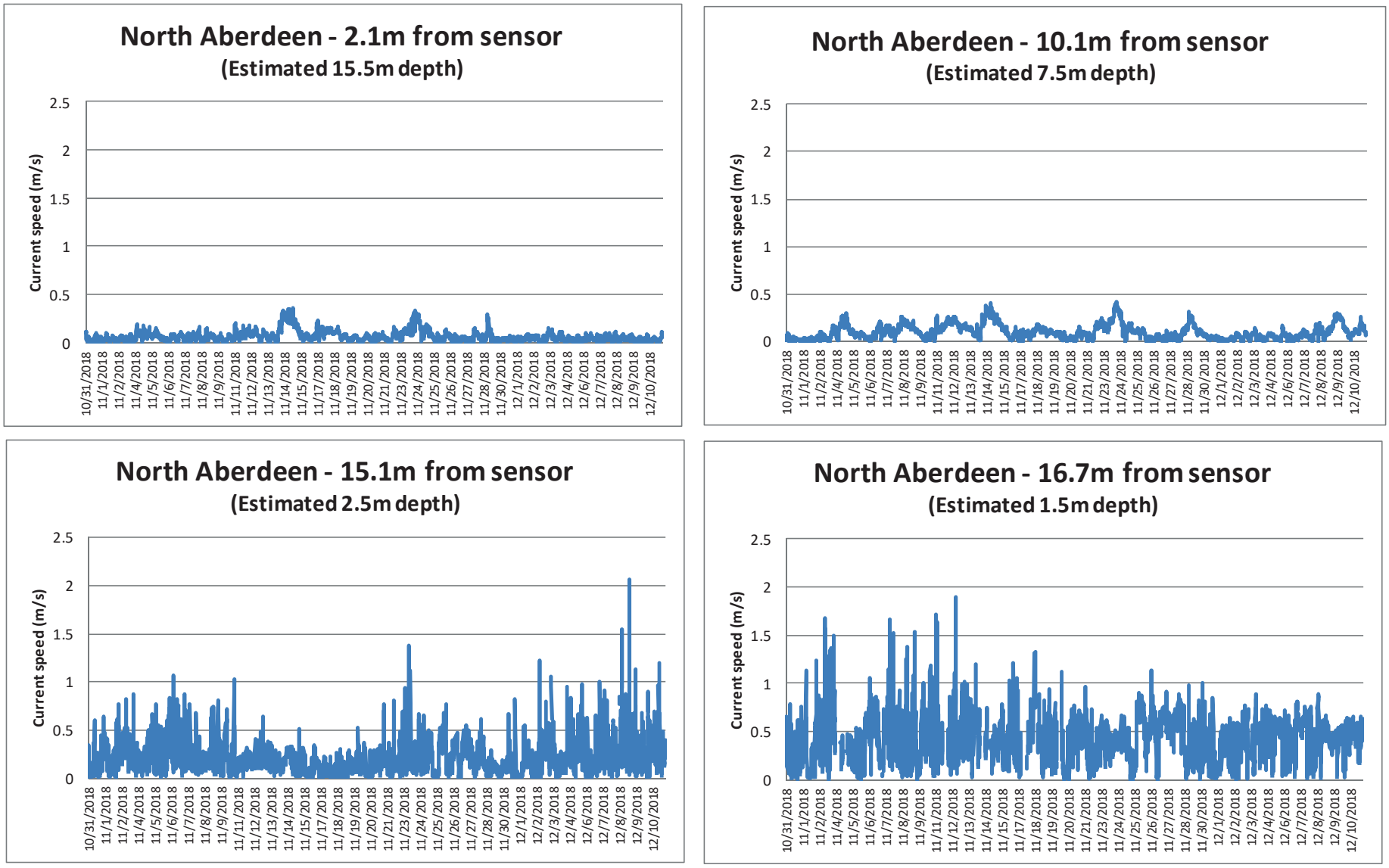


Figure 3 a,b,c,d: Current speeds measured in 2018 (October 31 to December 10, 2018). Raw data obtained from David Cook (NSDFA) from ADCP deployment. Estimated depths calculated from sensor deployment characteristics.

Table 1: Summary table of current speeds statistics determined from data derived from ADCP deployed October 31, 2018 to December 11, 2018. Raw data obtained from David Cook (NSDFA) from ADCP deployment.

Height from sensor (m)	2.1	3.1	4.1	5.1	6.1	7.1	8.1	9.1	10.1	11.1	12.1	13.1	14.1	15.1	16.1
Estimated mean depth (m)*	15.5	14.5	13.5	12.5	11.5	10.5	9.5	8.5	7.5	6.5	5.5	4.5	3.5	2.5	1.5
Min speed (m/s)	0.001	0	0.001	0	0	0.001	0	0.001	0.001	0	0.002	0.001	0.001	0.003	0.003
Max speed (m/s)	0.354	0.352	0.374	0.378	0.392	0.407	0.407	0.408	0.415	0.408	0.394	0.42	0.487	2.061	1.892
Mean speed (m/s)	0.0633	0.0765	0.0860	0.0918	0.0936	0.0943	0.0952	0.0969	0.0998	0.1015	0.1033	0.1065	0.0777	0.2072	0.4119

*Calculated by subtracting the bin sizes from the measured sensor depth.

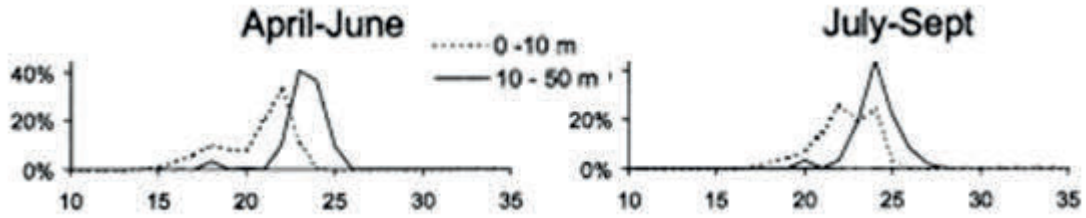


Figure 4: Frequency distribution of salinity measurements taken from Baddeck Bay, including Whycocomagh Basin, Baddeck Bay and St. Patrick's Channel. Figure adapted from figures within Tremblay, 2002.

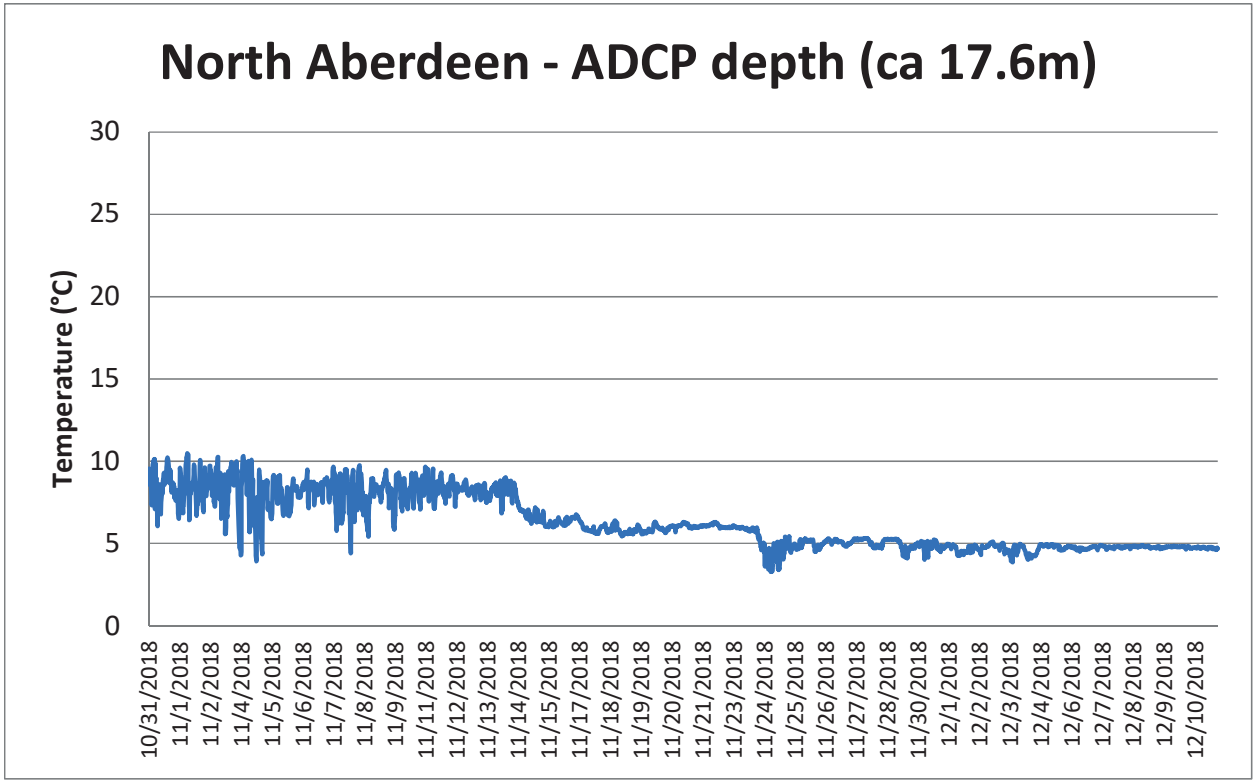


Figure 5: Winter temperatures measured in 2018 (October 31 to December 10, 2018). Raw data obtained from David Cook (NSDFA) from ADCP deployment. Depth is the average depth measured by the ADCP.

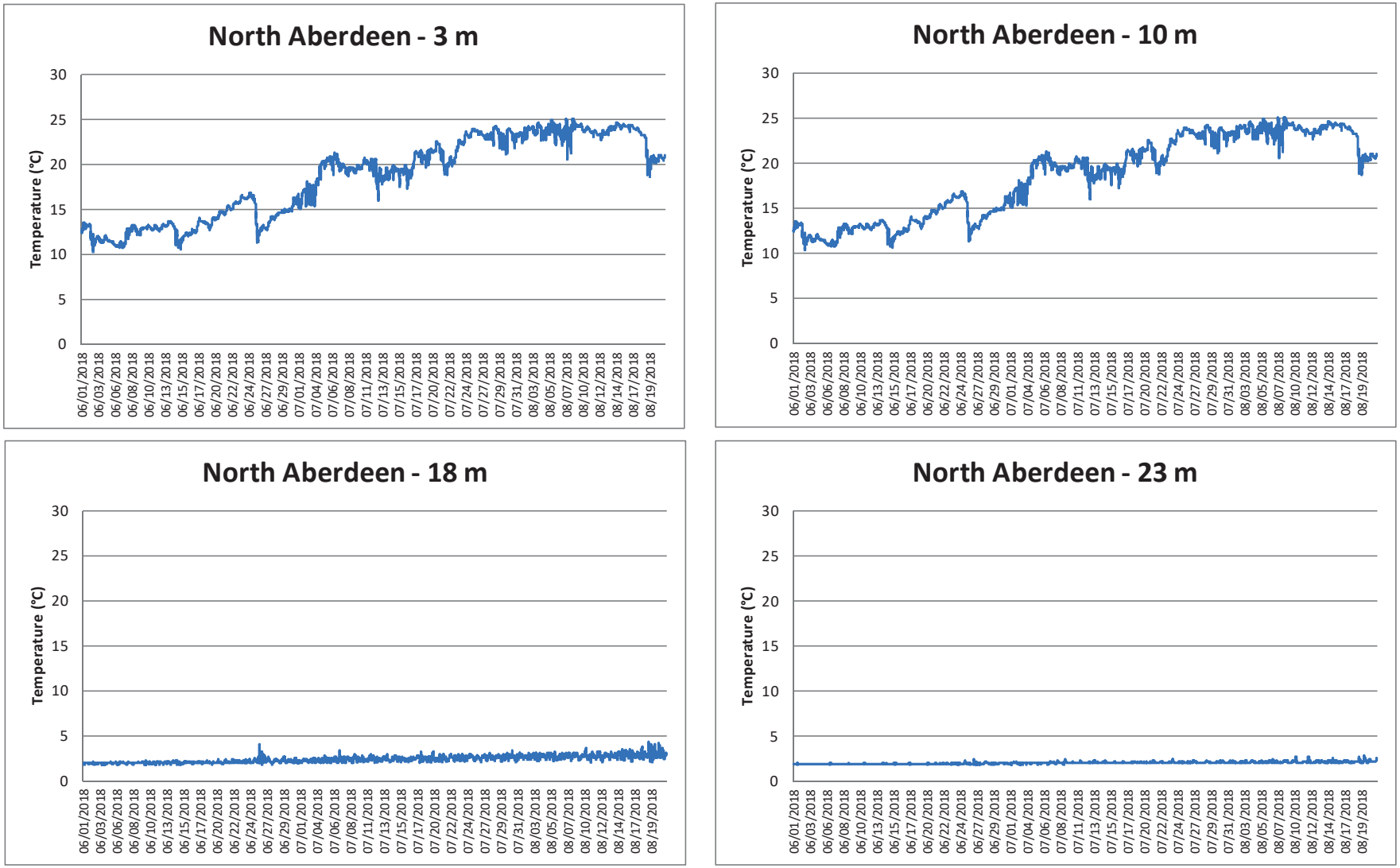


Figure 6 a,b,c,d: Summer temperatures measured in 2018 (June 1, 2018 to August 19, 2018) at depths from surface as recorded at deployment of sensors. Raw data obtained from David Cook (NSDFA).

4.2 Baseline environmental monitoring

The baseline monitoring package has been submitted separately.

4.3 Site design

Extensive depth sounding activities were conducted in Whycocomagh Bay in 2017. This allowed the creation of depth profiles to determine best locations for sites. Benthic information was also collected at that time. This information was overlapped with potential visual impacts to determine best options for the new sites. The proposed site in North Aberdeen was deemed to have suitable depths and bottom characteristics and have minimal visual impact so more intense scoping of the lease was initiated in 2018. This intense scoping included profiling of temperatures and oxygens near the proposed site, profiling of oceanographic characteristics, and baseline monitoring of the benthic environment. Results from these activities are found elsewhere in this Development Plan. Specific characteristics of this body of water that are significant and have been accounted for in terms of the site plans are described below.

Anoxic water

Whycocomagh Bay is separated from the east (St. Patrick's Channel) via a sill less than 12 m deep. Whycocomagh Bay itself has a pair of deep basins of 38 and 46 m deep separated by a sill of approximately 7 m depth. These sills inhibit flushing below sill depth, preventing a horizontal exchange of deep water and partly isolating the physical and biological processes of one basin from the other and inhibit biota movement (Parker et al, 2007). This makes for a unique oceanographic environment that must be considered in site design and operation. In particular, significant thermoclines and haloclines are known to exist and much of the benthic layer is known to be naturally anoxic (Parker et al, 2007). The oxygen profiles of this site, as collected during scoping activities, indicate that oxygen levels at depth (28m) can hover between 40% to 60% saturation. Recent research in Whycocomagh Bay, including monitoring conducted by WFN, indicate that the thermocline and oxycline move seasonally and can become quite shallow (<8m). Published reports indicate there is no upwelling in the bay (Parker et al, 2007). However, some upwelling of low oxygen "fingers" of water has been experienced in nearby fish farming operations in the past. These events are thought to be caused by deep water currents caused by tide. As the deep water is pushed in by a moon tide, the low oxygen water at depth pushes to the surface and oxygen levels decline in the fish rearing layer. The recorded moving thermocline and oxycline and anecdotal evidence of upwelling must be considered in operational procedures. In response to this risk, oxygen monitoring occurs on a regular basis and increases around wind and tidal events. An oxygen supplementation system will be part of the infrastructure for the cages in susceptible areas, as determined by the oxygen profiles.

Ice cover

Another feature of Whycocomagh Bay that must be managed is the presence of ice over the bay during winter. The bay begins icing over after mid-December and generally stays covered with ice

until March/April. At exposed sites, the ice coverage will be managed via harvesting the fish prior to the ice forming. Any remaining fish cages will be moved to another lease site where over-wintering and winter harvest can occur (AQ 0814x). The moorings will stay in place over the winter. Spar buoys may be replaced with temporary buoys to mark the site for the winter period. These temporary buoys will allow the ice to travel over them when it moves out in the spring. By contrast, the large Spar buoys may get dragged with the ice when it breaks up in the spring. This has been experienced in the past and needs to be avoided (Robin Stuart, personal communication). The area is not navigable at this time due to the presence of the ice so that a navigation hazard is not created by the removal of the larger buoys.

Water currents and waves

The current, tide and wave data collected over the autumn months and early winter months of 2018 (October 31, 2018 to December 11, 2018) via deployment of an ADCP (Acoustic Doppler Current Profiler), summarized in Section 4.1 and Appendix F, have been used to engineer the cage and infrastructure for this site. Note that the raw data is also available for this purpose.

Water temperature

As shown in Section 4.1, temperature was monitored at successive depths (3m, 10m, 18m, 23m) within the proposed site boundaries from June 1, 2018 to August 19, 2018. Graphs of the temperature profiles at these depths clearly show the presence of a thermocline. This was expected and is a well-recognized phenomenon for Whycocomagh Bay. Temperature was also monitored at 18m using the ADCP from October 31, 2018 to December 11, 2018. The temperature profiles of the water depths the fish will inhabit have been incorporated into the growth model of the fish to predict feeding rates and days to harvest.

Infrastructure for the site

As a result of experimental work conducted by WFN since 2019 and the biophysical data collected, the intended infrastructure for the site will be 100m (circumference) cages in a 2X5 array. The intended cages and grid system are shown in the amended application to Transport Canada for the Navigable Waters permit (Section 6.1).

SECTION 5: THE OTHER USERS OF THE PUBLIC WATERS SURROUNDING THE PROPOSED AQUACULTURAL OPERATION

5.1 Description of other users

AQ 1430 is located in a sparsely populated area. That was one of the reasons the site was chosen. The TransCanada Highway (Route 105) runs along much of the adjacent shoreline to the west of the proposed site. The TransCanada Highway (Route 105) and Route 223 are the main thoroughfares east of the proposed site. The site is not visible from these roads. Users within different radii of the proposed site are described below.

Users within 1 km radius

Businesses within 1 km of the proposed development are shown in Figure 7, numbered according to their description below:

1. Cape Escape B&B and Therapeutics (<1km northwest, inland) – seasonally offers a single suite for rent. This business is on the Trans-Canada Highway, away from the shoreline.

There are other local property owners within one km of the site. But because of the steep aspect of the shoreline and the woodland, there is only one property owner who may be able to see the site from his home. Property owners in that area have had a good relationship with We'koqma'q First Nation.



Figure 7: Google Earth image of the proposed site area with a 1 km radius (yellow circle). The approximate location of the single known business owner within this radius is numbered according to its description in the main text of this document.

Users within 3 km

Businesses or other public users within 3 km of the proposed development are shown in Figure 8, numbered according to their descriptions below:

2. Bear on the Lake Guesthouse (southwest, along the Trans-Canada, on the same side of the Bay) – seasonally offers private rooms and hostel accommodations that overlook the Bras D'Or.
3. Little Narrows Beach Municipal Park (east, across the Bay) – offers sandy beachfront access to the public.

The opposite (south) side of the Bay is more than 2 km away. It is more populated than the north side but is still sparsely populated with a handful of property, farm and cottage owners. Part of the Little Narrows community is within this radius, including the park mentioned above (#3).

Because of the distance between the proposed site and these users, it is unlikely that there will be significant visual impact, if any at all.



Figure 8: Google Earth image of the proposed site area with a 3 km radius (yellow circle). The approximate locations of the known users of this space within this radius are numbered according to their description in the main text of this document.

Users within 5 km

Businesses or other public users within 5 km of the proposed development are shown in Figure 9, numbered according to their descriptions below:

4. Aberdeen Motel (southwest, same side of the Bay) – classic single-story motel with more than a dozen rooms. It is not on the shore of the lake.
5. WFN processing plant (northeast, same side of Bay) - CFIA registered seafood processing facility that processes the finfish aquaculture products produced by WFN.
6. Little Narrows Presbyterian Church (northeast, same side of Bay)
7. Little Narrows Ferry (northeast)
8. Little Narrows Community Center (east northeast, across the Bay): community hall which hosts local events and is available for rental.
9. Timeout Campground (southeast, across the Bay) – private 93 site camping and RV campground with 1000' of waterfront.
10. Cape Breton Cottage Bed and Breakfast (south, across the Bay) – single private cottage rental on beachfront and single B&B rental 250 feet from Bras D'Or Lake shore.
11. Eagle D'Or Cottages (southwest, across the Bay) – two cottages on Bras D'Or Lake shorefront.

All of the Little Narrows community is within this radius, across the Bay. The primary amenities in the area are listed above (#3,6,7,8).

Because of the distance between the proposed site and these users, it is unlikely that there will be significant impact, if any at all.



Figure 9: Google Earth image of the proposed site area with a 5 km radius (yellow circle). The approximate locations of the known users of this space within this radius are numbered according to their description in the main text of this document.

Users within 10 km

We'koqma'q First Nation (Whycocomagh 2 Reserve), and the village of Whycocomagh are within 10 km of the proposed site. They are circled in blue in Figure 10.

We'koqma'q First Nation is a Mi'kmaw community in the middle of Whycocomagh with a registered population of approximately 1000 persons according to Indigenous and Northern Affairs Canada. The We'koqma'q Nation has traditionally used the public waters for fisheries activities as described in Section 3.2. Whycocomagh and Whycocomagh Bay are recognized areas of cultural, recreational, and social significance (CEPI, 2006). It is notable that We'koqma'q has been involved in shellfish and finfish aquaculture activities in the local waters for decades. The proposed aquaculture site is a significant part of the First Nation's business development plans. It will be managed in association with the other Mi'kmaw activities in the waters. A single group manages both the fisheries and aquaculture portfolio of the Band and will ensure that they are complementary.

The Whycocomagh community has a population of approximately 850 residents and has several small businesses that support the local residents, including gas stations, a pharmacy, grocery store, bank, several bakeries and restaurants, accommodations (Keltic Quay, Fair Isle Motel, Aberdeen Motel), farmer's market, school (P-8, population<200), fire department, community center and other amenities and tourist features.

In Whycocomagh, a main user group of the public waters is the Whycocomagh Waterfront Centre Association which supports both a community center as well as a marina. The marina is gated access with piers and a launch ramp to the Bras D'Or, a pump station, fresh water and washrooms. Floating docks and moorings are available for member rental.

Whycocomagh Provincial Park is located east of Whycocomagh. The park features hiking (5 km of trails), camping (40 sites) and picnicking. It overlooks the Skye River Valley and the Bras D'Or Lake. The main park straddles the Trans-Canada Highway and has areas of access to the Bras D'Or Lake.



Figure 10: Google Earth image of the proposed site area with a 10 km radius (yellow circle). Whycocomagh, including the We'koqma'q community is circled in blue.

Other regional users or parties interested in the public waters

The Bras D'Or Lake is a popular cruising location for pleasure crafts. Whycocomagh Bay is open to the Bras D'Or Lake only via Little Narrows Channel and yet is a popular spot, particularly for small sailing vessels, kayakers, canoeists and small fishing vessels. These may be local residents or seasonal users.

Other parties interested in the area in terms of conservation include:
Bras D'Or Stewardship Society: a non-profit organization established in 1998 committed to promoting stewardship of the Bras D'Or Lakes and their watershed. The proposed site is within the Society's area of interest.

Bras D'Or Lake Biosphere Reserve Association: a registered charity that oversees the UNESCO designated Bras D'Or Lake Biosphere Reserve[13]. Its mission is "to engage all peoples in the balanced and sustainable development of the exceptional cultural, environmental and economic assets within the Bras d'Or Lake watershed." The proposed site is within the Biosphere Reserve.

Bras d'Or Lakes Collaborative Environmental Planning Initiative (CEPI): CEPI is an alliance of federal, provincial, municipal, and First Nations governments and other interests who have signed a charter that represents "the collective intent, or "will", of the relevant governments with responsibilities for the management and protection of the Bras d'Or Lakes and its watershed".

5.2 Significance of proposed area to wildlife

Significant terrestrial habitats

Significant land habitats recognized by NSDNR along the shoreline of Whycocomagh Bay are shown in Figure 11 and include the following:

- IN418: deer wintering
- IN21: deer wintering
- IN142: bald eagle nest
- VI207: common loon habitat
- IN192: bald eagle nest
- IN17: bald eagle nest
- IN433: bald eagle nest
- IN22: bald eagle nest
- IN51: bald eagle nest
- IN37: bald eagle nest
- IN49: bald eagle nest

[13] In 2011, the Bras d'Or Lake and its watershed area were designated a UNESCO Biosphere Reserve, recognizing that the locals live in harmony with nature and work to promote a healthy environment, economy and culture.

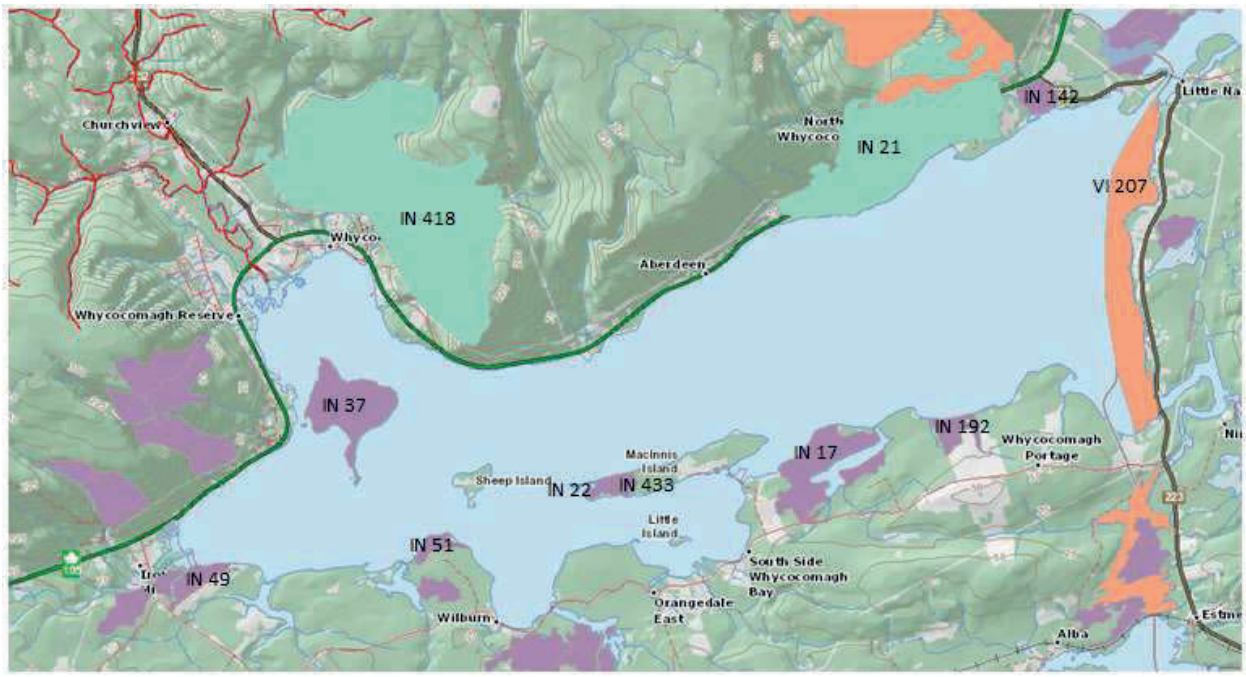


Figure 11: Significant land habitats[14] on the shoreline of Whycocomagh Bay

Rare and endangered species

A data report from the Atlantic Canada Conservation Centre provides more in-depth detail on the possibility of the presence of rare and endangered species that may use the proposed development area as well as special wildlife areas of the region. The complete report generated for the proposed site location is attached as Appendix E. A summary of this report follows:

Rare species list

Within 5 km of the site centers, records indicate the presence of 25 species of rare or endangered vascular plants and 23 species of rare or endangered vertebrates. Within this list of species, only Atlantic salmon are aquatic. All others are terrestrial flora or fauna.

Shoreside species of plants include:

- Ray's knotweed
- Seaside brookweed

Shoreside species of animals include:

- Nelson's sparrow
- Cliff swallow
- Killdeer
- Spotted sandpiper

[14] Adapted from https://nsgi.novascotia.ca/plv/ Accessed April 12, 2024; used with permission. Additional information provided by Frances MacKinnon.

Species at Risk

Six Species at Risk are on record as being in the region. They are listed in the table below. None are water dwelling or expected to be found shoreside.

Table 2: Species at risk within 5 km radius of proposed site[15]

Scientific name	Common name	SARA status	Habitat, other comments
Riparia riparia	Bank swallow	Threatened	Nests in burrows excavated in eroding banks of coastal cliffs and other steep vertical soft soil faces[16]
Hirundo rustica	Barn swallow	Threatened	Nests in barns, garages, houses, bridges and culverts near open areas. Part of the agricultural landscape in Nova Scotia.[17]
Dolichonyx oryzivorus	Bobolink	Threatened	Open grasslands and hayfields[18]
Contopus cooperi	Olive-sided Flycatcher	Threatened	Spruce and fir swamps and bogs[19]
Contopus virens	Eastern Wood-Pewee	Special Concern	Woodlands[20]
Sorex dispar	Long-tailed Shrew	Special Concern	Mountainous, forested areas; may occur along small mountain streams[21]

Location sensitive species

One location sensitive species has been recorded in the region: black ash. Black ash grows in swampy, low-lying areas that are very wet and marshy.[22]

Culturally significant flora and fauna

The sweet flag is a medicinal plant in the Whycocomagh area that is of significance for the Mi'kmaw people (CEPI, 2006). CEPI, 2006 also mentioned barrows goldeneye which have been seen near Whycocomagh Bay shore and bald eagles which are more commonly seen.

---

[15] Species list extracted from Atlantic Canada Conservation Center Report 6326. Species habitat and other comments obtained from sources referenced in footnotes.

[16] https://novascotia.ca/natr/wildlife/biodiversity/species-list.asp Accessed April 9, 2024.

[17] http://www.farmbiodiversity.ca/species-at-risk-2/birds/barn-swallow/ Accessed April 9, 2024.

[18] https://novascotia.ca/natr/wildlife/biodiversity/species-list.asp Accessed April 9, 2024.

[19] https://novascotia.ca/natr/wildlife/biodiversity/species-list.asp Accessed April 9, 2024.

[20] https://novascotia.ca/natr/wildlife/biodiversity/species-list.asp Accessed April 9, 2024.

[21] https://www.iucnredlist.org/species/41394/115183478#habitat-ecology Accessed April 9, 2024.

[22] http://www.uinr.ca/black-ash/ Accessed April 9, 2024.

General marine life

The Bras D'Or Lake marine environment is known for its uniqueness in terms of reduced salinities, limited physical exchange with the open ocean, diversity of seasonal temperature regimes, and low tides. One of the most often reported attributes of the lake is the fact that both warm water and cold-water species are found in the same water system (Tremblay, 2002).

Within Whycocomagh Bay, the diversity of marine life is more limited than other areas of the lake. It is a low salinity region with large basins of low oxygen levels. It has been suggested that these characteristics limit benthic organisms in many parts of the bay, with the exception of micro-organisms (Lambert, 2002). Low abundance of mysids, copepods (Petrie & Bugden, 2002; Strains & Yeats, 2002) have been noted. Many invertebrate species such as lobsters and rock crab are unlikely to be in this area due to its low salinity. Similarly, scallops are unlikely to be in this area. (Tremblay, 2002)

Studies have shown that herring and gaspereau occur in Whycocomagh Bay and the presence of winter flounder, cod, skate, and windowpane flounder was evidenced by their appearance in trawl catches in Whycocomagh Bay in 1999-2000, which were similar to findings from tows conducted in 1967. The cod population in this bay is thought to be unique from other cod populations in the lake. This is based on the low incidence of the sealworm (*Pseudoterranova decipiens*) in cod of the bay relative to adjacent areas. This segregation is thought to be due to the restricted passageway at Little Narrows, which may discourage the movement of cod between the Bay and St. Patrick's Channel. Local knowledge suggests that cod populations are significantly reduced over previous levels (personal communication, Joe Googoo, We'koqma'q Elder).

Grey seals and harbor seals are the only marine mammals known to inhabit Whycocomagh Bay (Robin Stuart, personal communication).

5.3 Impacts to other users including wildlife

Impacts to human users of the public waters surrounding the proposed development

Tourist operators, local and seasonal residents

A number of businesses within the region that were identified in Section 5.1 rely on tourism. A key draw to the region is the Bras D'Or Lake. And local and seasonal residents enjoy the public waters surrounding the proposed development for its beauty, nature and recreational opportunities. Concerns that these groups of the community may have are discussed below.

Visual impact

The area is well known for the attractiveness of its landscape, including the views of the Bras D'Or Lake. WFN recognizes this value to the area's tourism industry as well as to the local community members in general.

For this proposed site, the cages will not be highly visible from the highway nor by local property owners, with one exception as described in Section 5.1. They will be visible from the immediate shoreline. As shown in Figure 7, there are not many users of this immediate shoreline. There is likely no place in the region that is more sheltered from view. This was one of the reasons for choosing this site. Moving cages to locations where they would be hidden from public view was suggested during the scoping process[23]. This comment was made specific to the proposed Whycocomagh lease (AQ 0814x), not AQ 1430.

In recognition of the importance of appearance, WFN is committed to ensuring that the cages are maintained in an orderly fashion to ensure that they properly represent the opportunity that they are bringing to the community and do not negatively impact the visual landscape. The regular inspection and maintenance of cages is a best practice of the company that is mandated under the Nova Scotia Aquaculture Management Regulations within the Farm Management Plan as mentioned in Section 3.2 (*Mitigating Fisheries Impacts through Operational Procedures*). In addition to the Farm Management Plan requirements explained previously regarding infrastructure maintenance, all of the WFN finfish aquaculture operations will follow the Farm Operations requirements also defined by the Nova Scotia Aquaculture Management Regulations. These requirements acknowledge that the responsible operation of a marine finfish site includes consideration of neighbors and other users of shared resources, including aspects affecting visual impact. To this effect, the Farm Management Plan must include the following:

- Described and approved management practices for removing and disposing of accumulated refuse and decommissioned farm supplies and equipment;
- Described and approved management practices for retrieving any gear or debris from the aquacultural operation that has broken loose; including timelines for completion;
- Described and approved management practices for maintaining the site in good order.

The above elements will be approved for implementation by NSDFA and operators will be audited for adherence to the plan according to NSDFA's requirements.

Smell and Noise

Part of the appeal of the region pertains to the rural landscape in terms of low noise pollution and high air quality. WFN recognizes the value of maintaining these local attributes and will apply and document practices that reduce noise, particularly outside of working hours, and reduce odors in general.

A concern about the smell of WFN's finfish operation in Whycocomagh was brought up during the scoping process [24]. It is recognized by WFN that they had an incident where smell was a problem for a couple of days in the summer of 2018. This was due to an interruption in trucking that required offal transfer during an excessively hot day (>30°C). Normal procedures for WFN's finfish operations include removing organic waste on a bi-weekly basis for transport to the Guysborough facility which is equipped to deal with such waste. Increased oversight of this procedure now occurs to ensure that

[23] Refer to Page 8 of the Report on Public Engagement During Scoping
[24] Refer to Page 12 of the Report on Public Engagement During Scoping

the transportation will not be disrupted. And the shipping containers are lined and sealed on site prior to transport so that spillage will not occur *en-route*.

Other aspects of the operation that may be a risk for causing odors will be described and documented in the Farm Management Plan. This includes the storing and disposal of feed, mortalities and other organic waste. Addressing these are part of the Farm Operations requirements of the Nova Scotia Aquaculture Management Regulations.

It is notable that the Farm Management Plan also requires the description, application, and documentation of procedures that minimize noise. These will be approved for implementation by NSDFA and operators will be audited for adherence to the plan according to NSDFA's requirements.

As mentioned previously, WFN's finfish operation hopes to become certified to the Global Aquaculture Alliance's Best Aquaculture Practices (BAP). Section 3K of this standard requires safe and responsible storage and disposal of farm supplies and waste. Procedures required for this would be above and beyond the Farm Management Plan requirements described above and would be third party audited. The relevant BAP Farm Standard (Issue 3.1) is attached as Appendix B.

It is notable that finfish aquaculture operations have been operating in the community for more than 30 years and the relationships with local residents regarding the operation have been very positive.

Navigation for marina users, recreational boaters, fishers and others

Recreational boaters, fishers, marina users and other local residents or passersby who use the waterways for travel need to have clear delineation of safe travel paths when in or below water structures, such as finfish cages, exist. WFN has ensured this by completing a Notice of Works form to Transport Canada, as required under Section 6 of this Development Plan. WFN will mark their sites in accordance with these requirements.

Miscellaneous concerns raised during scoping

During the public meeting held in the community, an attendee mentioned his concern that WFN's current aquaculture operation in Whycocomagh is causing the build-up of dead seaweed along the shore which is interfering with angling from the shore.[25] The association between the dead seaweed and the finfish culture activities is not clear; nor is it clear that changes to the operations would make an impact on this phenomenon. Regardless, WFN is dedicated to monitoring and measuring the environmental impact of its finfish aquaculture operations, including eutrophication. This is demonstrated by WFN's partnership in research that modeled and measured nutrient level changes in the water resulting from its operations. This was previously described in Section 3.2 ("*Mitigating Fisheries Impacts through Research and Development"*).

[25] Refer to Page 8 of the Report on Public Engagement During Scoping

Ensuring the proper disposal of sewage waste was brought up during the scoping process.[26] Storage and disposal of human waste must be described and documented in the Farm Management Plan as part of the Farm Operations requirements of the Nova Scotia Aquaculture Management Regulations.

Impacts to wildlife users of the public waters surrounding the proposed development

There are no identified rare or endangered species that are expected to be directly impacted by the operation of this site. Mitigation measures applied to reduce fisheries impacts are described in Section 3.2 and will also mitigate impacts to other wildlife in the bay in general.[27] Measures applied to support the sustainability of wild salmon are described in section 7.2.

As described in Section 5.2, there are no SARA listed species expected to interact with the proposed site since all known SARA species in the area are terrestrial.

Similarly, all rare and endangered species, with the exception of Atlantic salmon, are terrestrial and not expected to be encountered during normal operation of the site. Potential risks to shoreline species and water birds, particularly those known to be rare or endangered, will be mitigated within a wildlife interaction plan. This plan will describe procedures that ensure least interference with surrounding wildlife while supporting their habitat. This will include a requirement that boat travel to and from the site is via the most direct route possible, without travelling near the shore or near wildlife. An exception to this will occur during a weekly sweep of the shoreline to look for debris that may inadvertently have been released during operation of the site. This will enable the upkeep of the shoreline to a level of cleanliness that promotes wildlife habitat. For these procedures, employees will be cautioned to not approach wildlife and not travel through marsh areas where sensitive species may be harbored. An annual shoreline clean-up will also occur for the adjacent area. This clean-up will not be conducted at times of the year when shoreline birds are nesting.

A wildlife interaction plan must be described in an operator's Farm Management Plan as defined by the Nova Scotia Aquaculture Management Regulations. It must be approved for implementation by NSDFA and operators will be audited for adherence to the plan according to NSDFA's requirements. The BAP certification standard also requires a Wildlife Interaction Plan. The relevant BAP Farm Standard (Issue 3.1) is attached as Appendix B.

Complements to other users

Support of the local economy

Development of WFN's finfish aquaculture operations is anticipated to bring a significant number of local direct and indirect jobs to the community (see Sections 2.3, 2.4, and 2.5).

[26] Refer to Page 8 of the Report on Public Engagement During Scoping

[27] The potential benthic environmental impacts were brought up during scoping. See page 8 of Report on Public Engagement During Scoping.

Support of conservation efforts

WFN will work with the conservation groups active in the area to help collect information on the oceanographic and ecological characteristics of this area of the Bras D'Or Lake. On this front, WFN has an established relationship with Dr. Bruce Hatcher and will continue to assist Dr. Hatcher as he collects information to: characterize the dynamics in the cline of Whycocomagh Bay, explore ice cover changes and effects in Whycocomagh Bay, explore anthropogenic effects on the Bay's characteristics, and other research efforts. WFN will also assist the Stewardship Society and Biosphere Reserve Association to collect information and educate people on the unique ecology of the Whycocomagh region, if requested.

Robin Stuart, a previous Manager of Aquaculture Operations for WFN, who does periodic consulting for WFN, is a representative on CEPI and will help to communicate any concerns the group may have with the fish farm.

5.4 Impacts by other users including wildlife

Generally speaking, WFN's finfish operations have, and hope to continue to have, an excellent and mutually beneficial relationship with the local communities.

A possible negative impact of people on the operations needs mentioning. This refers to vandalism of the fish nets. In the past, one of the nets was released manually by a non-resident. This resulted in fish release. Fishing within the pens has also occurred. Since this time, WFN has hired security to patrol their sites and mitigate these risks. The feed barge for this site will be equipped with security cameras to monitor activities.

Fish-eating birds (herons, hawks, kingfisher, eagles, and other species) can be common-place in regions that support finfish aquaculture operations. If not properly managed, such birds can prey on the fish in the cages, causing stress and physical damage. WFN finfish aquaculture operations will use bird nets on their cages during seasons when bird predation is a problem. These nets will cover the surface of the water at a height from the water surface so that bird predation cannot occur. The procedures for their use and maintenance are required as part of the Farm Management Plan.

SECTION 6: THE PUBLIC RIGHT OF NAVIGATION

6.1 Navigation Protection Act approval

A copy of the Notice of Works form and required attachments follow as Appendix G.

SECTION 7: THE SUSTAINABILITY OF WILD SALMON

7.1 Identification of local salmon populations

(Reference: CSAS Science Response 2017/20, 2020/031)

The proposed North Aberdeen site (AQ 1430) is within Salmon Fishing Area 19, also called the Eastern Cape Breton Designatable Unit by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Closest salmon bearing rivers that have direct connections to the body of water that contains the proposed site include Skye River (mouth within 9 km of the site), Middle River (mouth approximately 14 km from the site), and Baddeck River (mouth approximately 17 km from the site). Only the Skye River opens into the Whycocomagh Bay subwatershed. The Middle and Baddeck Rivers open into an adjacent watershed (St. Patricks Channel) which is somewhat separated from the Whycocomagh Bay subwatershed via a sill less than 12 m deep. Since 2006, Middle and Baddeck Rivers have had their salmon populations enhanced through a Provincial stocking program which includes broodstock collection on these rivers. This enhancement is intended to offset anticipated catch and release mortalities on these rivers and has allowed an open catch and release fall season on the Middle and Baddeck Rivers. Food, Social and Ceremonial (FSC) allocations are also available on these rivers. Middle and Baddeck Rivers are index populations. As for all index rivers in Eastern Cape Breton, the populations were assessed to be below conservation egg requirements in 2018.

The approximate locations of all salmon bearing rivers in the vicinity of the site, as reported in the 2017 and 2020 CSAS Stock Status Update for SFAs 19-21 and 23 are shown below in Figure 12.

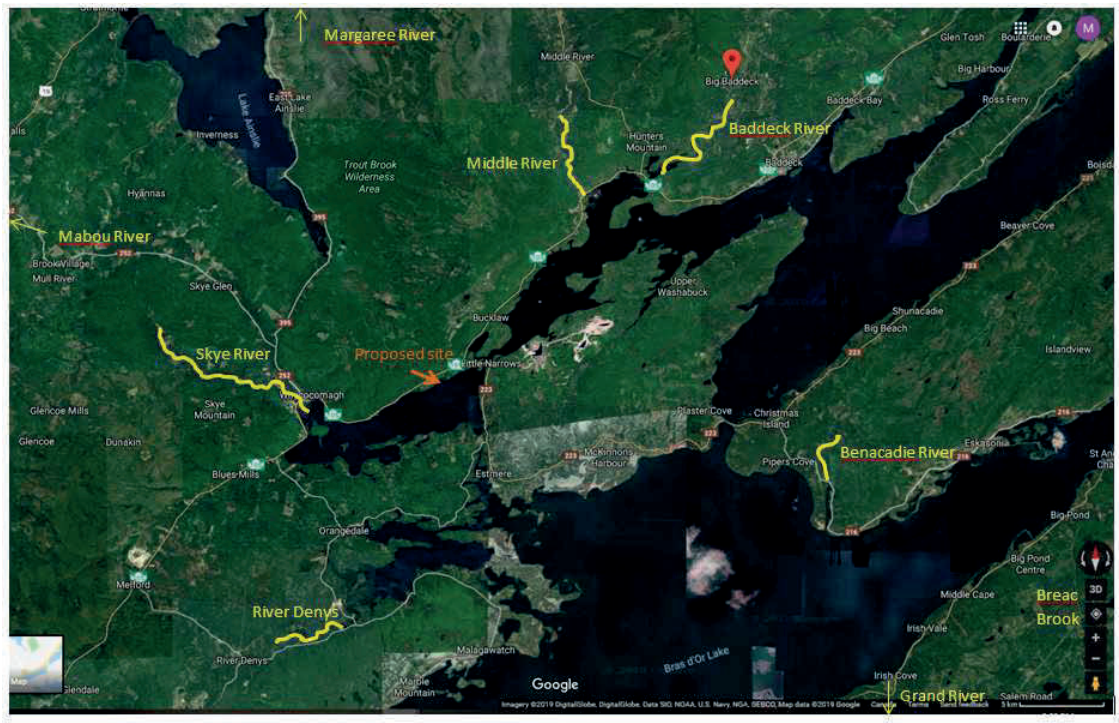


Figure 12: Salmon bearing rivers within the region of the site.

7.2 Support of the sustainability of wild salmon

Although rainbow trout are not indigenous to the Bras d'Or Lake area, it has a resident population that has developed from stocking efforts for the sport fishery, with the first trout introduced in 1899. These introduced fish have been shown to be successfully reproducing in the wild and are contributing to the fishery numbers (Madden et al., 2010). Rainbow trout continue to be stocked by the province through an enhancement program. This would suggest that there is little concern that the presence of rainbow trout affects the sustainability of wild salmon.

Furthermore, WFN will institute operational procedures to mitigate the greatest perceived risks of finfish aquaculture operations to wild salmon populations; these being fish escape, disease and biosecurity, and environmental impact risks. These have been described in Section 3.2.

As indicated in Section 7.1, Middle and Baddeck Rivers have had their salmon populations enhanced through a Provincial stocking program which includes broodstock collection on these rivers. Approval of this lease/licence is not anticipated to affect these efforts.

The environmental and oceanographic data collection in the bay that is supported by WFN (Section 5.3 Support of conservation efforts*)* is intended to improve understanding of the local ecosystem as a whole, as well as more broadly with regards to global warming. Although there is no direct intent to use this data to support Atlantic salmon conservation measures, an increased understanding of the environment may contribute to conservation practices in general.

SECTION 8: THE NUMBER AND PRODUCTIVITY OF OTHER AQUACULTURE SITES IN THE PUBLC WATERS SURROUNDING THE PROPOSED AQUACULTURAL LOCATION

8.1 Identification of other aquaculture sites[28]

WFN or We'koqma'q First Nation Band Council is presently the lease holder for all aquaculture sites within Whycocomagh Bay, both finfish and shellfish. There are a few oyster sites of other operators that are in close proximity distance-wise, but the waters are not directly connected to Whycocomagh Bay.

WFN is making two requests for new commercial finfish sites within Option 1413 in the eastern end of Whycocomagh Bay (one on the north side, AQ 1430 – this application, and one on the south side, AQ 1431), and a request for the amalgamation and enlargement of leased areas in the west end of Whycocomagh Bay (AQ 0814x). Since 2019, We'koqma'q was assigned a previously active finfish/shellfish site in the region which will likely be used for oyster aquaculture in the future (AQ 0193).

All of the sites planned for the area are shown in Figure 13, as they can be seen on the NSDFA site mapping tool. Figure 13 also shows other existing aquaculture sites in the area.

Collectively, the requested sites will allow a financially viable rainbow trout aquaculture operation while availing enough area to increase fallowing times. Increased fallowing will reduce fish health risks and minimize potential environmental impacts of the operations.

[28] The potential for aquaculture in the area was brought up during scoping. See page 4 of Report on Public Engagement During Scoping.

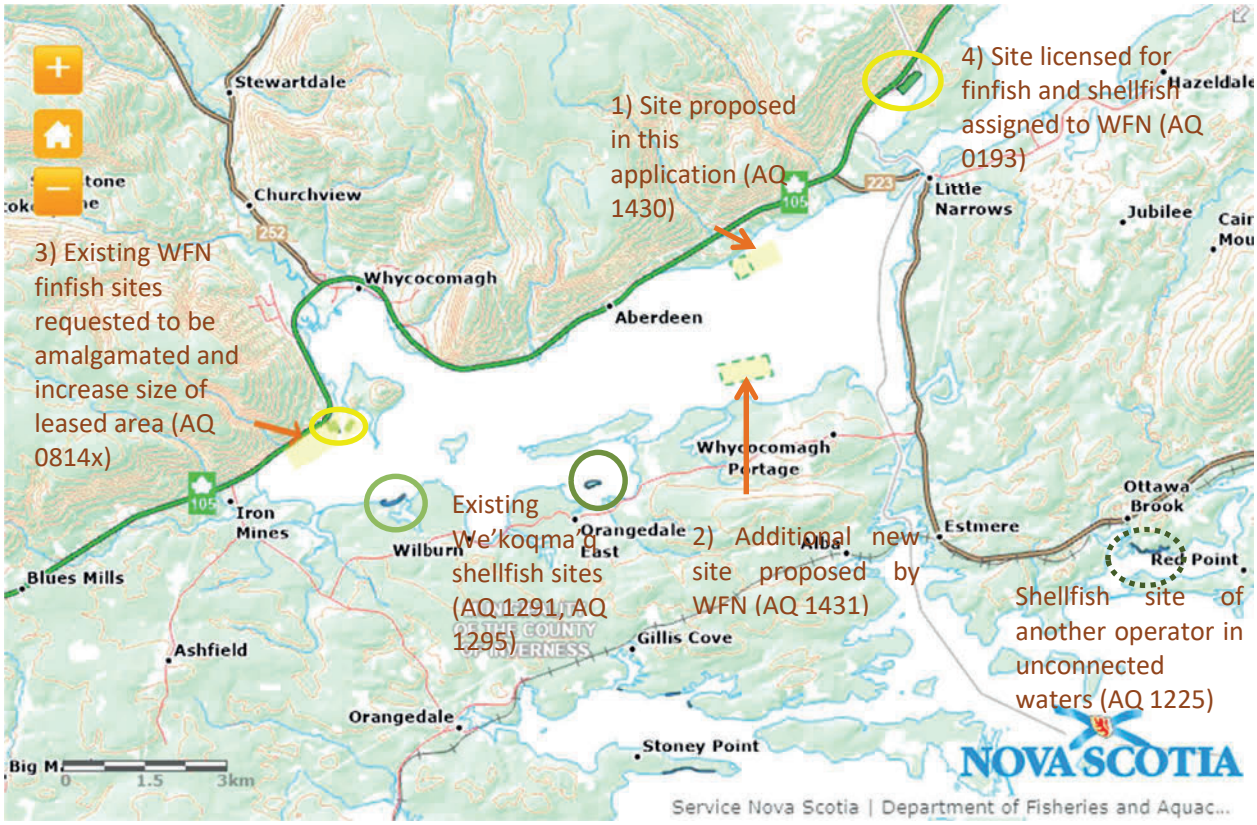


Figure 13: Map of the region of the proposed site showing existing aquaculture sites as well as sites proposed in other applications. The base map was acquired from https://novascotia.ca/fish/aquaculture/site-mapping-tool/ Accessed April 8, 2024.

As shown in Figure 13, Site 1 is the new commercial finfish site described in this Development Plan (AQ 1430). Site 2 is a new commercial finfish site proposed by WFN in another application (AQ 1431). Site 3 is the region where WFN is currently the lease holder for three small finfish leases; WFN is requesting an amendment to amalgamate and enlarge this area in another application (AQ 0814x). Site 4 is the finfish/shellfish site assigned to WFN since 2019 (AQ 0193); the future use of this site is being explored, including its potential use for oyster aquaculture. Two of We'koqma'q's existing shellfish sites in Whycocomagh Bay are also shown in the map (circled in green), along with a shellfish site in unconnected waters (hashed circle in green).

8.2 Interactions with other aquaculture operations

WFN's three proposed finfish sites (AQ 1430, AQ 1431, AQ 0814x) will be managed as a single farm to promote optimal fallowing regimes. Final stocking plans will be developed in conjunction with NSDFA and DFO to maximize fish health and minimize environmental impacts. When all sites are available for use, a rotating fallowing cycle is anticipated.

These three sites and their relative location to each other, along with grid arrays intended within the sites are shown in Figure 14.

In the past, the proposed sites AQ 1430 and AQ 1431 and the outer area ("production area") of AQ 0814x have been exposed to moving ice in the spring. As a result, cages are not left here over the winter and these production areas are used in the ice-free period, from April to December, only. For the winter months, cages are pulled into a sheltered area that is part of the requested 0814x site. Here, the ice floes do not push through. This is why 0814x has a designated production area and a designated over-wintering area, as explained further below.

A summary of the purpose for each site and array follows, as per current plans. Actual site stocking will depend on EMP results, I&T permissions and Stocking Level Approvals.

0814x

As shown in Figure 14, AQ 0814x will have both an over-wintering location and a production location. The overwintering location for all fish is shown as 0814x OW. The separate, single production array at 0814x #1 will regularly receive small fish in late fall. This production array at 0814x may also be occasionally used for small scale experimental trials (e.g. testing stocks, feeds). Biomass at this site will be kept low.

1430

As shown in Figure 14, AQ 1430 will house two arrays of 2 X 5 cages each. A single array will receive spring juveniles as well as the juveniles received the previous fall at AQ 0814x. The second array will be fallow. The array used will alternate between years.

1431

As shown in Figure 14, AQ 1431 will house two arrays of 2 X 5 cages each. A single array will receive second-year fish to be harvested in that year. The second array will be fallow. The array used will alternate between years.



Figure 14: Requested commercial leases are outlined in orange. Projected locations of cage arrays for the production season within the leases are the white polygons. Projected location for over-wintering cages is the light blue polygon.

Overview of all sites

The production plan for all sites for the next few years is shown below in a table format. This stocking plan is projected, and actual site stocking will be directed by fish performance, environmental monitoring results, fish health results, and introductions and transfers permissions.

Application No.	**Maximum site biomass (MT)**	**Maximum cage density (kg/m3)**	**Size(s) of cages, including net volumes**	**Maximum cage number**	**Maximum number of fish per cage (at harvest size)**
1430 ("North Aberdeen")	940 MT	20	100m circumference, 6,350 m^3	10	56,000
1431 ("South Aberdeen")	1146 MT	20	100m circumference, 6,350 m^3	10	56,000
0814x ("Inner Bay"): production area	200 MT	20	100m circumference, 6,350 m^3	10	56,000
0814x ("Inner Bay"): over-wintering area	2000 MT (winter months only, no feed inputs)	20	100m circumference, 6,350 m^3	30	56,000

Fallowing:

As explained previously, the plan is to rotate the production area within each of AQ 1430 and AQ 1431 on an annual basis to allow a fallowing time of a production area of 15 months. The requested site areas are large enough to house two grids and enable this to occur.

The production plan for all sites is shown below as a Gantt chart (Figure 15) to demonstrate array fallowing and lease fallowing plans. The colored blocks represent times when a specific array is stocked. The black blocks represent times when a specific array is fallow, with no fish stocked.

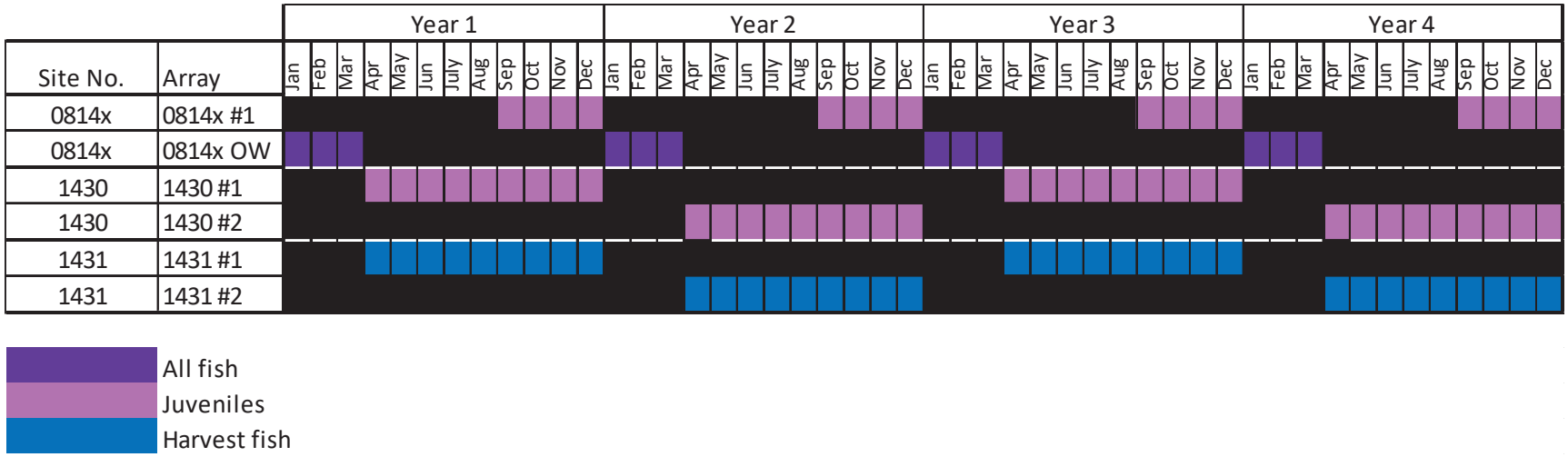


Figure 15: Gantt chart showing stocking and fallow periods for all of WFN finfish sites in Whycocomagh Bay. The black blocks represent times when a specific array is fallow, with no fish stocked.

References

Black, W.F. 1958. Biology of mysids of the Great Bras d'Or. MS. Rept. Fish. Res. BoardCan. #671. (Cited, not seen.)

Bricknell, I., Dalesman, S., O'Shea, B., Pert, C.C., and Mordue Luntz, A.J. 2006. Effect of environmental salinity on sea lice *Lepeoptheirus salmonis* success. Dis. Aquat. Org. 71(3):201-212.

CEPI. 2006. Bras D'Or Lakes Traditional Ecological Knowledge Workshop Proceedings. CEPI Workshop May 3-4, 2006, Eskasoni, NS.

DFO. 2017. Lobster (Homarus americanus) off the Atlantic Coast of Nova Scotia (Lobster Fishing Areas 27-33): 2017 Stock Status Update. DFO Can. Sci. Advis. Sec. Sci. Resp. 2017/026.

DFO. 2017. Stock Status Update of 4VWX Herring. DFO Can. Sci. Advis. Sec. Sci. Resp. 2017/037.

DFO. 2017. Stock Status Update of Atlantic Salmon in Salmon Fishing Areas (SFAs) 19-21 and 23. DFO Can. Sci. Advis. Sec. Sci. Resp. 2017/020.

DFO. 2021. Stock Status Update of Atlantic Salmon in Salmon Fishing Areas (SFAs) 19-21 and 23. DFO Can. Sci. Advis. Sec. Sci. Resp. 2020/031.

DFO. 2022. Lobster Fishing Areas 27 – 38: Integrated Fisheries Management Plan. https://www.dfo-mpo.gc.ca/fisheries-peches/ifmp-gmp/maritimes/2022/inshore-lobster-homard-cotiere-eng.html#toc2 Accessed April 11, 2024.

Dupont, F., Petrie, B., and Chaffey, J. 2003. Modeling the Tides of the Bras d'Or Lakes. Can. Tech. Rep. Hydrogr. Ocean Sci. ISSN 0711-6721. viii+53 p

Eskasoni Fish and Wildlife Commission and Dept. of Fisheries and Oceans. 1996. The Bras d'Or Lake Coastal Resources Mapping Project, managed by the Unama'ki Institute of Natural Resources (UINR), 4123 Shore Rd. Eskasoni, Nova Scotia B0A-1J0. Unpublished maps. (Cited, not seen.)

Foster, M. 2019. Economic Impact Study: The Aquaculture Industry in Nova Scotia. Presentation at Sea Farmers Conference 2019, Halifax, NS.

Krauel, D. 1976. A summary of the physical oceanography of the Bras d'Or Lake system. IN The proceedings of the Bras d'Or Lakes aquaculture conference, Sydney, Cape Breton. (Ed. M.G. McKay) College of Cape Breton Press, Sydney, N.S., 29-43. (Cited, not seen.)

Lambert, T.C. 2002. Overview of the ecology of the Bras d'Or Lakes with emphasis on the fish. Proc. N.S. Inst. Sci. 42:65-100.

Madden, J.R., MacMillan, J.L., and Apaloo, J. 2010. Examining the occurrence of wild rainbow trout in the Bras d'Or Lakes, Nova Scotia: using scale pattern analysis to differentiate hatchery and wild populations. In Proceedings of Wild Trout Symposium X, Conserving Wild Trout, Bozeman, Mont., 28–30 September 2010. pp. 184–195. Available from www.wildtroutsymposium.com/proceedings-10.pdf. Google Scholar

Mitchell S.O., and Rodger H.D. 2011. A review of infectious gill disease in marine salmonid fish. Journal of Fish Diseases. 34(6):411–32

Parker, M., Westhead, M. Doherty, P., and Naug, J. 2007. Ecosystem Overview and Assessment Report for the Bras d'Or Lakes, Nova Scotia. Can. Manuscr. Rep. Fish. Aquat. Sci. 2789: xxii + 223 pp.

Petrie, B. 1999. Sea level variability in the Bras d'Or Lakes. Atmos.-Ocean 37,221-239. (Cited, not seen.)

Petrie, B. and Bugden, G. 2002. The Physical Oceanography of the Bras d'Or Lakes. Proc. N. S. Inst. Sci. 42: 11-38.

Smith, J., Grant, J., and Stuart, R. 2002. Design of the Environmental Monitoring Program for the Marine Aquaculture Industry in Nova Scotia.

Stephenson M.F., McGladdery, S.E., Maillet, M. Veniot, A. and Meyer, G. 2003. First reported occurrence of MSX in Canada. J. Shellfish Res. 22: 355

Strain, P. and Yeats, P. 2002. The Chemical Oceanography of the Bras d'Or Lakes. Proc. N.S. Inst. Sci. 42: 39-66.

Tremblay, W.J. 2002. Large epibenthic invertebrates in the Bras D'Or Lakes. Proc. N.S. Inst. Sci. 42:65-100.

Vercaemer, B., MacIsaac, A., and Drinnan, P. 2010. Initiation of a Bras d'Or Lake oyster breeding program and broodstock management for resistance to MSX. Aquaculture Collaborative Research and Development Program (ACRDP) 2005-2008. Part 1. Initiation of a Bras d'Or Lake oyster breeding program for resistance to MSX. Part 2. Broodstock management for the Bras d'Or Lake oyster breeding program - resistance to MSX. Can. Tech. Rep. Fish. Aq. Sci. 2871

2.3 AQ#1431 Development Plan

Updated Development Plan for AQ 1431, South Aberdeen, Option to Lease AQ 1413

WFN Fish Farm Limited Partnership
April 23, 2024

INTRODUCTION

In February, 2019, We'koqma'q First Nation submitted three application packages for commercial finfish aquaculture sites in the Bras D'Or Lake near their Mi'kmaw community. These packages requested two new commercial marine finfish leases[1] and a boundary amendment to amalgamate three existing small commercial marine finfish leases. These proposed sites are within the Option to Lease # 1413 and are located on: the northeast side of Whycocomagh Bay near Aberdeen, the southeast side of Whycocomagh Bay, near Whycocomagh Portage, and in the west end of Whycocomagh Bay, south of the village of Whycocomagh. The sites are intended to operate together, as a single farm. These aquaculture sites and the activities they will permit will promote We'koqma'q First Nation's long-term objectives of achieving financial stability for their community, sustaining employment for band members and developing a vertically integrated business that can see success for generations.

In the years previous to these applications, We'koqma'q focused on building an egg-to-plate steelhead trout aquaculture operation. This included acquiring and investing in a hatchery with historical success with salmonid production, investing in sea pen infrastructure and capacity, and modernizing the local processing plant. The next logical step became expanding their steelhead trout farming activities in the lake.

At the time of the applications, We'koqma'q had seven years of experience operating marine finfish sites, three as a contract grower and four as the business owner. This informed the original applications. However, more than five years have passed since the original application submissions, and We'koqma'q has been working hard to better understand the fish, the environment's capacity for aquaculture, and how best to sustainably farm the waters of their local community. Since the original applications in 2019, We'koqma'q First Nation has successfully acquired and operated experimental finfish leases in areas overlapping AQ 1430 and AQ 1431, where the commercial leases are being sought. This experimental work is allowing We'koqma'q to investigate new technology, including the effectiveness and efficiency of 100m polar circle cages and camera-monitored feed barges, and the suitability of triploid stocks for rainbow trout aquaculture in the Bras D'Or Lake. It is also enabling development of a diagenesis model (FINS) to predict sulfide levels below a finfish aquaculture operation. Over these years, We'koqma'q also worked with Dalhousie University to model farm interactions with the environment and evaluate the commercial performance of a new strain of rainbow trout. All of this development work has informed production plans and will continue to inform the direction that We'koqma'q takes in the future.

[1] Within this document the term "lease" is intended to refer to both the lease and licence required for marine finfish aquaculture production in Nova Scotia. It is sometimes also referred to as a "site".

As a result of this additional time and experience, the original development plans within the three application packages for commercial finfish aquaculture sites were updated several times according to business planning, information gleaned from fish production and monitoring operations on experimental sites in the area, and in response to network review questions and concerns.

This document submission represents a revision of the development plan for one of these three commercial finfish aquaculture sites: denoted as AQ 1431, otherwise known as "South Aberdeen". The intention of this submission is to collate all changes into a single development plan document to facilitate review of the application. A similar revised development plan has been prepared for the other two commercial finfish lease applications that are part of We'koqma'q's vision for a sustainable steelhead trout farm.

One general point is the change in the applicant's name to WFN Fish Farm Limited Partnership. Since submission of the applications in 2019, We'koqma'q First Nation Band Council established a new limited partnership to hold the fish farm operations. This limited partnership includes a general partner (WHI General Partner Incorporated) and a limited partner (We'koqma'q First Nation). Therefore, the name WFN Fish Farm Limited Partnership as the applicant better reflects the operational status of the fish farm since it includes the mind and management of the business. WFN Fish Farm Limited Partnership has been abbreviated to WFN throughout this document.

Changes in content to the original development plan are listed by section in the table below, along with the reasons for the modifications.

Section (s)	Brief description of change	Date of submission requesting change	Reason for the modification
General	Updated the site references to the numbers designated by NSDFA in their review process (i.e. AQ 0814x, AQ 1430, AQ 1431).	April 23, 2024	To add clarity on the site being described.
General	Replaced applicant name to WFN Fish Farm Limited Partnership (WFN) throughout the documents.	March 7, 2024	To reflect the formation of the Limited Partnership created to operate and govern the finfish farm activities.
General	Replaced BAP Standards reference to "BAP Farm Standard, Issue 3.1" throughout the document.	April 23, 2024	To reflect the current BAP standard applicable for the farm.
General	Added sub-headings in various places in the document.	April 23, 2024	Intended to better organize the information provided.
General	Made text adjustments according to change of people, status of activities, etc.	April 23, 2024	Small corrections were made to verb tenses and wording to accommodate the completion of projects and changing of people that have occurred since 2019.
Introduction	New Introduction section added to the Development Plan.	April 23, 2024 (Similar introductory sections appear in the previous Development Plan Update submissions.)	To provide context for the updated Development Plan.
Section 1.0	Reworded to reflect changes made to other sections of the Development Plan.	April 23, 2024	To accurately reflect plans and current knowledge.
2.1 Production Plan	Added strains of trout to be used.	August 30, 2019	Response to a request for additional information from NSDFA.

Section (s)	Brief description of change	Date of submission requesting change	Reason for the modification
2.1 Production Plan	Changed the production plan, including the "Maximum site biomass", description of infrastructure to be used (cage size, cage number), number of fish per cage, stocking density, stocking date and fallow plan. Added a note on the use of triploid stocks.	July 20, 2023, February 26, 2024, April 23, 2024	Business planning, advice from consultants, information gleaned from fish production and monitoring on the experimental site in the area, and network responses informed a new production plan that was better suited to sustainably farm in the area.
2.1 Production Plan	Added a Gantt chart to explain fallowing at AQ 1431. The addition of this figure required changing the numbering of all subsequent figures.	April 23, 2024	To clarify intended fallowing schedule.
2.2 Infrastructure	Added equipment and infrastructure acquired since 2019.	September 9, 2020; July 20, 2023; February 26, 2024; April 23, 2024	To demonstrate investment in major capital acquisitions that will support the technical capability and business outcomes for the farm's operations.
2.4 Employment	Updated text.	April 23, 2024	To reflect updated employment plans.
2.5 Other economic contribution to the local community and Province	Updated text.	April 23, 2024	To improve clarity and update expectations.
3.1 Status of fisheries activities	Updated recreational fishing season and species fished in the local area.	April 24, 2020 (Response to network comments for AQ 0814x)	To correct content according to NSDA Inland Division's input regarding an application for the affiliated site AQ 0814x.
3.1 Status of fisheries activities	Added reference to latest CSAS for salmon in Salmon Fishing Area 19 and added reference to latest available information for LFA 28 (lobster). Neither updated reference changed the status of these fisheries.	April 23,2024	To recognize updated information was available on the status of the Atlantic salmon fishery and the lobster fishery in the local area.

Section (s)	Brief description of change	Date of submission requesting change	Reason for the modification
3.1 Status of fisheries activities.	Added description of Moderate Livelihood Fishery in the region.	April 23, 2024	To update potential fisheries activities in the area with the acknowledgement of the Moderate Livelihood Fishery.
3.2 Impacts on fisheries activities	Added expected impact on Moderate Livelihood Fishery.	April 23, 2024	To update potential fisheries activities in the area with the acknowledgement of the Moderate Livelihood Fishery.
3.2 Impacts on fisheries activities *(Mitigating Fisheries Impacts through Operational Procedures – Fish Escape)*	Updated FMP containment requirements and their application at WFN.	July 20, 2023; April 23, 2024	To advise of FMP containment requirements enhanced since the original development plan submission in 2019 and their application at WFN.
3.2 Impacts on fisheries activities *(Mitigating Fisheries Impacts through Operational Procedures – Fish Escape)*	Updated status of BAP certification.	July 20, 2023; April 23, 2024	To reflect current certification status.
3.2 Impacts on fisheries activities *(Mitigating Fisheries Impacts through Operational Procedures – Fish Escape)*	Added reference to trialing triploid stocks for their application at the farm and intention to use in the future, if these stocks thrive.	July 20, 2023	To describe an enhanced biological containment measure being trialed to mitigate risks associated with a fish escape.

Section (s)	Brief description of change	Date of submission requesting change	Reason for the modification
3.2 Impacts on fisheries activities *(Mitigating Fisheries Impacts through Operational Procedures – Fish Escape)*	Updated the technical capacity of WFN with a revised list of management personnel and description of recent investments in training of employees.	July 20, 2023	To reflect the current management team and enhanced technical capacity of WFN.
3.2 Impacts on fisheries activities *(Mitigating Fisheries Impacts through Operational Procedures – Disease and Biosecurity)*	Addition of description of WFN's application of the FMP and updates to operational procedures that address Disease and Biosecurity.	July 20, 2023	To describe improvements to procedures that mitigate Disease and Biosecurity risks.
3.2 Impacts on fisheries activities *(Mitigating Fisheries Impacts through Operational Procedures – Environmental Impacts)*	Added description of FINS modelling work (Proactive Environmental Impact Modelling).	July 20, 2023	To describe research efforts initiated after 2019 that target the development of a model intended to predict environmental impact below a finfish operation in order to assist with planning stocking levels for a site (FINS).
3.2 Impacts on fisheries activities *(Mitigating Fisheries Impacts through Operational Procedures – Environmental Impacts)*	Updated water column quality parameters monitoring requirements for BAP certification and the status of BAP certification.	April 23, 2024	To reflect current applicable BAP standard requirements and WFN's status regarding BAP certification.

Section (s)	Brief description of change	Date of submission requesting change	Reason for the modification
4.1 Oceanographic environment	Updated hyperlinks and values for wind speeds. Added reference to report entitled "Wind and Wave Conditions – Whycocomagh Bay – Marine Finfish Leases 0814x, 0814, 0600, 1431, 5010, 1430" (Appendix F).	April 23, 2024	Hyperlinks replaced to current references. Old links for wind speed no longer worked, so all information was updated to more recent listings and known available information.
4.3 Site design (*Anoxic water)*	Updated knowledge about the thermocline and oxycline.	April 23, 2024	To ensure information in the plan is current with research and monitoring outcomes.
4.3 Site design (*Ice cover)*	Slight rewording. No change to procedure.	April 23, 2024	To better clarify that cages are moved from exposed areas to protected areas in the winter to avoid moving ice.
4.3 Site design (*Infrastructure for the site*)	Updated cage size and grid design.	September 9, 2020; with additional revisions April 23, 2024	To ensure information in the plan is current with intended infrastructure plans that have evolved from work at experimental sites in the area as well as engagement with engineers.
6.1 Navigation Protection Act Approval	Updated submission to Transport Canada of drawings of gear on site. Note that there were no changes to site boundaries requested for this site (AQ 1431). See also Appendix G.	April 23, 2024	To reflect change in infrastructure required for production plan modifications described in Section 2.1 and 4.3.
7.1 Identification of local salmon populations	Added a reference to the latest CSAS (2020). There was no change to the information regarding local salmon.	April 23,2024	To recognize updated information on the status of Atlantic salmon in the local area.
8.1 Identification of other aquaculture sites	Updated listing of other aquaculture sites in the area.	April 23, 2024	To clarify and update the current status of nearby aquaculture sites.

Section (s)	Brief description of change	Date of submission requesting change	Reason for the modification
8.2 Interactions with other aquaculture operations	Added information regarding how the three commercial finfish sites intended for the area will work together to provide the production level required for financial sustainability.	February 26, 2024	To reflect production plan modifications described in Section 2.1 and to clarify the fallowing period for rotating between cage arrays on the sites as well as complete lease fallowing.
Appendix B	Updated Appendix B (BAP Farm Standard).	April 23,2024	Updated to current applicable BAP standard (BAP Farm Standard Issue Number 3.1).
Appendix C	Updated Appendix C (Resumes of Senior Personnel).	July 20, 2023	Updated to reflect current management team.
Appendix D	Updated Appendix D with addition of a citation for a Master of Science thesis.	April 23, 2024	To provide a reference to outcomes of modelling research work completed since 2019.
Appendix F	Added a new Appendix: “Wind and Wave Conditions – Whycocomagh Bay – Marine Finfish Leases 0814x, 0814, 0600, 1431, 5010, 1430”.	April 23, 2024	To provide updated information regarding wind and wave conditions relevant for site design.
Appendix G	Added CNWA Notice of Work as Appendix G.	April 23, 2024	To ensure current site design information in included as part of the Development Plan.

SECTION 1: THE OPTIMUM USE OF MARINE RESOURCES

WFN Fish Farm Limited Partnership (WFN) is requesting a new marine finfish lease in the Bras D'Or Lake in Inverness County, NS: AQ 1431. This proposed site is within the Option to Lease # 1413 and is located on the southeast side of Whycocomagh Bay near Whycocomagh Portage. This lease application is one part of WFN's larger plan to achieve a trout aquaculture production level that promotes financial viability while ensuring social and environmental sustainability. WFN has been successfully conducting rainbow trout aquaculture in this region for several years, first as a contract grower, and for the past nine years as the business owner. The proposed site is 34 hectares in size and expected to support the grow-out of 1146 tons of rainbow trout annually.

AQ 1431 will share employment with two other proposed commercial finfish aquaculture sites in Whycocomagh Bay (AQ 1430 and AQ 0814x), while supporting the continuity of WFN's finfish operations as a whole by optimizing use of its local infrastructure, including a processing plant, a land-based storage facility, a land-based hatchery, management offices and farm management software. WFN is expected to directly employ 67 people with all proposed sites in operation. It will also promote the installation of new infrastructure and investment in new equipment - not only for the finfish cage operation, but also for WFN's processing plant and hatchery.

An examination of the habitat below the proposed site, published studies from the area, and knowledge collected during scoping for the proposed activities suggest that this development can proceed in harmony with fishery activities in the public waters surrounding the proposed aquacultural operation. Management measures will be in place to mitigate the most significant risks of finfish aquaculture to the environment, these being fish escape, disease and biosecurity, and benthic environmental impacts. These measures are supplemented by partnering on research projects aimed to model impacts of different production levels and determine suitable environmental monitoring of WFN's finfish aquaculture activities.

The oceanographic and biophysical characteristics of the public waters surrounding the aquaculture operation were reviewed. This included data collected within the scoping activities, published studies, as well as the local knowledge and extensive experience of researchers, employees and contractors of the company. This information supports the feasibility of a finfish aquaculture operation at the proposed site and provides the best knowledge to inform a site design. This knowledge has been used to develop the infrastructure, procedures and production plans for the site.

Consideration and respect for the other users of the public waters surrounding the site will be demonstrated by WFN's responsible farm practices which include high standards for site maintenance, noise reduction, and waste management. It is the intent of WFN that other users of the waters see the finfish aquaculture site as an opportunity for the region, rather than a negative development. Risks to wildlife users of the region will be mitigated via the management measures intended to reduce risk of fish escape, disease and biosecurity, and benthic environmental impacts. These will be further supplemented with a wildlife interaction plan that recognizes the most susceptible wildlife of the region.

A Notice of Works application accompanies this development plan. Outcomes from Transport Canada's assessment will be applied to ensure the public right of navigation through compliance with the Canadian Navigable Waters Act (CNWA).

The region is one of a handful of regions in Nova Scotia where Atlantic salmon populations still exist. It is also the region that has experienced the longest history of net pen rainbow trout aquaculture. The mitigation measures intended to reduce risk of fish escape; disease and biosecurity; and benthic environmental impacts; and the forward-looking environmental monitoring research WFN is partnering on can assist in the continued successful coexistence of wild Atlantic salmon with WFN's rainbow trout operations. Furthermore, there is environmental and oceanographic data collection in the bay being conducted by other researchers that is supported by WFN which is intended to improve understanding of the local ecosystem as a whole, as well as more broadly with regards to global warming. Although there is no direct intent to use this data to support Atlantic salmon conservation measures, an increased understanding of the environment may contribute to conservation practices in general.

With regards to the number and productivity of other aquaculture sites in the public waters surrounding the proposed aquacultural operation, WFN is currently the only finfish aquaculture producer in Whycocomagh Bay and will manage its sites as a collective in order to ensure that fish health risks and environmental impacts are minimized. Having an increased number of commercial sites will allow financial viability of the steelhead farm while availing enough area to increase fallowing.

This site is one request of three that will enable sustainable operation of WFN's finfish aquaculture operations. Activities will contribute to economic development of We'koqma'q First Nation and the local region in general. Site location considerations and mitigation practices will reduce impacts to other users of the local waters, including the fishery, wildlife (including Atlantic salmon), local residents, and seasonal visitors. This includes the public right to navigation. Ongoing environmental monitoring along with the support of local research efforts should ensure that these practices are effective now, and in the future.

As summarized above and detailed in this development plan, this proposed commercial finfish aquaculture lease should have minimal negative impacts on the factors to be considered in decisions related to marine aquaculture sites; but there are significant positive impacts. Therefore, this request should represent an optimum use of marine resources.

SECTION 2: THE CONTRIBUTION OF THE PROPOSED OPERATION TO COMMUNITY AND PROVINCIAL ECONOMIC DEVELOPMENT

2.1 Production plan

Species: Rainbow trout, *Oncorhynchus mykiss* (called "steelhead" when grown in salt water).

Strain or potential strain: The rainbow trout will be all-female from either or both of two egg sources:

1. Trout Lodge: "Silver Steelhead" or "Winter and Fall Strain" (Now referred to collectively as "Steelhead".)[2]
2. Riverence: "Steelhead Trout" which were developed from the "Donaldson strain"

Triploid stocks: For the past several years, WFN has been trialing the use of triploid rainbow trout stocks. At this time, the triploid fish are showing similar performance as diploid, but it is still early in the evaluation process. In 2024, only triploid fish will be stocked. Provided triploid stocks continue to perform well, WFN intends to use triploid fish in the future.

Maximum site biomass (kg): 1,146,000 kg, according to environmental monitoring results and modelling

Maximum cage density during grow-out period (kg/m^3): 20 kg/m^3

Expected time to achieve maximum production: Minimum of 9 months from stocking

Size(s) of cages, including net volumes (m^3): 100m (circumference) polar circle; 8 m depth; 6,350m^3 per cage

Maximum stocked cage number, maximum total stocked net volume (m^3): 1 active array of 10 cages = 63,500m^3

Maximum number of fish per cage during grow out period: Current plans are up to 56,000 per cage at harvest size. The numbers initially stocked per cage will be informed from fish performance and environmental monitoring results.

Intended initial stocking date and seed source: April 2025, from Big Falls Hatchery (AQ 1028) and over-wintering stock held at Lease AQ # 0814x in Whycocomagh Bay, south of We'koqma'q Reserve.

Expected grow out period: As early as April start, as late as December end, according to ice conditions.

Expected fallow period: The lease has been sized to allow the placement of two arrays of 2X5 100-m (circumference) cages each. See Sections 6.1 and 8.2. The plan is to rotate the array used on an annual basis to enable fallowing of an array for 15 months. The entire site will be fallowed for at least 3 months each year.[3] This fallowing plan is depicted in the Gantt chart below (Figure 1) where

[2] https://www.troutlodge.com/en/trout-genetics/trout-eggs/ Accessed March 31, 2024

[3] In the past, this site (AQ 1431) has been exposed to moving ice in the spring. As long as this occurs, cages will not be left here over the winter and this production area will be used in the ice-free period, from April to December, only. For the winter months (January to March), cages will be pulled into a sheltered area that is part of the AQ 0814x lease, requested in an affiliated application.

months with fish on each array are shown in blue; months with no fish on each array are shown in black.

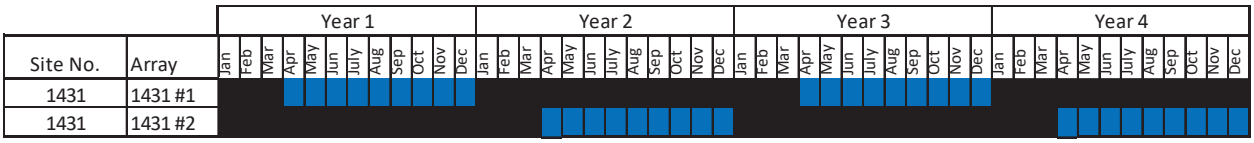


Figure 1: Gantt chart showing timing of fish stocking on each of two arrays at AQ 1431. Months with fish on each array are shown in blue; months with no fish on each array are shown in black.

Additional notes: As previously stated, this site represents one lease of three new or amended leases planned for WFN's finfish aquaculture operations. Use of all sites, as described in the development plans, is required to enable WFN to reach financial viability. A summary of the overall expected plans for sites can be found in Section 8.2.

2.2 Infrastructure

This site is to be serviced by WFN's facilities in and around Whycocomagh and Aberdeen. These services include the land-based facilities for holding and managing nets and feed in Whycocomagh; barges, boats and vehicles based in Whycocomagh; management offices at the We'koqma'q Fisheries and Band offices, a FishTalk farm management database housed at the We'koqma'q Fisheries office; and other supporting infrastructure and services. Additional investments in infrastructure and equipment for the fish farm that have occurred since the application was originally made in 2019 include:

- a winter harvest system and oxygenation system for the over-wintering location;
- two new engineered grids;
- more robust containment equipment: 400 mm SDR 17 Polar Cirkel cages of 100 m diameter, certified to the Norwegian NS 9415 Standard[4]; as well as STAR knotless containment nets of polyolefin fibres[5] - designed to withstand frequent net cleaning;
- a built-for-purpose harvest boat;
- a passive grading system;
- two remotely operated net cleaners;
- two state-of-the-art feeding barges that enable pan-camera viewing and remote feeding of fish.

Additional new nets, a Lift Up mort retrieval system; an improved net cleaner; an oxygen monitoring, production and delivery system; and modifications to existing vessels are planned for 2024. Pending this application, a new work barge as well as new grid systems are intended for 2025 or 2026. WFN's business plan projects additional significant capital investments at the farm over the next several years.

[4] https://www.akvagroup.com/plastic-pens/ Accessed March 31, 2024
[5] https://www.garwarefibres.com/products/smolt-grow-out-cages/star Accessed March 31,2024

WFN owns and operates the processing facility that handles their fish. This facility acquired BAP certification in 2021. Since the original site development plans were submitted in 2019, the processing facility has undergone a 2000 sq ft expansion; the roof to the pre-existing section of the building has been replaced; external storage facilities, including cold storage have been added; and a state-of- the art Baader 581 fillet machine has been installed and commissioned. Most recently, the processing facility purchased a vacuum system to add to the pin-boning machine. In 2024, a new raw material weighing system that will give enhanced yield capability will be added, along with a slurry ice system, and new heading and gutting machines.

Just previous to the original application submission, WFN acquired Big Falls Fish Growers in Wolfville, NS, in order to have full control over juvenile production for the aquaculture operation. The hatchery facility has since acquired: bulk oxygen storage; two boiler units for improved hatchery water temperature control; a tractor for farm operations; and is in its second phase of significant water treatment and distribution upgrades for conversion to a water re-use system. The primary focus of these upgrades is to enable the production of a larger fish for distribution to the lake sites and thereby reduce the time required in the net pens.

WFN has the facilities and infrastructure for egg to plate production of high-quality steelhead trout. It is focused on optimizing its business. It has made, and plans to continue to make, significant investments in infrastructure to do so.

2.3 Services and suppliers

Local (NS) service requirements in terms of contractors (welders, carpenters, others) and suppliers of general merchandise will be necessary to support the finfish operations. The scale of these requirements will be reflected by the scale of the operations. Processing will occur at WFN's facility in Aberdeen, NS, upgraded as described above. Juveniles will come from the improved Big Falls Hatchery in Wolfville, NS, described above. Feed will be purchased from outside of the province (Skretting in NB) because of the requirement that the feed mill be BAP certified in order to assist WFN's goal of achieving four-star BAP certification. Eggs will be purchased from an international supplier since there is no local supply. (The development of a local broodstock is under investigation and achieving a critical production mass will be imperative for its success.)

2.4 Employment

AQ 1431 will share employment with two other proposed farming sites (AQ 1430 and AQ 0814x), directly requiring 28 positions. These direct employees include a Director of Farming Operations, Farm Manager, Security team, Records Technician, Fish Welfare Lead, Technical Maintenance team, Harvesting & Logistics team, Feed team, Dive and Underwater Maintenance team, and Operations team. Each of the three proposed marine sites are vital to ensuring the security of employment of the rest of WFN since it will optimize the use of the processing facility in Aberdeen, NS (28 employees) and the hatchery in Wolfville, NS (7FT + 4 seasonal employees). In total, WFN's fish farming activities will directly support 67 employees[6].

[6] The potential economic benefits to the area were brought up during scoping. See page 5 of Report on Public Engagement During Scoping.

2.5 Other economic contributions to the local community and Province

Spin off economic benefits to the local communities would be expected to occur as well. A 2019 report on the economic impact of aquaculture in Nova Scotia indicated that 1.55 indirect jobs result from every person directly employed at an aquaculture operation (Foster, 2019). That suggests that an additional 104 indirect jobs depend on the success of this and the other two commercial finfish lease applications. Combining the 67 jobs that are directly tied to WFN and the estimated indirect jobs (104), this represents a total impact of 171 jobs, mostly in rural Nova Scotia.

2.6 Financial viability

WFN's business development plan has been submitted as a separate document.

2.7 Adverse economic impacts

There are no adverse economic impacts expected from fulfillment of this request.

SECTON 3: FISHERIES ACTIVITIES IN THE PUBLIC WATERS SURROUNDING THE PROPOSED AQUACULTURAL OPERATION

3.1 Status of fisheries activities

Recreational fishery

Trout

(Reference: https://novascotia.ca/fish/documents/Anglers-Handbook-2018.pdf and feedback from NSDFA Inland Fisheries)

The proposed aquaculture site is located in NS Recreational Fishing Area 1: Cape Breton, Inverness, Richmond and Victoria Counties, specifically within the Bras D'Or Lake. Here the speckled (brook) trout recreational fishing season is open in the tidal waters of the Bras D'Or Lake, including Whycocomagh Bay in which the proposed site is located, from April 1 to September 30, with some restrictions. The recreational fishing season for brown trout and rainbow trout is year-round. Skye River which feeds into the subwatershed of Whycocomagh Bay of the Bras D'Or approximately 8 km away from the proposed site is open for the same period. Other major recreational fishing rivers in the area feed into different subwatersheds. These include River Denys which feeds into the Denys Basin, and Middle River and Baddeck River which feed into the St. Patricks Channel. River Denys, Middle and Baddeck Rivers are Special Trout Management Areas with minimum size and bag limits. For further reference, the locations of these rivers are shown on a map in Section 7.1 (Figure 13).

A resident population of rainbow trout exists in the Bras D'Or Lake area. This is enhanced every year by the release of juveniles reared in provincial hatcheries to support the above-described rainbow trout sport fishery.

Non-salmonid species

(Reference: https://novascotia.ca/fish/documents/Anglers-Handbook-2018.pdf and feedback from NSDFA Inland Fisheries)

Recreational fishing for the following species is also conducted in the Bras D'Or Lake: white perch, yellow perch, brown bullhead, white sucker, chain pickerel, lake whitefish, striped bass, shad, gaspereau, smelt, and eel.

Atlantic salmon

(Reference: CSAS Science Response 2017/20, 2020/031)

The proposed site is located within Salmon Fishing Area 19. There is no recreational salmon fishing permitted in Whycocomagh Bay, where the proposed site is located. The Middle and Baddeck Rivers, which feed into the Bras D'Or to an adjacent subwatershed (St. Patricks Channel), have an open catch and release fall season for Atlantic salmon. Social and Ceremonial (FSC) allocations are also available on these rivers. For more discussion on this site and these rivers relative to the salmon populations, see Section 7.

Commercial Fishery

Historically, the Bras D'Or Lake has supported some limited fisheries activities. The bottom trawl fishery was banned in the Bras D'Or Lake in 1992. The local herring fishery closed in 1999. This left only lobster and oyster fishing.

Lobster

In 2016, there were 14 licences for commercial lobster fishing in the Bras D'Or Lake (Lobster Fishing Area (LFA) 28), with a trap limit of 250 and a minimum legal-size limit of 84mm. The season runs annually from April 30 to June 30 (DFO, 2017). This was unchanged, as of 2022 (DFO, 2022).

Historical landings from LFA 28 are shown in Figure 2.

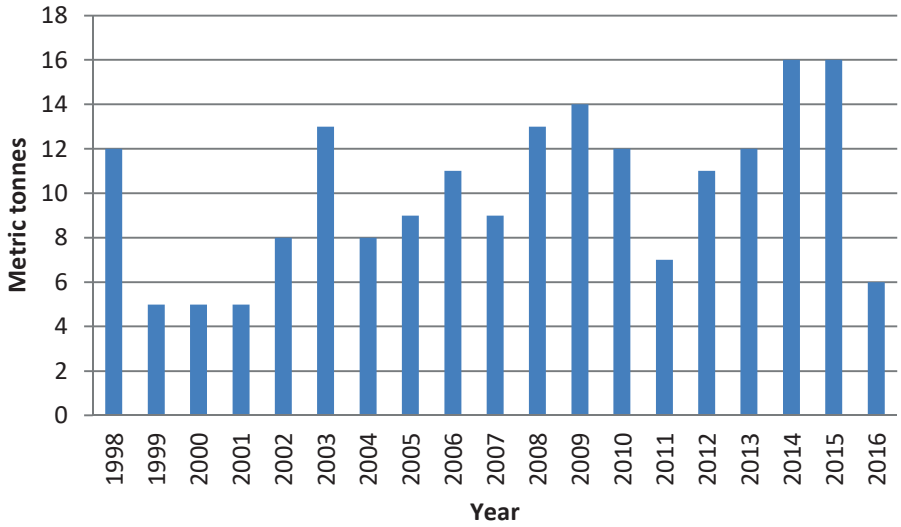


Figure 2: Historical lobster landings from LFA 28 (the Bras D'Or Lake). Graph generated from 2017 Stock Status Update (DFO, 2017). Landings for LFA 28 are no longer shared for confidentiality reasons due to the low number of LFA 28 licence holders. (DFO, 2022)

The lobster industry in LFA 28 is small relative to that of Nova Scotia in general. The mean landings for 2013-2015 for LFA 28 represent 0.8% of the mean landings for Nova Scotia for the same period, as calculated from data within the 2017 Stock Status Update (DFO, 2017).

Oyster

Oysters were an important harvest for local Mi'kmaq and, likely, non-native settlers of the Bras D'Or Lake region (Tremblay et al., 2002). Traditional knowledge of the area indicates that oyster populations were all along the north, west, and south west coasts of Whycocomagh Bay at one time (Eskasoni Fish and Wildlife Commission and Dept. of Fisheries and Oceans. 1996, cited not seen). However, populations declined due to over-fishing, degradation of habitats and the appearance of the MSX parasite (*Haplosporidium nelsonii)* in 2002 (Stephenson et al., 2003).

Traditional Mi'kmaw Fishery

We'koqma'q First Nation has traditionally fished in Whycocomagh Bay for a number of species including cod, hake, smelts, trout (speckled and brown), herring, mackerel, gaspereau, cod, eels, flounder, lobster, softshell clams, mussels and oysters. Currently, smelts, trout (speckled, brown and rainbow), eels, winter flounder, striped bass, softshell clams, mussels and oysters are fished (Joe Googoo, We'koqma'q Elder, personal communication).

Moderate Livelihood Fishery

There is some moderate livelihood fishing expected in the main Bras d'Or Lake for lobster. No moderate livelihood fishing is anticipated for Whycocomagh Bay, the body of water for this requested site (Bobby Gould, Fishery Manager at We'koqma'q First Nation, personal communication).

3.2 Impacts on fisheries activities

Recreational

Trout

Although rainbow trout are not indigenous to the Bras d'Or Lake area, it has a resident population that has developed from stocking efforts for the sport fishery, with the first trout introduced in 1899. These introduced fish have been shown to be successfully reproducing in some regions in the wild and are contributing to the fishery numbers (Madden et al., 2010). Rainbow trout continue to be stocked by the province through an enhancement program. Other trout populations do not seem to be affected by this enhancement, as exemplified by the fact that speckled trout populations are thought to be recovering in the Whycocomagh area (CEPI, 2006; Joe Googoo, We'koqma'q Elder, personal communication).

Rainbow trout aquaculture operations have been operating in Whycocomagh Bay for several decades and issues regarding the trout fishery have not been raised. Anglers of the area have historically been supportive of the trout operations. Robin Stuart, a previous manager of the fish farm was approached to collaborate with anglers to increase rainbow trout populations in the lake[7].

WFN will conduct their operations under strict containment management procedures, disease and biosecurity procedures, and environmental monitoring procedures as described below under "Mitigating Fisheries Impacts through Operational Procedures".

The successful historical co-existence of the recreational trout fishery with trout aquaculture operations combined with WFN's intended enhanced management procedures suggest that there will be minimal impacts on the recreational trout fishery.

[7] See page 6 of Report on Public Engagement during Scoping.

Non-salmonid species

As stated for the recreational trout fishery, rainbow trout aquaculture operations have been operating in Whycocomagh Bay for decades and issues regarding the sport fishery have not been raised. As also stated previously, WFN will conduct their operations under strict containment management procedures, disease and biosecurity procedures, and environmental monitoring procedures as described below under "Mitigating Fisheries Impacts through Operational Procedures".

Because of the successful historical co-existence of rainbow trout aquaculture operations with the sport fishery and the enhanced fishery risk mitigation efforts, there are no impacts on recreational fisheries activities anticipated for any species.

Atlantic salmon

Interactions with Atlantic salmon are described in Section 7 of the Development Plan.

Commercial Fishery

Lobster

Although lobsters were in Whycocomagh Bay in the mid 60's they have disappeared from the Bay since that time (Joe Googoo, We'koqma'q Elder, personal communication). Traditional knowledge collected in 1996 (Eskasoni Fish and Wildlife Commission and Dept. of Fisheries and Oceans. 1996, cited not seen) and trawl surveys from 1999 indicate no lobster inhabit Whycocomagh Bay (Tremblay et al., 2002). This proposed finfish aquaculture site will, therefore, likely not impact the commercial lobster fishery.

Oyster

Some populations of oysters remain in the lake today, including in Whycocomagh Bay, and initiatives are underway to understand why these populations survive. This knowledge will be used to develop stocks or culture practices that allow rejuvenation of the oyster populations (Vercaemer et al., 2010; Robin Stuart, personal communication). We'koqma'q First Nation is part of these efforts, have a vested interest in the rejuvenation of the oyster populations, and will continue to support developments along this line.

Traditional Mi'kmaw Fishery

As stated for the recreational fishery, rainbow trout aquaculture operations have been operating in Whycocomagh Bay for decades and issues regarding the traditional fishery have not been raised. As also stated previously, WFN will conduct their operations under strict containment management procedures, disease and biosecurity procedures, and environmental monitoring procedures as described below under "Mitigating Fisheries Impacts through Operational Procedures".

Because of the successful historical co-existence of rainbow trout aquaculture operations with the traditional fishery and the enhanced fishery risk mitigation efforts, there are no impacts on traditional fisheries activities anticipated for any species. This aquaculture development will be managed in

association with the other Mi'kmaw activities in the waters, including fishing. A single group manages both the fisheries and aquaculture portfolio of the Band and will ensure that they are complementary.

Moderate Livelihood Fishery

Because there is no moderate livelihood fishing expected in Whycocomagh Bay, the location for the proposed lease, there is no impact expected on this fishery.

General

It is notable that there were no fisheries concerns raised during the public scoping process conducted for this application.

Fish Habitat

In determining the potential for impact of an aquaculture site, the risks to fish habitat for the chosen site must be considered. WFN gathered information about the habitat beneath the proposed site and collated published descriptions of the area. This information is described below and is intended to assist with determination of fish habitat risks by DFO and others.

Habitat beneath the proposed site - summary of baseline monitoring

This summary is provided only to describe the habitat observed beneath the proposed site. Complete baseline monitoring results were submitted to DFO and NSDFA for their review as per Section 4.2.

Location Name	**Coordinates**	**Benthic sediment description**	**Flora/Fauna description**	**Station Classification**
Southside Aberdeen, Center Lease	Lat: 45.96054; Long: -61.02726	Brown mud with some greyish mud	Holes, mussel shells	Oxic A
Southside Aberdeen, Corner Lease 1	Lat: 45.9627; Long: -61.02195	Dark brown mud; holes in mud	n/a	Oxic A
Southside Aberdeen, Corner Lease 2	Lat: 45.96081; Long: -61.03368	Brown mud; holes in mud	Dead roots	Oxic A
Southside Aberdeen, Corner Lease 3	Lat: 45.95756; Long: -61.03232	Sediment could not be retrieved according to required standard. Hard bottom video transect was completed in its stead with video taken every 10m. Video revealed a mixed bottom: rock and hard packed sand with some silt. Starfish, small bivalves all along transect. Algae at three points. A rock crab was visible at one point on transect. Bivalve shells at three points on transect. Eel grass or eel grass strands at three points along transect.		

Location Name	Coordinates	Benthic sediment description	Flora/Fauna description	Station Classification
Southside Aberdeen, Corner Lease 4	Lat: 45.9594; Long: -61.02065	Dark brown mud	n/a	Oxic A
Southside Aberdeen, Reference 1	Lat: 45.975882; Long: -61.03986	Brown/black mud	n/a	Oxic A
Southside Aberdeen, Reference 2	Lat: 45.9622; Long: -61.01108	Sediment could not be retrieved according to required standard. Hard bottom video transect was completed in its stead with video taken every 10m. Video revealed sediment of rock and hard packed sand; cobble; rock; and some silt all along transect. Star fish visible at each point along transect. Small bivalves at four points along transect. Mussels and clams at one point and algae at one point. Bivalve shells visible along transect. Leaves visible at two adjacent stations along transect.		

Published descriptions of the benthos of Whycocomagh Bay

As extracted from Parker et al., 2007: "Whycocomagh Bay has two deep basins and a flushing time of approximately two years. This slow water exchange facilitates the unique anoxic and hypoxic character of the deep basins within the Bay (Petrie and Bugden 2002). The eastern basin in Whycocomagh Bay, immediately west of St. Patricks Channel, has DO levels as low as 38% at the bottom (38 m) (Strain and Yeats 2002). The 48 m deep western basin has only 47% saturation at 15 m depth, and is typically anoxic below 25 m (Krauel 1975), a characteristic that appears consistent over the year and over time (Strain and Yeats 2002). Black's (1958) observation of only a few organisms of two shallow water species of mysid shrimp in Whycocomagh Bay is a further indication that low dissolved oxygen levels have likely existed for some time in the deeper waters at this location." In the same review paper, a limited diversity of copepods was also noted for Whycocomagh Bay, with only the four most common copepod species typically being found.

Previous internal studies on the site area

Several years ago, baseline information on the benthos of this area was conducted. Although the environmental monitoring data did not meet the QA/QC guidelines of the Nova Scotia Department of Fisheries and Aquaculture, the information is still relevant. The internal report produced as a result of this study is attached as Appendix A. This study indicated that the benthic flora and fauna in the area of the site were limited in diversity.

Mitigating Fisheries Impacts through Operational Procedures

Three of the greatest perceived risks of finfish aquaculture operations to fisheries and fisheries' habitats are fish escape, disease, and impact on the benthos and water quality. WFN will institute operational procedures to mitigate these risks as described below.

Fish Escape

All of the WFN finfish aquaculture operations will follow the fish containment management requirements described in their Farm Management Plan (FMP) as defined by the Nova Scotia Aquaculture Management Regulations. This containment management plan includes:

- Described and approved operating procedures that limit the risk of a breach, including the identification of critical control points, critical control limits, monitoring and corrective actions. The controls are identified through conducting a site-specific hazard analysis.
- Described and approved procedures for site management if unusual events or severe weather occurs.
- Minimum infrastructure requirements, and minimum infrastructure maintenance and inspection requirements –including proof of a professional engineer's approval of the design of the structures in place for containment management.
- Described and approved responses to breaches or suspected breaches, including mandatory reporting.

The above plan will be approved for implementation by NSDFA and operators will be audited for adherence to the plan according to NSDFA's requirements.

FMP Containment Requirements Instituted after 2019

In addition to the minimum requirements that were in place for marine finfish operators at the time of the original lease application submission (2019) and described therein, the Containment Management Framework of the FMP was expanded and further clarified in 2021. A significant piece of this clarification was the requirement of "approved/certified engineering documentation pertaining to the integrity of the site's infrastructure. In essence, the site infrastructure design and construction must have been deemed as being satisfactory to reasonably withstand the prevailing oceanographic and meteorological conditions (e.g., weather, currents, ice flow, etc.) at the site's location to ensure the fish stay contained."

WFN has engineering approvals for its current experimental lease installations in North and South Aberdeen. In addition, WFN has been working with Gael Force[8] since March, 2023 to enhance modelling of mooring systems at the new lease sites to detect the weakest points and target these areas for reinforcement. This work is ongoing (April 2024). These models for the new proposed lease sites will be submitted to NSDFA, once completed and will add an additional layer of diligence regarding the integrity of the infrastructure regarding fish containment. It is notable that WFN's infrastructure has been updated with more robust equipment; and procedures have been updated as a result of the FMP requirements, with enhanced quality control checks and increased training. The containment structures have withstood the strain of Hurricane Fiona and other major wind and weather events with no issues for the past several years.

FMP Status at WFN

The FMP was still relatively new to the industry in 2019, when the original applications were submitted. Since that time, WFN has used the FMP as a foundation for establishment of best practices. The execution of these best practices is facilitated by increased personnel capacity

[8] https://www.gaelforcegroup.com/ Accessed March 31,2024

described in a later section. Additionally, the implementation of the FMP has been enhanced by the creation of a new position of Records Technician, to better enable the tracking of records and to increase assurances that standard procedures are followed.

BAP Certification

WFN's finfish operation is working to become certified to the Global Aquaculture Alliance's Best Aquaculture Practices (BAP). This science-based and continuously-improved global performance standard is third party audited and assures "healthful foods produced through environmentally and socially responsible means". The BAP standard requires the application of a written "Containment Plan" to prevent fish escape. This would be above and beyond the FMP containment requirements described above, and it would be third party audited. The relevant BAP Farm Standard (Issue 3.1) is attached as Appendix B. Since 2021, WFN has successfully had its processing plant certified to the BAP seafood processing standard and continues the groundwork required for certification of the hatchery and marine farm.

Use of Triploid Stocks

As mentioned in Section 2.1, for the past several years, WFN has trialed the use of triploid rainbow trout stocks. Providing the triploid fish are able to thrive at the marine farm, WFN intends to use triploid fish in the future since such stocks are sterile. This is a mitigation measure to reduce risks associated with a fish escape. Effectively, if an escape event were to occur, reproduction of the escaped triploids could not occur.

Technical Capacity

Finally, the regulatory and certification minimum requirements will be enhanced with the extensive practical knowledge and experience of the managers responsible for WFN's finfish aquaculture operations. Resumes for senior management are attached as Appendix C.

A brief synopsis of their most relevant qualifications and experience follows:

- Manager of Aquaculture Operations: Wade Skinner – more than 15 years of fish farm experience, at a variety of locations and from a range of perspectives, from operations to infrastructure.
- Farm Manager: Anthony Phillips – four years of operational experience at WFN, significant leadership experience within the community.
- Hatchery Manager: Trissa Dunham – a decade of salmonid hatchery experience, formally trained as a biologist (BSc)
- Processing Plant Manager: Wayne Fowlie – decades of seafood processing experience, aquaculture experience, formally trained as a biologist/biochemist (BSc)
- VP Sales: Steve French – more than thirty years of seafood sales experience, formal business training (BBA)

This group meets frequently to discuss and coordinate production planning from egg to plate. They are a solid leadership team with extensive experience in aquaculture and related industries.

Additionally, since the original applications were submitted, personnel capacity at the farm has been greatly enhanced, both in terms of acquiring new people, as well as in terms of training retained persons.

Recent training programs delivered to employees which are incremental to mandated safety and operations requirements are listed below:

- NSCC Aquaculture Operations Certificate (2023) - 4 persons
- FishTalk Farm Management software (2023) – 1 person
- Occupational SCUBA Diver Certification (2021) – 5 persons
- Operational Training (2021, 2022) – 4 persons
- Road to BAP Certification Training (2019, 2020) – 36 persons

Disease and Biosecurity

All of WFN's finfish aquaculture operations will follow the fish health requirements within their Farm Management Plan as defined by the Nova Scotia Aquaculture Management Regulations. These requirements include:

- Described and approved finfish husbandry and welfare, veterinary care and disease surveillance practices. These practices include following the NSDFA marine finfish disease surveillance program and adhering to the multi-governmental agency (NSDFA, DFO, CFIA) Introductions and Transfers disease screening and permitting requirements.
- Described and approved biosecurity measures appropriate to the operation and its risk.
- Prescribed mortality and disease reporting requirements.
- Prescribed reporting of antibiotic and products used to treat sea lice.
- Described and approved procedures and measures to be followed in the case of a disease outbreak.

The above elements will be approved for implementation by NSDFA and operators will be audited for adherence to the plan according to NSDFA's requirements.

FMP Status at WFN

As stated previously for Fish Escape mitigation, the FMP was still relatively new to the industry in 2019, when the original applications were submitted. Since that time, WFN has used the FMP as a foundation for establishment of best practices. The execution of these best practices is facilitated by increased personnel capacity described in an earlier section.

Disease and Welfare-Specific Updates to Procedures

In addition to the fish health aspects within the FMP that were described in the original applications, WFN has implemented elements to increase fish welfare, and subsequently reduce fish health and disease risks, including the following:

- Stocking with a larger juvenile to reduce time at sea and ensure a stronger, more resilient fish at sea pen entry.

- Use of passive grading, when applicable, prior to harvest, to reduce unnecessary fish handling and facilitate the reduction of densities.
- In-house, five-member crew of certified occupational SCUBA divers for inspecting fish and retrieving mortalities in a timely manner.
- Increased use of underwater cameras for observing fish.
- Creation of Records Technician position to encourage timely inspections, water quality monitoring, and procedures with appropriate recording.
- Creation of Fish Welfare position to execute required monitoring and oversight of fish handling activities.

BAP Certification

As stated previously, WFN is working to become certified to the Global Aquaculture Alliance's Best Aquaculture Practices. This certification includes sections addressing minimum animal health and welfare and biosecurity requirements. These requirements would be above and beyond the FMP fish health requirements and require third party auditing. The relevant BAP Farm Standard (Issue 3.1) is attached as Appendix B. Since 2019, WFN has successfully had its processing plant certified to the BAP seafood processing standard and continues the groundwork required for certification of the hatchery and marine farm.

Unique Biophysical Conditions in the Bras D'Or

An additional relevant aspect regarding disease relates to the unique low salinity waters of Whycocomagh Bay, the region of the proposed site. Salinity measurements of 17-18 ppt are recorded at the surface and approximately 20 ppt within a few meters. This has a number of fish health advantages that mitigate disease risk. Sea lice, which are ectoparasites of salmonids that may transfer between cultured and wild fish populations, and are often a great concern for salmonid fisheries enthusiasts, do not thrive in lower salinity waters (R. Wooten and C. Sommerville, personal communication). Bricknell, et al., 2006 demonstrated that sea lice (*Lepeoptheirus salmonis*) actively avoid low salinities (<27ppt) and even short-term exposure to low salinity water (<27ppt) severely compromised sea lice survival and host infectivity. Low salinity waters are also known to reduce the risk of amoebic gill disease (AGD) (Mitchell & Rodger, 2011), another disease of concern for salmonid culturalists. Finally, the low salinity water reduces osmotic transfer stress from the hatchery, thereby reducing fish health and welfare risks.

Environmental Impacts

All of WFN's finfish aquaculture operations will follow the Environmental Monitoring Program requirements dictated by NSDFA as required by the Aquaculture Management Regulations, as well as the environmental monitoring requirements required by DFO according to the Aquaculture Activities Regulations (AARs). These monitoring requirements focus primarily on potential impacts on the surrounding marine benthic environment, a primary concern regarding marine finfish aquaculture sites. They apply a risk-based approach to determine monitoring requirements. Monitoring requirements for marine finfish sites include:

- A site-specific benthic sampling and monitoring regime customized according to production level, site configuration, species cultured, past environmental performance of the site, and site specific oceanographic and biophysical characteristics. This must be pre-approved by NSDFA prior to the monitoring.
- Provincial and Federal review and approval of records of observations taken during monitoring and of the monitoring conducted, including Quality Assurance and Quality Control records that demonstrate adherence to procedures and protocols defined by NSDFA in their EMP Standard Operating Procedures (SOPs) and DFO within the AARs.
- Provincial and Federal review and approval of records of lab results, including Quality Assurance and Quality Control records that demonstrate adherence to procedures and protocols defined by NSDFA in their EMP Standard Operating Procedures (SOPs) and DFO within the AARs.
- Reporting of the results to NSDFA and DFO within defined timelines.

The environmental program also requires the provision of a mitigation plan which is to be applied when poor environmental performance is indicated by the monitoring.

WFN contributes to the Environmental Monitoring Program's ongoing development through representation on the Nova Scotia Aquaculture Environmental Coordinating Committee. This committee, which is co-chaired by NSDFA and DFO, is a forum for industry and regulators to provide input and exchange ideas regarding the environmental monitoring program for marine sites in Nova Scotia.

Proactive Environmental Impact Modelling

In addition to mandated benthic sampling, WFN has participated in an enhanced environmental monitoring program at one of their experimental finfish aquaculture sites which overlaps the commercial site being applied for in this submission. This program collected environmental monitoring data to proof and hone a model (FINS) developed to predict sulfide levels below a finfish aquaculture operation. FINS uses a diagenesis[9] model (DIGENIX) that incorporates a hydrodynamic model (FVCOM) and depositional model (ORGANIX) to predict expected sulfide level outcomes based on stocking densities, feed rates, cage arrangements and hydrodynamics of the site. It is anticipated that such a model will help WFN to proactively minimize impacts on the benthos when planning future fish farming activities.

Additional Environmental Impact Reduction Procedures

Specific operational practices to reduce benthic impact are planned for WFN's commercial finfish aquaculture activities. Having more available lease area, as will be achieved in part with this new site, will enable greater fallowing times of sections of the leases. This strategy will be combined with increased training of staff on the use of feeding cameras and feeding techniques to try to improve food conversion and reduce benthic impacts.

[9] Diagenesis refers to the physical, chemical, and biological changes in sediments after deposition.

BAP Certification

As stated previously, WFN is working to become certified to the Global Aquaculture Alliance's Best Aquaculture Practices. This certification includes sections addressing minimum environmental monitoring requirements. These requirements would be above and beyond the FMP environmental monitoring requirements. For the WFN's finfish aquaculture sites in the Bras D'Or Lake, this environmental monitoring has to include monitoring the water column itself for quality parameters including total suspended solids, dissolved oxygen, chlorophyll a, total phosphorous, and phytoplankton. WFN has started this monitoring. The relevant BAP Farm Standard (Issue 3.1) is attached as Appendix B. Since 2021, WFN has successfully had its processing plant certified to the BAP seafood processing standard and continues the groundwork required for certification of the hatchery and marine farm.

Mitigating Fisheries Impacts through Research and Development

WFN is committed to monitoring and mitigating impacts of its finfish aquaculture activities on the environment, including fisheries and fisheries' habitat. In this regard, WFN has historically supported and will continue to support researchers as they assess and develop techniques to monitor impacts.

Efforts have included collaborating with Peter Cranford, of DFO Science, and NSDFA to evaluate alternative means for monitoring benthic environmental impacts. WFN has also supported research to complete a carrying capacity analysis for finfish aquaculture in Whycocomagh Bay. This study, led by Dr. Christopher Algar (Dept. of Oceanography, Dalhousie University), developed a model that captured carbon, oxygen, and sulfur dynamics in the sediments of Whycocomagh Bay, both with and without the influence of fish cages. The model was used to assess the impact of aquaculture on the Whycocomagh Bay benthic ecosystem and investigate how changes in fish-rearing practices, such as increased stocking levels, may affect these impacts. Additional information regarding this work can be found in Appendix D. WFN was a partner on this project, providing site access, logistics assistance, personnel, historical environmental monitoring data and production data.

SECTION 4: OCEANOGRAPHIC AND BIOPHYSICAL CHARACTERISTICS OF THE PUBLIC WATERS

4.1 Oceanographic environment

The proposed site is in Whycocomagh Bay of the Bras D'Or Lake - referred to as "Bras D'Or Lakes" by some. The following excerpt from Lambert, 2002, gives excellent background information on the unique oceanographic environment of the Bras D'Or Lake:

"The Bras d'Or Lakes are situated in Cape Breton Island at the northern end of Nova Scotia. This body of water of about 1,100 km^2 is essentially an enclosed estuary with three outlets to the sea. The Great Bras d'Or Channel and the Little Bras d'Or Channel connect with Sydney Bight to the north, and St. Peter's Canal gives access to Chedabucto Bay to the south. Only the Great Bras d'Or Channel is large enough to permit any significant exchange of water. The Bras d'Or Lakes watershed is about 2500 km^2; this area added to that of the Lakes themselves gives a total catchment area of 3600 km^2 (Krauel, 1976).

Input from six rivers and restricted access to the ocean keeps salinity in the range of 20 to 26, whereas, sea water just outside the Lakes in Sydney Bight ranges from about 28 to 32. The Lakes are usually ice covered in the winter and surface waters often exceed 20°C in the late summer, particularly in smaller, shallow bays (Petrie and Bugden, 2002).

The waters of the Bras d'Or Lakes are characterised by a two-layer system; a low salinity surface layer which has a wide annual range in temperature and a lower layer of higher salinity in which temperature range is much less pronounced. In general, surface water moves toward the entrance of the Lakes and out into Sydney Bight and is replaced with outside oceanic water which enters the Lakes near the bottom and flows underneath the surface layer (Krauel, 1976; Petrie and Bugden, 2002). With the exception of restricted channels, there is little mixing between these layers except for winter months when higher winds and wave action disrupt the stability of this system. In some areas where currents and exchange rates are very low, the amount of dissolved oxygen can become quite depressed and in Whycocomagh Bay, anoxic (no oxygen) conditions exist (Petrie and Bugden, 2002; Strain and Yeats, 2002)."

The biophysical characteristics of the site environment are summarized in the table below with supporting figures and tables provided, as relevant.

Characteristic	Value	Reference	Comments
Wind speed (km/hr)	14.45 average, 98.2 max	Cape Breton Mesonet (Whycocomagh weather station)[10]	Derived from measurements taken from weather station in Whycocomagh Bay since November 2020.
Average wind speed (km/hr) (30m height)	20.6	Canada.ca Wind Atlas[11]	Value derived from wind atlas for GPS coordinate at center of lease.
Wind speed class rating (10m height)	Moderate to High	Keys et al., 2017. Digital Wind Exposure Map for NS. Forest Research Report FOR 2017-15	Wind speed class rated from "Very Low" to "Very High" based on estimated annual maximum wind speeds across Nova Scotia. Value/rating stated is for shoreline adjacent to proposed site.
Maximum wave height (m)[12]	1.08	Raw data obtained from David Cook (NSDFA) from ACDP deployment.	Value stated is the greatest Hmax measured with the ACDP during October 31, 2018 to December 11, 2018 deployment at a site across the Bay but within 2 km of this site.
Direction of maximum wave	244° (WSW)	Raw data obtained from David Cook (NSDFA) from ACDP deployment.	Direction stated is the direction of the maximum wave listed above.
Annual minimum tide (m)	The Bras D'Or Lake has very small lunar tidal fluctuations. Whycocomagh Bay, in particular, shows limited change. As extracted from Parker et al., 2007: "A 21-day record from the western end of Whycocomagh Basin indicated no detectable semidiurnal or diurnal tides (Dupont et al. 2003; Petrie 1999)." Results from an ADCP (Acoustic Doppler Current Profiler) deployed in the site region from October 2018 to December 2018 supports this observation with little measured change in depth. Local persons have observed an increasing tidal range in recent years, for example with exceptionally large tides of 0.5m observed in the fall of 2018 (personal communication, Robin Stuart).		
Annual maximum tide (m)			

[10] https://capebretonweather.ca/archive.php?id=001D0A80898D Accessed April 1, 2024.

[11] http://www.windatlas.ca/rose-en.php?field=E1&height=30&season=ANU&no=6&lat=45.960595&lon=-61.027308 Accessed April 1, 2024.

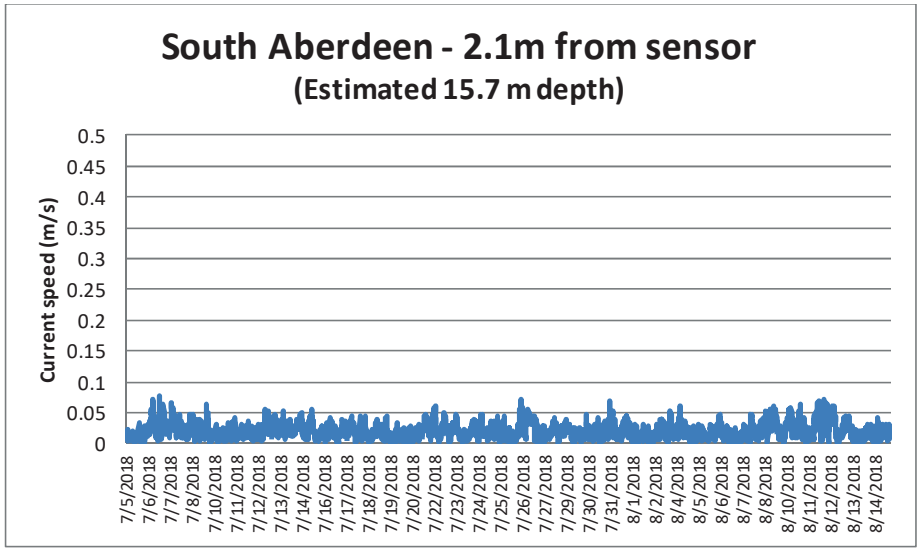
[12] The wave characteristics were collected off site but within 2 km of this proposed site. They were collected over the autumn months and early winter months of 2018 (October 31, 2018 to December 11, 2018) via deployment of an ADCP (Acoustic Doppler Current Profiler). This monitored a number of variables at multiple levels in the water column. Although only summaries are depicted within this plan, all of the data derived from this monitoring will be used in the engineering of the cage and infrastructure for this site.

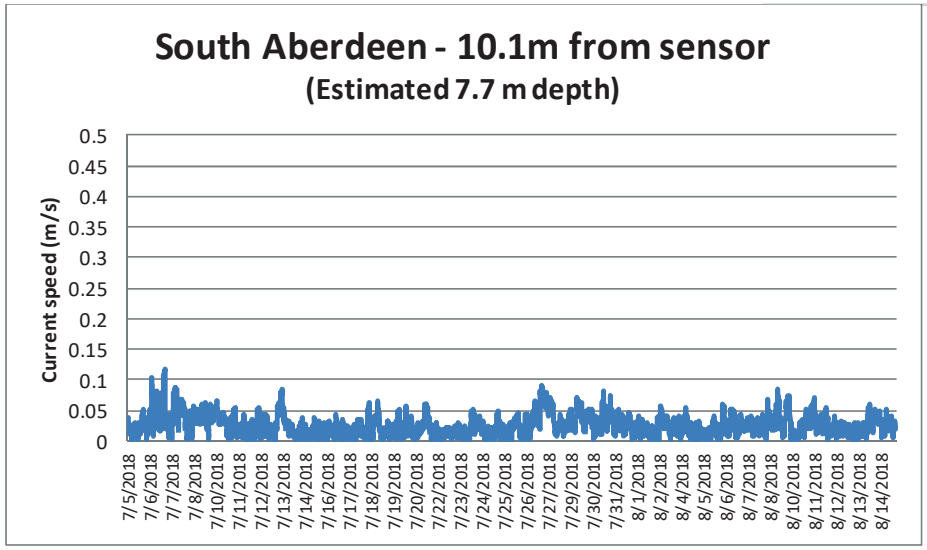
Characteristic	Value	Reference	Comments
Current speed range and averages (cm/sec)[13]	See Figure 3 a,b,c,d and statistics summary table (Table 1) that follow.		
Annual minimum salinity (ppt)	Upper 10m: 15 ppt Below 10m: 17 ppt	Tremblay, 2002	Throughout the Bras d'Or Lake, salinities are lower in the 0-10 m depth interval than in the 10-50 m depth interval and in the upper metre of the Whycocomagh and Denys Basins maybe 5 after rainfall (Petrie, 2001). There is also a seasonal difference in salinity, with lower salinities in spring compared to summer. Tremblay, 2002). The salinities of the area are shown in Figure 4 which was adapted from figures within Tremblay, 2002
Annual maximum salinity (ppt)	Upper 10m: 25 ppt Below 10m: 27 ppt	Tremblay, 2002	
Annual minimum temperature (°C)	3°C	Raw data obtained from David Cook (NSDFA) from ACDP deployment.	Value stated is the lowest ADCP temperature measured during October 31, 2018 to December 11, 2018 probe deployment at a site across the Bay but within 2 km of this site. See also summary temperature plots (Figures 5, 6).
Annual maximum temperature (°C)	25°C	Raw data obtained from David Cook (NSDFA).	Value stated is the greatest "cage level" temperature measured during June 1, 2018 to August 19, 2018 probe deployment at a site across the Bay but within 2 km of this site. See also summary plots (Figures 5, 6). Although some temperature data was also recorded on this site, the recording

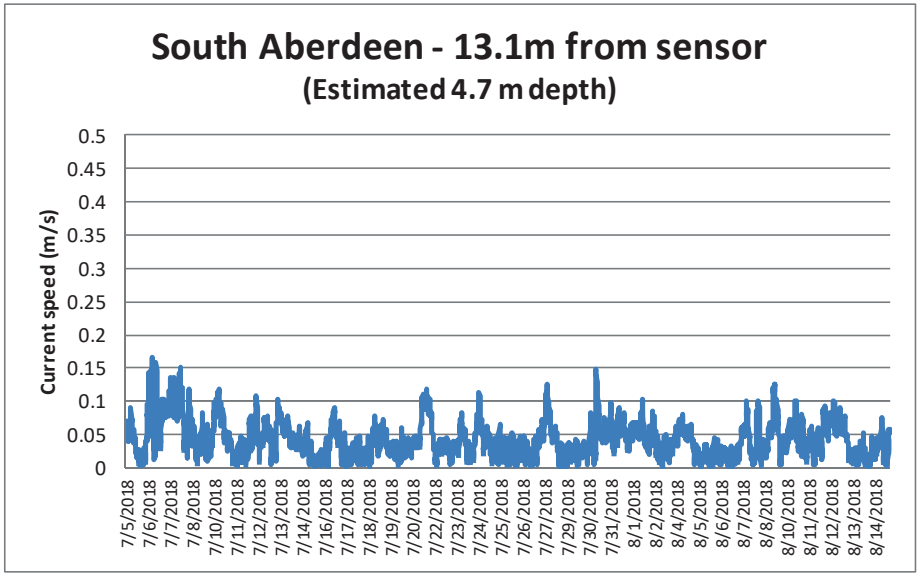
[13] The current speed and direction values of this area were collected from July 5, 2018 to August 15, 2018 via deployment of an ADCP (Acoustic Doppler Current Profiler). This monitored a number of variables associated with currents at multiple levels in the water column. Although only summaries are depicted within this plan, all of the data derived from this monitoring will be used in the engineering of the cage and infrastructure for this site.

Characteristic	Value	Reference	Comments
			occurred below the thermocline so that it was not reflective of the maximum temperatures that would be experienced by the fish.
Depth of water at each corner of the site (m)	Corner 1: 25.4m Corner 2: 26.1m Corner 3: 13.0m Corner 4: 14.0m Center Lease: 27.9m	Depths taken during baseline EMP sampling	

Since the original submission of the Development Plan, a report on the wind and wave conditions at the site was prepared for CMAR by DSA Engineering: "Wind and Wave Conditions – Whycocomagh Bay – Marine Finfish Leases 0814x, 0814, 0600, 1431, 5010, 1430". This has been added as a new Appendix to this development plan (Appendix F).







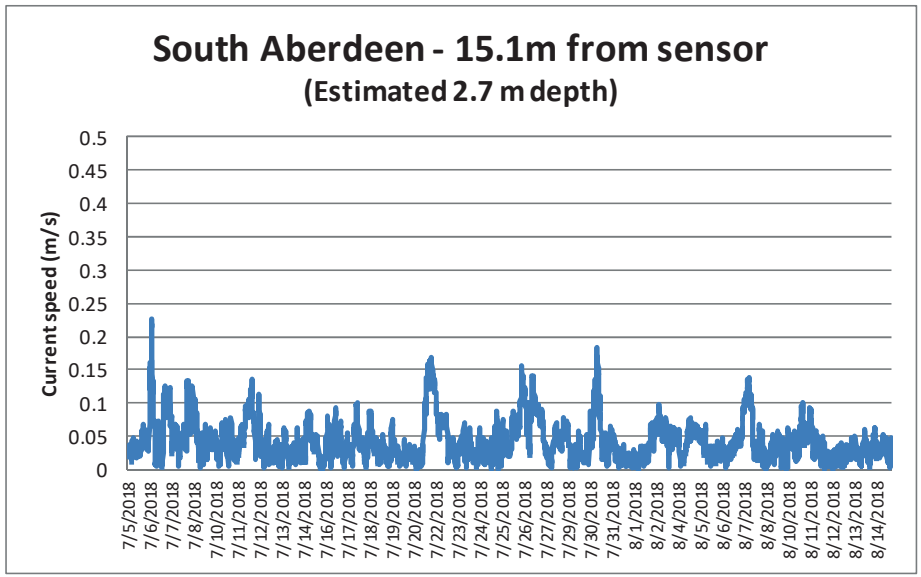


Figure 3 a,b,c,d: Current speeds measured on site in 2018 (July 5 to August 15, 2018). Raw data obtained from David Cook (NSDFA) from ADCP deployment. Estimated depths calculated from sensor deployment characteristics.

Table 1: Summary table of current speeds statistics determined from data derived from ADCP deployed on site July 5, 2018 to August 15, 2018. Raw data obtained from David Cook (NSDFA) from ADCP deployment.

Height from sensor (m)	2.1	3.1	4.1	5.1	6.1	7.1	8.1	9.1	10.1	11.1	12.1	13.1	14.1	15.1
Estimated mean depth* (m)	15.7	14.7	13.7	12.7	11.7	10.7	9.7	8.7	7.7	6.7	5.7	4.7	3.7	2.7
Min speed (m/s)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Max speed (m/s)	0.077	0.087	0.084	0.100	0.101	0.120	0.122	0.102	0.117	0.123	0.130	0.165	0.231	0.226
Mean speed (m/s)	0.021	0.021	0.021	0.022	0.021	0.021	0.022	0.023	0.026	0.031	0.036	0.043	0.046	0.043

*Calculated by subtracting the bin sizes from the measured sensor depth.

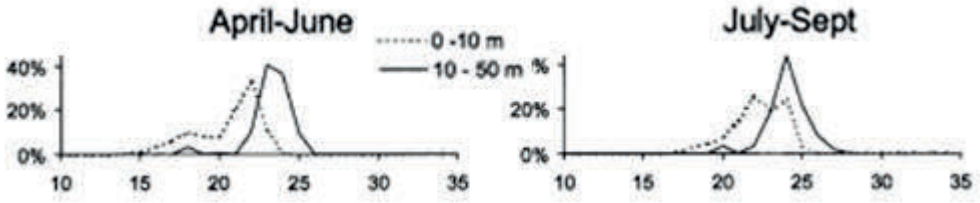
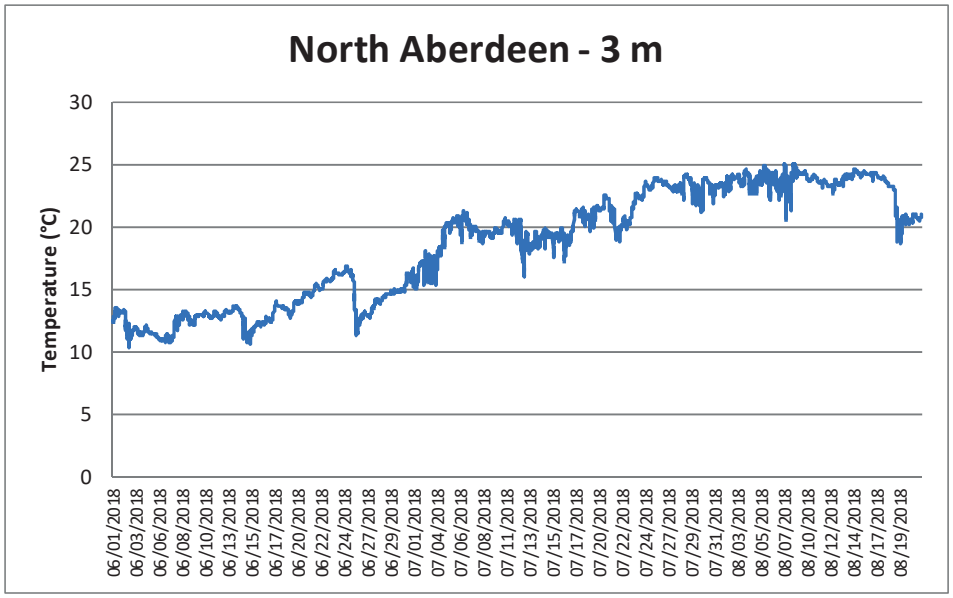
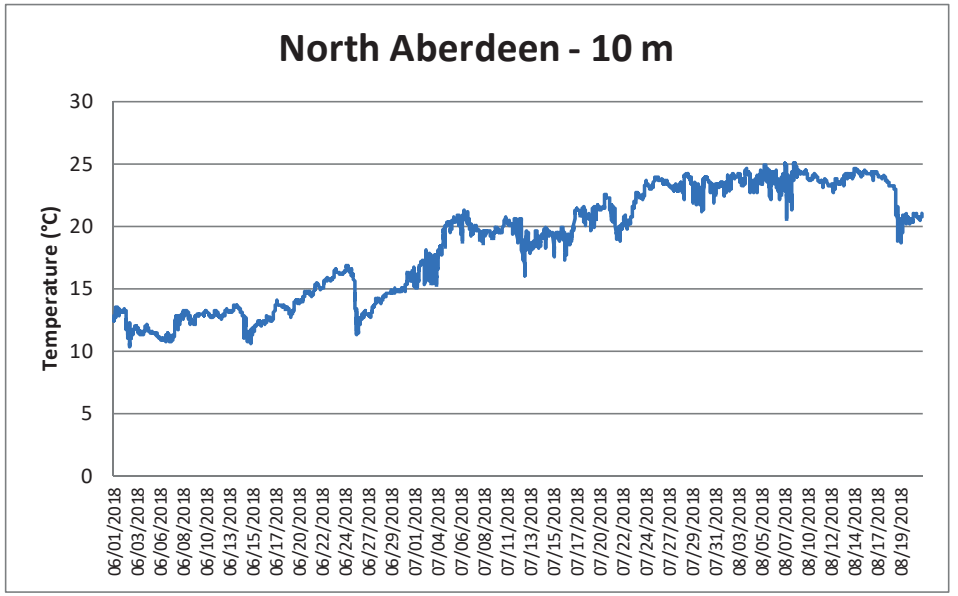
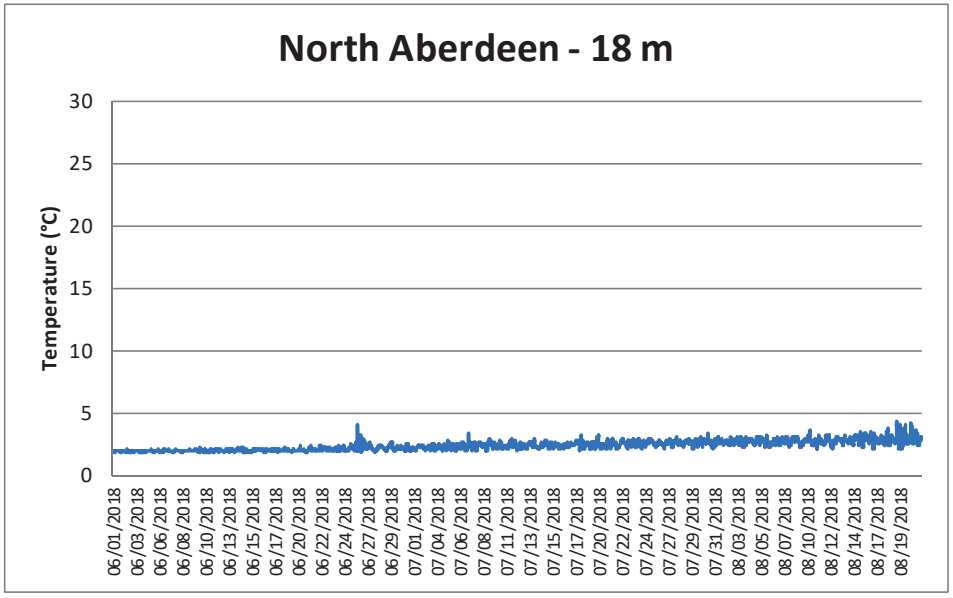


Figure 4: Frequency distribution of salinity measurements taken from Baddeck Bay, including Whycocomagh Basin, Baddeck Bay and St. Patrick's Channel. Figure adapted from figures within Tremblay, 2002.







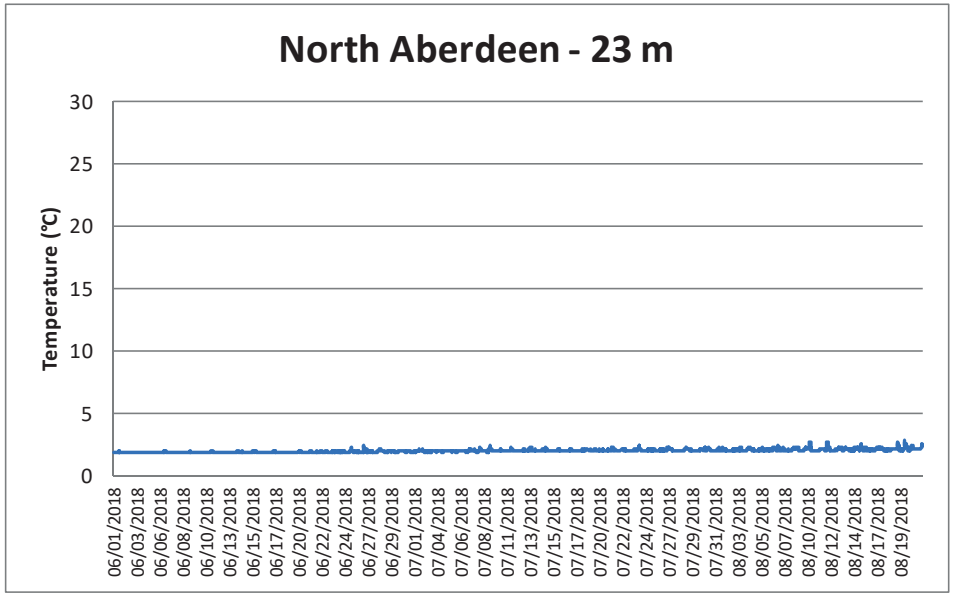


Figure 5 a,b,c,d: Summer temperatures measured in 2018 (June 1, 2018 to August 19, 2018) at depths from surface as recorded at deployment of sensors. Sensors were deployed within a few km of the site proposed in this Development Plan. Raw data obtained from David Cook (NSDFA).

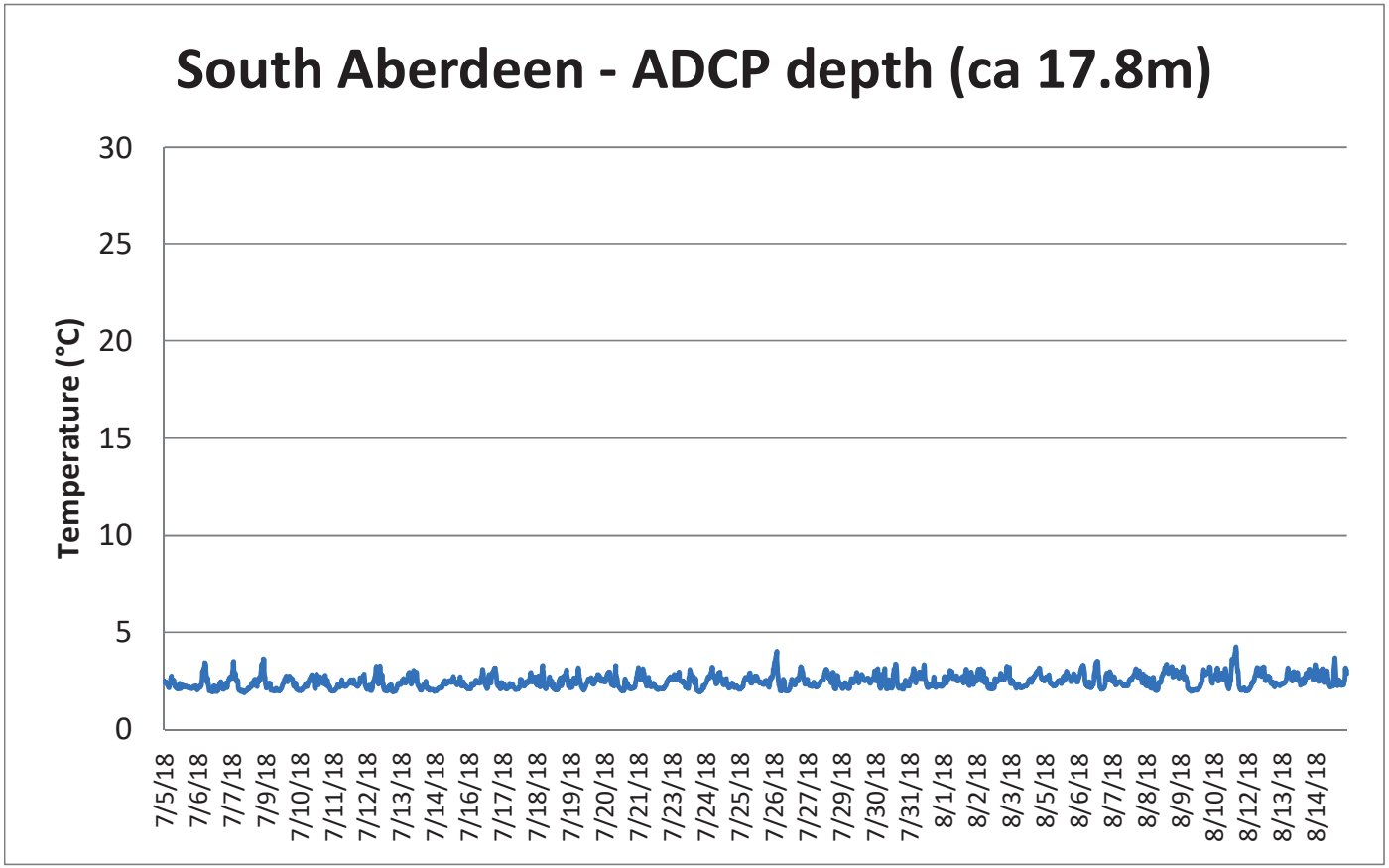


Figure 6: Summer temperatures measured in 2018 (July 5 to August 14, 2018) at the proposed site. Raw data obtained from David Cook (NSDFA) from ADCP deployment. Depth is the average depth measured by the ADCP. The stable low temperature recorded suggests that the probe was deployed below the thermocline so that these temperatures should not be used to estimate site maximum temperatures.

4.2 Baseline environmental monitoring

The baseline monitoring package has been submitted separately.

4.3 Site design

Extensive depth sounding activities were conducted in Whycocomagh Bay in 2017. This allowed the creation of depth profiles to determine best locations for sites. Benthic information was also collected at that time. This information was overlapped with potential visual impacts to determine best options for the new sites. The proposed site in South Aberdeen was deemed to have suitable depths and bottom characteristics and have minimal visual impact so more intense scoping of the lease was initiated in 2018. This intense scoping included profiling of temperatures and oxygens near the proposed site, profiling of oceanographic characteristics, and baseline monitoring of the benthic environment. Results from these activities are found elsewhere in this Development Plan. Specific characteristics of this body of water that are significant and have been accounted for in terms of the site plans are described below.

Anoxic water

Whycocomagh Bay is separated from the east (St. Patrick's Channel) via a sill less than 12 m deep. Whycocomagh Bay itself has a pair of deep basins of 38 and 46 m deep separated by a sill of approximately 7 m depth. These sills inhibit flushing below sill depth, preventing a horizontal exchange of deep water and partly isolating the physical and biological processes of one basin from the other and inhibit biota movement (Parker et al, 2007). This makes for a unique oceanographic environment that must be considered in site design and operation. In particular significant thermoclines and haloclines are known to exist and much of the benthic layer is known to be naturally anoxic (Parker et al, 2007). The oxygen profiles of this site, as collected during scoping activities, indicate that oxygen levels at depth (28m) can hover between 40% to 60% saturation. Recent research in Whycocomagh Bay, including monitoring conducted by WFN, indicate that the thermocline and oxycline move seasonally and can become quite shallow (<8m). Published reports indicate there is no upwelling in the bay (Parker et al, 2007). However, some upwelling of low oxygen "fingers" of water has been experienced in nearby fish farming operations in the past. These events are thought to be caused by deep water currents caused by tide. As the deep water is pushed in by a moon tide, the low oxygen water at depth pushes to the surface and oxygen levels decline in the fish rearing layer. The recorded moving thermocline and oxycline and anecdotal evidence of upwelling must be considered in operational procedures. In response to this risk, oxygen monitoring occurs on a regular basis and increases around wind and tidal events. An oxygen supplementation system will be part of the infrastructure for the cages in susceptible areas, as determined by the oxygen profiles.

Ice cover

Another feature of Whycocomagh Bay that must be managed is the presence of ice over the bay during winter. The bay begins icing over after mid-December and generally stays covered with ice until March/April. At exposed sites, the ice coverage will be managed via harvesting the fish prior to

the ice forming. Any remaining fish cages will be moved to another lease site where over-wintering and winter harvest can occur (AQ 0814x). The moorings will stay in place over the winter. Spar buoys may be replaced with temporary buoys to mark the site for the winter period. These temporary buoys will allow the ice to travel over them when it moves out in the spring. By contrast, the large Spar buoys may get dragged with the ice when it breaks up in the spring. This has been experienced in the past and needs to be avoided (Robin Stuart, personal communication). The area is not navigable at this time due to the presence of the ice so that a navigation hazard is not created by the removal of the larger buoys.

Water currents and waves

The current, tide and wave data collected via deployment of ADCPs (Acoustic Doppler Current Profilers), summarized in Section 4.1 and Appendix F, have been used to engineer the cage and infrastructure for this site. Note that the raw data is also available for this purpose.

Water temperature

As shown in Section 4.1, temperature was monitored at successive depths (3m, 10m, 18m, 23m) at a location within a few kms of the proposed site, from June 1, 2018 to August 19, 2018. Graphs of the temperature profiles at these depths clearly show the presence of a thermocline. This was expected and is a well-recognized phenomenon for Whycocomagh Bay. Temperature was also monitored at 18m using the ADCP from July 5, 2018 to August 14, 2018, but this information was not useful for production planning since the probe was deployed below the thermocline, and the temperatures recorded were not reflective of temperatures that the fish would experience in the cages. The temperature profiles of the water depths the fish will inhabit have been incorporated into the growth model of the fish to predict feeding rates and days to harvest.

Infrastructure for the site

As a result of experimental work conducted by WFN since 2019, and the biophysical data collected, the intended infrastructure for the site will be 100m (circumference) cages in a 2X5 grid array. The intended cages and grid system are shown in the amended application to Transport Canada for the Navigable Waters permit (Section 6.1).

SECTION 5: THE OTHER USERS OF THE PUBLIC WATERS SURROUNDING THE PROPOSED AQUACULTURAL OPERATION

5.1 Description of other users

AQ 1431 is located in a sparsely populated area. That was one of the reasons the site was chosen. Portage Road is the main thoroughfare in this region, running east-west parallel to the shore but distant from it. A number of private drives lead off from Portage Road towards the Lake. The densest population resides on Joseph MacFarlane Drive which runs north off Portage Road towards and along the lakeshore.

Users within 1 km radius

There are no known businesses within a one km radius. Eagle D'Or Cottages is just outside of this radius and is shown in Figures 7 and 8. There are no cottages or homes on the shoreline directly adjacent to this area.



Figure 7: Google Earth image of the proposed site area with a 1 km radius around the site center (yellow circle).

Users within 2 km

There are at least four property owners within a 2 km radius with access to the water via private wharves, all to the southwest of the proposed site. Known businesses within 2 km of the proposed development are shown in Figure 8, numbered according to their descriptions below:

1. Eagle D'Or Cottages – two cottages for rent with Bras D'Or Lake shorefront.
2. Cape Breton Cottage Bed and Breakfast – single private cottage rental on beachfront and single B&B rental 250 feet from Bras D'Or Lake shore. It is unlikely the cage site will be visible from this shorefront because of the lay of the land in this area.



Figure 8: Google Earth image of the proposed site area with a 2 km radius around the site center (yellow circle). The approximate locations of the known users of this space within this radius are numbered according to their description in the main text of this document.

Users within 3 km

Businesses or other public users within 3 km of the proposed development are shown in Figure 9, numbered according to their descriptions below:

3. Cape Escape B&B and Therapeutics (north side of Bay, inland) – seasonally offers a single suite for rent. This business is on the Trans-Canada Highway, away from the shoreline.
4. Bear on the Lake Guesthouse (north side of Bay) – seasonally offers private rooms and hostel accommodations that overlook the Bras D'Or.
5. Timeout Campground – private 93-site camping and RV campground with 1000' of waterfront.

The opposite (north) side of the Bay is more than 2 km away, but within 3 km. It is less populated than the south side.



Figure 9: Google Earth image of the proposed site area with a 3 km radius (yellow circle). The approximate locations of the known users of this space within this radius are numbered according to their description in the main text of this document.

Users within 5 km

Businesses or other public users within 5 km of the proposed development are shown in Figure 10, numbered according to their descriptions below:

6. WFN processing plant (northeast, opposite side of Bay)- CFIA registered seafood processing facility that processes the finfish aquaculture products produced by WFN.
7. Little Narrows Presbyterian Church (northeast).
8. Little Narrows Ferry (northeast).
9. Little Narrows Community Center (northeast) - community hall which hosts local events and is available for rental.
10. Little Narrows Beach Municipal Park (northeast) – offers sandy beachfront access to the public.
11. Aberdeen Motel- (north side of the Bay) – classic single-story motel with more than a dozen rooms. It is not on the shore of the lake.

All of the Little Narrows community is within this radius. The primary amenities in the area are listed above (#7,8,9,10).

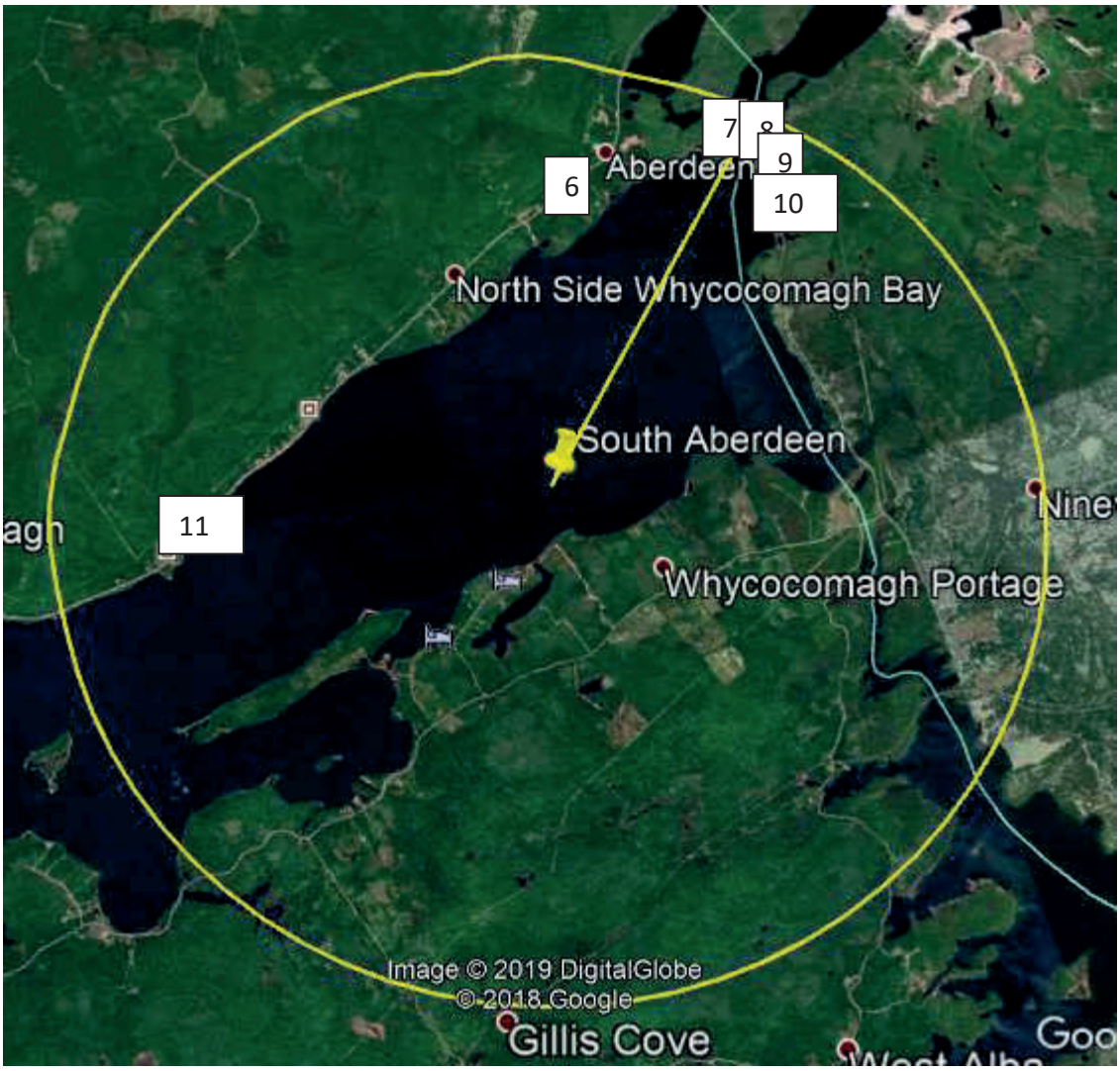


Figure 10: Google Earth image of the proposed site area with a 5 km radius (yellow circle). The approximate locations of the known users of this space within this radius are numbered according to their description in the main text of this document.

Users within 10 km

We'koqma'q First Nation (Whycocomagh 2 Reserve), and the village of Whycocomagh are within 10 km of the proposed site. They are circled in blue in Figure 11.

We'koqma'q First Nation is a Mi'kmaw community in the middle of Whycocomagh with a registered population of approximately 1000 persons according to Indigenous and Northern Affairs Canada. The We'koqma'q Nation has traditionally used the public waters for fisheries activities as described in Section 3.2. Whycocomagh and Whycocomagh Bay are recognized areas of cultural, recreational, and social significance (CEPI, 2006). It is notable that We'koqma'q has been involved in shellfish and finfish aquaculture activities in the local waters for decades. The proposed aquaculture site is a significant part of the First Nation's business development plans. It will be managed in association

with the other Mi'kmaw activities in the waters. A single group manages both the fisheries and aquaculture portfolio of the Band and will ensure that they are complementary.

The Whycocomagh community has a population of approximately 850 residents and has several small businesses that support the local residents, including gas stations, a pharmacy, grocery store, bank, several bakeries and restaurants, accommodations (Keltic Quay, Fair Isle Motel, Aberdeen Motel), farmer's market, school (P-8, population<200), fire department, community center and other amenities and tourist features.

In Whycocomagh, a main user group of the public waters is the Whycocomagh Waterfront Centre Association which supports both a community center as well as a marina. The marina is gated access with piers and a launch ramp to the Bras D'Or, a pump station, fresh water and washrooms. Floating docks and moorings are available for member rental.

Whycocomagh Provincial Park is located east of Whycocomagh. The park features hiking (5 km of trails), camping (40 sites) and picnicking. It overlooks the Skye River Valley and the Bras D'Or Lake. The main park straddles the Trans-Canada Highway and has areas of access to the Bras D'Or Lake.

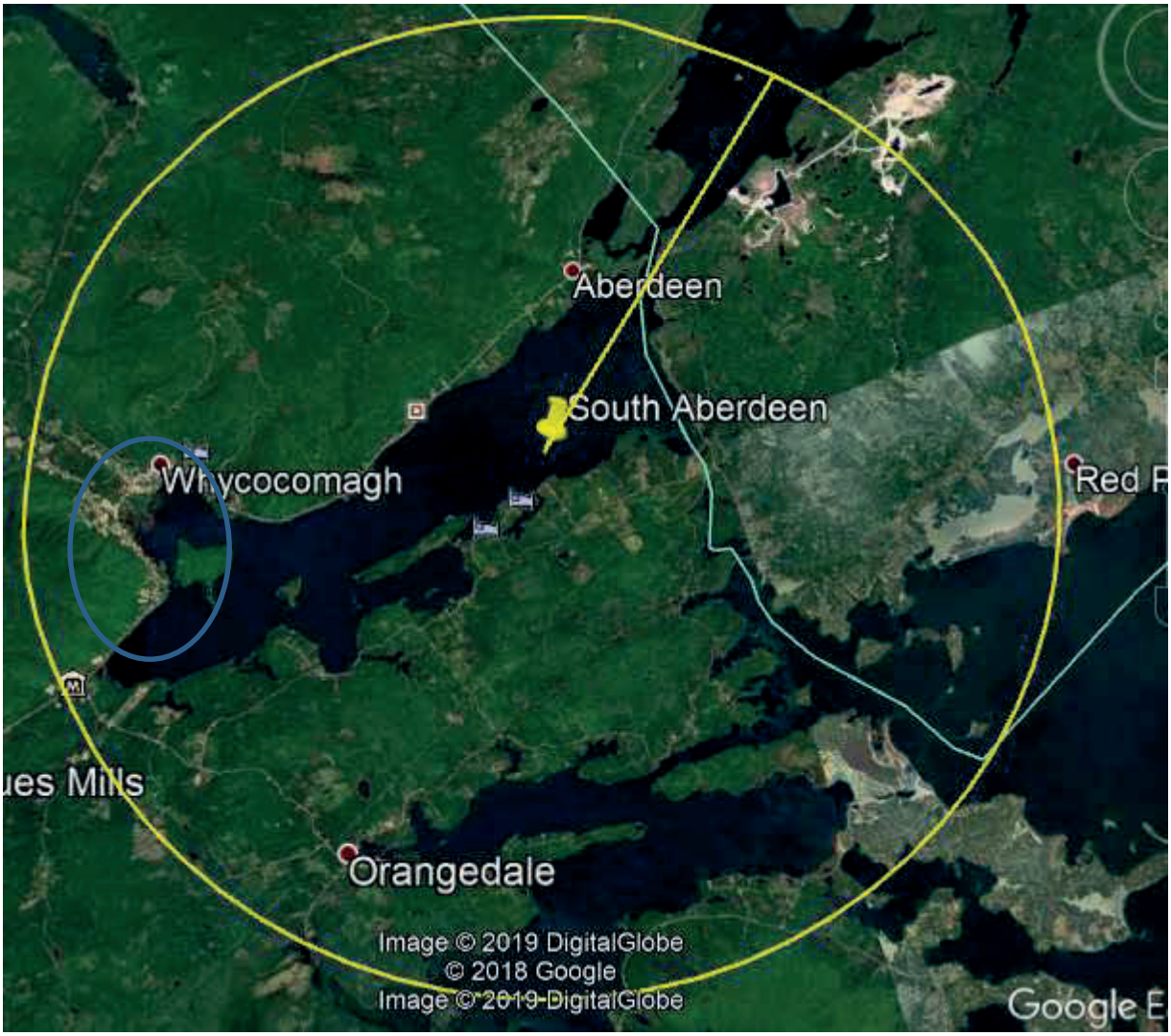


Figure 11: Google Earth image of the proposed site area with a 10 km radius (yellow circle). Whycocomagh, including the We'koqma'q First Nation is circled in blue.

Other regional users or parties interested in the public waters

The Bras D'Or Lake is a popular cruising location for pleasure crafts. Whycocomagh Bay is open to the Bras D'Or Lake only via Little Narrows Channel and yet is a popular spot, particularly for small sailing vessels, kayakers, canoeists and small fishing vessels. These may be local residents or seasonal users.

Other parties interested in the area in terms of conservation include:
Bras D'Or Stewardship Society: a non-profit organization established in 1998 committed to promoting stewardship of the Bras D'Or Lakes and their watershed. The proposed site is within the Society's area of interest.

Bras D'Or Lake Biosphere Reserve Association: a registered charity that oversees the UNESCO designated Bras D'Or Lake Biosphere Reserve[14]. Its mission is "to engage all peoples in the balanced and sustainable development of the exceptional cultural, environmental and economic assets within the Bras d'Or Lake watershed." The proposed site is within the Biosphere Reserve.

Bras d'Or Lakes Collaborative Environmental Planning Initiative (CEPI): CEPI is an alliance of federal, provincial, municipal, and First Nations governments and other interests who have signed a charter that represents "the collective intent, or "will", of the relevant governments with responsibilities for the management and protection of the Bras d'Or Lakes and its watershed".

5.2 Significance of proposed area to wildlife

Significant terrestrial habitats

Significant land habitats recognized by NSDNR along the shoreline of Whycocomagh Bay are shown in Figure 12 and include the following:

- IN418: deer wintering
- IN21: deer wintering
- IN142: bald eagle nest
- VI207: common loon habitat
- IN192: bald eagle nest
- IN17: bald eagle nest
- IN433: bald eagle nest
- IN22: bald eagle nest
- IN51: bald eagle nest
- IN37: bald eagle nest
- IN49: bald eagle nest

[14] In 2011, the Bras d'Or Lake and its watershed area were designated a UNESCO Biosphere Reserve, recognizing that the locals live in harmony with nature and work to promote a healthy environment, economy and culture.

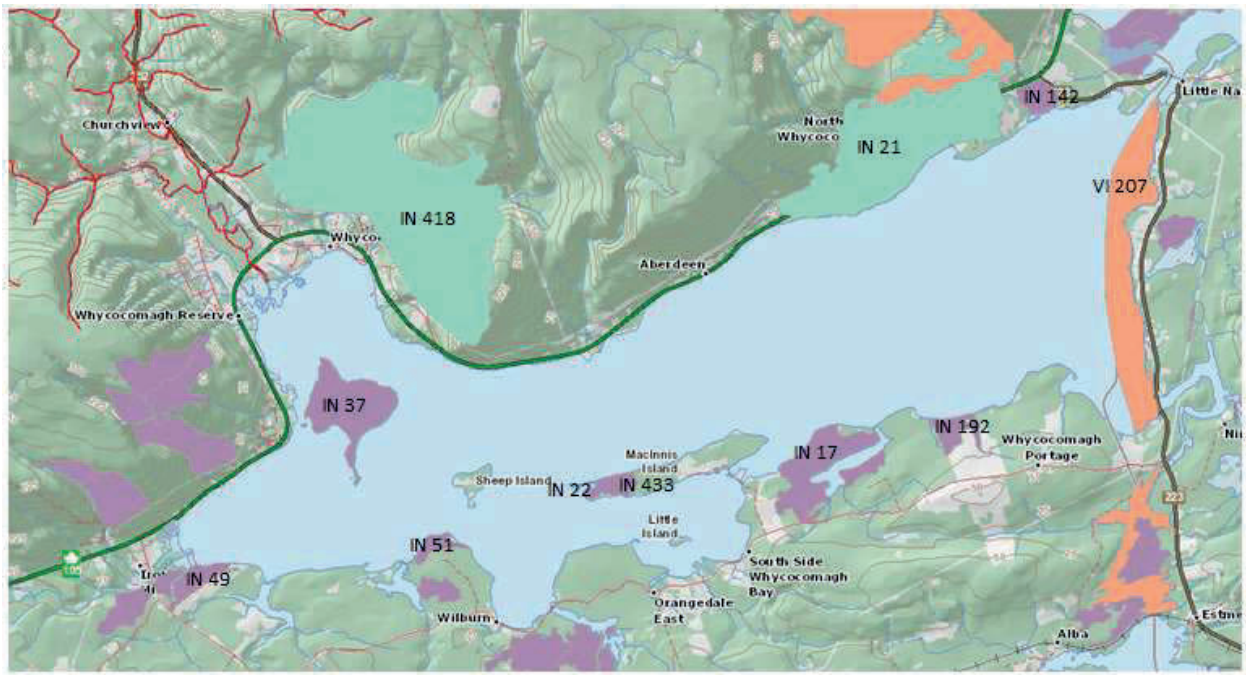


Figure 12: Significant land habitats[15] on the shoreline of Whycocomagh Bay

Rare and endangered species

A data report from the Atlantic Canada Conservation Centre provides more in-depth detail on the possibility of the presence of rare and endangered species that may use the proposed development area as well as special wildlife areas of the region. The complete report generated for the proposed site location is attached as Appendix E. A summary of the report follows:

Rare species list

Within 5 km of the site centers, records indicate the presence of 26 species of rare or endangered vascular plants, 1 species of rare or endangered nonvascular plant, and 24 species of rare or endangered vertebrates.

Within this list of species, two are aquatic, including:

- Alewife
- Atlantic salmon

Shoreside species of plants include:

- Ray's knotweed
- Seaside brookweed

Shoreside species of animals or water birds include:

- Nelson's sparrow
- Cliff swallow

[15] Adapted from https://nsgi.novascotia.ca/plv/ Accessed April 12, 2024; used with permission. Additional information provided by Frances MacKinnon.

- Killdeer
- Wilson's snipe
- Spotted sandpiper

Species at Risk

Seven Species at Risk are on record as being in the region. They are listed in the table below. None are water dwelling or expected to be found shoreside.

Table 2: Species at risk within 5 km radius of proposed site[16]

Scientific name	Common name	SARA status	Habitat, other comments
Degella plumbea	Blue felt lichen	Special Concern	Hardwoods in woodlands[17]
Riparia riparia	Bank swallow	Threatened	Nests in burrows excavated in eroding banks of coastal cliffs and other steep vertical soft soil faces[18]
Hirundo rustica	Barn swallow	Threatened	Nests in barns, garages, houses, bridges and culverts near open areas. Part of the agricultural landscape in Nova Scotia.[19]
Dolichonyx oryzivorus	Bobolink	Threatened	Open grasslands and hayfields[20]
Contopus cooperi	Olive-sided Flycatcher	Threatened	Spruce and fir swamps and bogs[21]
Contopus virens	Eastern Wood-Pewee	Special Concern	Woodlands[22]
Sorex dispar	Long-tailed Shrew	Special Concern	Mountainous, forested areas; may occur along small mountain streams[23]

Location sensitive species

One location sensitive species has been recorded in the region: black ash. Black ash grows in swampy, low-lying areas that are very wet and marshy.[24]

[16] Species list extracted from Atlantic Canada Conservation Center Report 6327. Species habitat and other comments obtained from sources referenced in footnotes.
[17] https://wildlife-species.canada.ca/species-risk-registry/species/speciesDetails_e.cfm?sid=1123. Accessed April 9, 2024.
[18] https://novascotia.ca/natr/wildlife/biodiversity/species-list.asp Accessed April 9, 2024.
[19] http://www.farmbiodiversity.ca/species-at-risk-2/birds/barn-swallow/ Accessed April 9, 2024.
[20] https://novascotia.ca/natr/wildlife/biodiversity/species-list.asp Accessed April 9, 2024.
[21] https://novascotia.ca/natr/wildlife/biodiversity/species-list.asp Accessed April 9, 2024.
[22] https://novascotia.ca/natr/wildlife/biodiversity/species-list.asp Accessed April 9, 2024.
[23] https://www.iucnredlist.org/species/41394/115183478#habitat-ecology Accessed April 9, 2024.
[24] http://www.uinr.ca/black-ash/ Accessed April 9, 2024.

Culturally significant flora and fauna

The sweet flag is a medicinal plant in the Whycocomagh area that is of significance for the Mi'kmaw people (CEPI, 2006). CEPI, 2006, also mentioned barrows goldeneye which have been seen near Whycocomagh Bay shore and bald eagles which are more commonly seen.

General marine life

The Bras D'Or Lake marine environment is known for its uniqueness in terms of reduced salinities, limited physical exchange with the open ocean, diversity of seasonal temperature regimes, and low tides. One of the most often reported attributes of the lake is the fact that both warm water and cold-water species are found in the same water system (Lambert, 2002).

Within Whycocomagh Bay, the diversity of marine life is more limited than other areas of the lake. It is a low salinity region with large basins of low oxygen levels. It has been suggested that these characteristics limit benthic organisms in many parts of the bay, with the exception of micro-organisms (Lambert, 2002). Low abundance of mysids, copepods (Petrie & Bugden, 2002; Strains & Yeats, 2002) have been noted. Many invertebrate species such as lobsters and rock crab are unlikely to be in this area due to its low salinity. Similarly, scallops are unlikely to be in this area (Tremblay, 2002).

Studies have shown that herring and gaspereau occur in Whycocomagh Bay and the presence of winter flounder, cod, skate, and windowpane flounder was evidenced by their appearance in trawl catches in Whycocomagh Bay in 1999-2000, which were similar to findings from tows conducted in 1967. The cod population in this bay is thought to be unique from other cod populations in the lake. This is based on the low incidence of the sealworm (*Pseudoterranova decipiens*) in cod of the bay relative to adjacent areas. This segregation is thought to be due to the restricted passageway at Little Narrows, which may discourage the movement of cod between the bay and St. Patrick's Channel. Local knowledge suggests that cod populations are significantly reduced over previous levels (personal communication, Joe Googoo, We'koqma'q Elder).

Grey seals and harbor seals are the only marine mammals known to inhabit Whycocomagh Bay (Robin Stuart, personal communication).

5.3 Impacts to other users including wildlife

Impacts to human users of the public waters surrounding the proposed development

Tourist operators, local and seasonal residents

A number of businesses within the region that were identified in Section 5.1 rely on tourism. A key draw to the region is the Bras D'Or Lake. And local and seasonal residents enjoy the public waters surrounding the proposed development for its beauty, nature and recreational opportunities. Concerns that these groups of the community may have are discussed below.

Visual impact

The area is well known for the attractiveness of its landscape, including the views of the Bras D'Or Lake. WFN recognizes this value to the area's tourism industry as well as to the local community members in general.

For this proposed site, the cages will not be visible from the highway. They will be visible from the immediate shoreline. As shown in Figures 7 and 8, there are not many users of this immediate shoreline. This was one of the reasons for choosing this site. Moving cages to locations where they would be hidden from public view was suggested during the scoping process[25]. This comment was made specific to the proposed Inner Whycocomagh Bay lease (AQ 0814x), not AQ 1431.

In recognition of the importance of appearance, WFN is committed to ensuring that the cages are maintained in an orderly fashion to ensure that they properly represent the opportunity that they are bringing to the community and do not negatively impact the visual landscape. The regular inspection and maintenance of cages is a best practice of the company that is mandated under the Nova Scotia Aquaculture Management Regulations within the Farm Management Plan as mentioned in Section 3.2 (*Mitigating Fisheries Impacts through Operational Procedures*). In addition to the Farm Management Plan requirements explained previously regarding infrastructure maintenance, all of the WFN finfish aquaculture operations will follow the Farm Operations requirements also defined by the Nova Scotia Aquaculture Management Regulations. These requirements acknowledge that the responsible operation of a marine finfish site includes consideration of neighbors and other users of shared resources, including aspects affecting visual impact. To this effect, the Farm Management Plan must include the following:

- Described and approved management practices for removing and disposing of accumulated refuse and decommissioned farm supplies and equipment;
- Described and approved management practices for retrieving any gear or debris from the aquacultural operation that has broken loose; including timelines for completion;
- Described and approved management practices for maintaining the site in good order.

The above elements will be approved for implementation by NSDFA and operators will be audited for adherence to the plan according to NSDFA's requirements.

Smell and Noise

Part of the appeal of the region pertains to the rural landscape in terms of low noise pollution and high air quality. WFN recognizes the value of maintaining these local attributes and will apply and document practices that reduce noise, particularly outside of working hours, and reduce odors, in general.

A concern about the smell of WFN's finfish operation in Whycocomagh was brought up during the scoping process [26]. It is recognized by WFN that they had an incident where smell was a problem for a couple of days in the summer of 2018. This was due to an interruption in trucking that required offal transfer during an excessively hot day (>30°C). Normal procedures for WFN's finfish operations

[25] Refer to Page 8 of the Report on Public Engagement During Scoping

[26] Refer to Page 12 of the Report on Public Engagement During Scoping

include removing organic waste on a bi-weekly basis for transport to the Guysborough facility which is equipped to deal with such waste. Increased oversight of this procedure now occurs to ensure that the transportation will not be disrupted. And the shipping containers are lined and sealed on site prior to transport so that spillage will not occur en route.

Other aspects of the operation that pose a risk for causing odors will be described and documented in the Farm Management Plan. This includes the storing and disposal of feed, mortalities and other organic waste. Addressing these are part of the Farm Operations requirements of the Nova Scotia Aquaculture Management Regulations.

It is notable that the Farm Management Plan also requires the description, application, and documentation of procedures that minimize noise. These will be approved for implementation by NSDFA and operators will be audited for adherence to the plan according to NSDFA's requirements.

As mentioned previously, WFN's finfish operation hopes to become certified to the Global Aquaculture Alliance's Best Aquaculture Practices (BAP). Section 3K of this standard requires safe and responsible storage and disposal of farm supplies and waste. Procedures required for this would be above and beyond the Farm Management Plan requirements described above and would be third party audited. The relevant BAP Farm Standard (Issue 3.1) is attached as Appendix B.

It is notable that finfish aquaculture operations have been operating in the community for more than 30 years and the relationships with local residents regarding the operation have been very positive.

Navigation for marina users, recreational boaters, fishers and others

Recreational boaters, fishers, marina users and other local residents or passersby who use the waterways for travel need to have clear delineation of safe travel paths when in or below water structures, such as finfish cages, exist. WFN has ensured this by completing a Notice of Works form to Transport Canada, as required under Section 6 of this Development Plan. WFN will mark their sites in accordance with these requirements.

Miscellaneous concerns raised during scoping

During the public meeting held in the community, an attendee mentioned his concern that WFN's current aquaculture operation in Whycocomagh is causing the build-up of dead seaweed along the shore which is interfering with angling from the shore.[27] The association between the dead seaweed and the finfish culture activities is not clear; nor is it clear that changes to the operations would make an impact on this phenomenon. Regardless, WFN is dedicated to monitoring and measuring the environmental impact of its finfish aquaculture operations, including eutrophication. This is demonstrated by WFN's partnership in research that modeled and measured nutrient level changes in the water resulting from its operations. This was previously described in Section 3.2 ("*Mitigating Fisheries Impacts through Research and Development*").

[27] Refer to Page 8 of the Report on Public Engagement During Scoping

Ensuring the proper disposal of sewage waste was brought up during the scoping process.[28] Storage and disposal of human waste must be described and documented in the Farm Management Plan as part of the Farm Operations requirements of the Nova Scotia Aquaculture Management Regulations.

Impacts to wildlife users of the public waters surrounding the proposed development

There are no identified rare or endangered species that are expected to be directly impacted by the operation of this site. Mitigation measures applied to reduce fisheries impacts are described in Section 3.2 and will also mitigate impacts to other wildlife in the bay in general.[29] Measures applied to support the sustainability of wild salmon are described in section 7.2.

As described in Section 5.2, there are no SARA listed species expected to interact with the proposed site since all known SARA species in the area are terrestrial.

Similarly, all rare and endangered species, with the exception of Atlantic salmon and alewife, are terrestrial and not expected to be encountered during normal operation of the site. Potential risks to shoreline species and water birds, particularly those known to be rare or endangered, will be mitigated within a wildlife interaction plan. This plan will describe procedures that ensure least interference with surrounding wildlife while supporting their habitat. This will include a requirement that boat travel to and from the site is via the most direct route possible, without travelling near the shore or near wildlife. An exception to this will occur during a weekly sweep of the shoreline to look for debris that may inadvertently have been released during operation of the site. This will enable the upkeep of the shoreline to a level of cleanliness that promotes wildlife habitat. For these procedures, employees will be cautioned to not approach wildlife and not travel through marsh areas where sensitive species may be harbored. An annual shoreline clean-up will also occur for the adjacent area. This clean-up will not be conducted at times of the year when shoreline birds are nesting.

A wildlife interaction plan must be described in an operator's Farm Management Plan as defined by the Nova Scotia Aquaculture Management Regulations. It must be approved for implementation by NSDFA and operators will be audited for adherence to the plan according to NSDFA's requirements. The BAP certification standard also requires a Wildlife Interaction Plan. The relevant BAP Farm Standard (Issue 3.1) is attached as Appendix B.

Complements to other users

Support of the local economy

Development of WFN's finfish aquaculture operations is anticipated to bring a significant number of local direct and indirect jobs to the community (see Sections 2.3, 2.4, and 2.5).

[28] Refer to Page 8 of the Report on Public Engagement During Scoping

[29] The potential benthic environmental impacts were brought up during scoping. See page 8 of Report on Public Engagement During Scoping

Support of conservation efforts

WFN will work with the conservation groups active in the area to help collect information on the oceanographic and ecological characteristics of this area of the Bras D'Or Lake. On this front, WFN has an established relationship with Dr. Bruce Hatcher and will continue to assist Dr. Hatcher as he collects information to: characterize the dynamics in the cline of Whycocomagh Bay, explore ice cover changes and effects in Whycocomagh Bay, explore anthropogenic effects on the Bay's characteristics, and other research efforts. WFN will also assist the Stewardship Society and Biosphere Reserve Association to collect information and educate people on the unique ecology of the Whycocomagh region, if requested.

Robin Stuart, a previous Manager of Aquaculture Operations for WFN, who does periodic consulting for WFN, is a representative on CEPI and will help to communicate any concerns the group may have with the fish farm.

5.4 Impacts by other users including wildlife

Generally speaking, WFN's finfish operations have, and hope to continue to have, an excellent and mutually beneficial relationship with the local communities.

A possible negative impact of people on the operations needs mentioning. This refers to vandalism of the fish nets. In the past, one of the nets was released manually by a non-resident. This resulted in fish release. Fishing within the pens has also occurred. Since this time, WFN has hired security to patrol their sites and mitigate these risks. The feed barge for this site will be equipped with security cameras to monitor activities.

Fish-eating birds (herons, hawks, kingfisher, eagles, and other species) can be common-place in regions that support finfish aquaculture operations. If not properly managed, such birds can prey on the fish in the cages, causing stress and physical damage. WFN finfish aquaculture operations will use bird nets on their cages during seasons when bird predation is a problem. These nets will cover the surface of the water at a height from the water surface so that bird predation cannot occur. The procedures for their use and maintenance are required as part of the Farm Management Plan.

SECTION 6: THE PUBLIC RIGHT OF NAVIGATION

6.1 Navigation Protection Act approval

A copy of the Notice of Works form and required attachments follow as Appendix G.

SECTION 7: THE SUSTAINABILITY OF WILD SALMON

7.1 Identification of local salmon populations

(Reference: CSAS Science Response 2017/20, 2020/031)

The proposed South Aberdeen site (AQ 1431) is within Salmon Fishing Area 19, also called the Eastern Cape Breton Designatable Unit by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Closest salmon bearing rivers that have direct connections to the body of water that contains the proposed site include Skye River (mouth within 8 km of the site), Middle River (mouth approximately 16 km from the site), and Baddeck River (mouth approximately 19 km from the site). Only the Skye River opens into the Whycocomagh Bay subwatershed. The Middle and Baddeck Rivers open into an adjacent watershed (St. Patricks Channel) which is somewhat separated from the Whycocomagh Bay subwatershed via a sill less than 12 m deep. Since 2006, Middle and Baddeck Rivers have had their salmon populations enhanced through a Provincial stocking program which includes broodstock collection on these rivers. This enhancement is intended to offset anticipated catch and release mortalities on these rivers and has allowed an open catch and release fall season on the Middle and Baddeck Rivers. Food, Social and Ceremonial (FSC) allocations are also available on these rivers. Middle and Baddeck Rivers are index populations. As for all index rivers in Eastern Cape Breton, the populations were assessed to be below conservation egg requirements in 2018.

The approximate locations of all salmon bearing rivers in the vicinity of the site, as reported in the 2017 and 2020 CSAS Stock Status Updates for SFAs 19-21 and 23 are shown below in Figure 13.

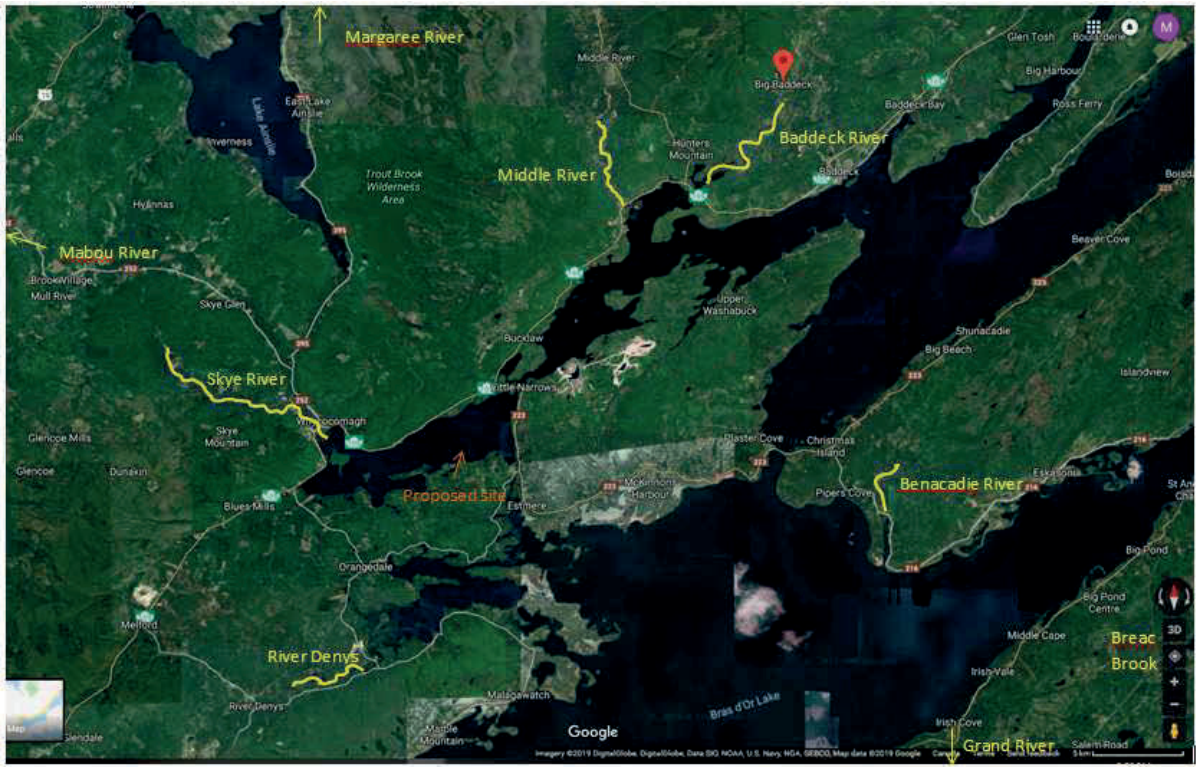


Figure 13: Salmon bearing rivers within the region of the site.

7.2 Support of the sustainability of wild salmon

Although rainbow trout are not indigenous to the Bras d'Or Lake area, it has a resident population that has developed from stocking efforts for the sport fishery, with the first trout introduced in 1899. These introduced fish have been shown to be successfully reproducing in the wild and are contributing to the fishery numbers (Madden et al., 2010). Rainbow trout continue to be stocked by the province through an enhancement program. This would suggest that there is little concern that the presence of rainbow trout affects the sustainability of wild salmon.

Furthermore, WFN will institute operational procedures to mitigate the greatest perceived risks of finfish aquaculture operations to wild salmon populations; these being fish escape, disease and biosecurity, and environmental impact risks. These have been described in Section 3.2.

As indicated in Section 7.1, Middle and Baddeck Rivers have had their salmon populations enhanced through a provincial stocking program which includes broodstock collection on these rivers. Approval of this lease/licence is not anticipated to affect these efforts.

The environmental and oceanographic data collection in the bay that is supported by WFN (Section 5.3 Support of conservation efforts*)* is intended to improve understanding of the local ecosystem as a whole, as well as more broadly with regards to global warming. Although there is no direct intent to use this data to support Atlantic salmon conservation measures, an increased understanding of the environment may contribute to conservation practices in general.

SECTION 8: THE NUMBER AND PRODUCTIVITY OF OTHER AQUACULTURE SITES IN THE PUBLC WATERS SURROUNDING THE PROPOSED AQUACULTURAL LOCATION

8.1 Identification of other aquaculture sites[30]

WFN or We'koqma'q First Nation Band Council is presently the lease holder for all aquaculture sites within Whycocomagh Bay, both finfish and shellfish. There are a few oyster sites of other operators that are in close proximity distance-wise, but the waters are not directly connected to Whycocomagh Bay.

WFN is making two requests for new commercial finfish sites within Option 1413 in the eastern end of Whycocomagh Bay (one on the north side, AQ 1430, and one on the south side, AQ 1431 – this application), and a request for the amalgamation and enlargement of leased areas in the west end of Whycocomagh Bay (AQ 0814x). Since 2019, We'koqma'q was assigned a previously active finfish/shellfish site in the region which will likely be used for oyster aquaculture in the future (AQ 0193).

All of the sites planned for the area are shown in Figure 14, as they can be seen on the NSDFA site mapping tool. Figure 14 also shows other existing aquaculture sites in the area.

Collectively, the requested sites will allow a financially viable rainbow trout aquaculture operation while availing enough area to increase fallowing times. Increased fallowing will reduce fish health risks and minimize potential environmental impacts of the operations.

[30] The potential for aquaculture in the area was brought up during scoping. See page 4 of Report on Public Engagement During Scoping.

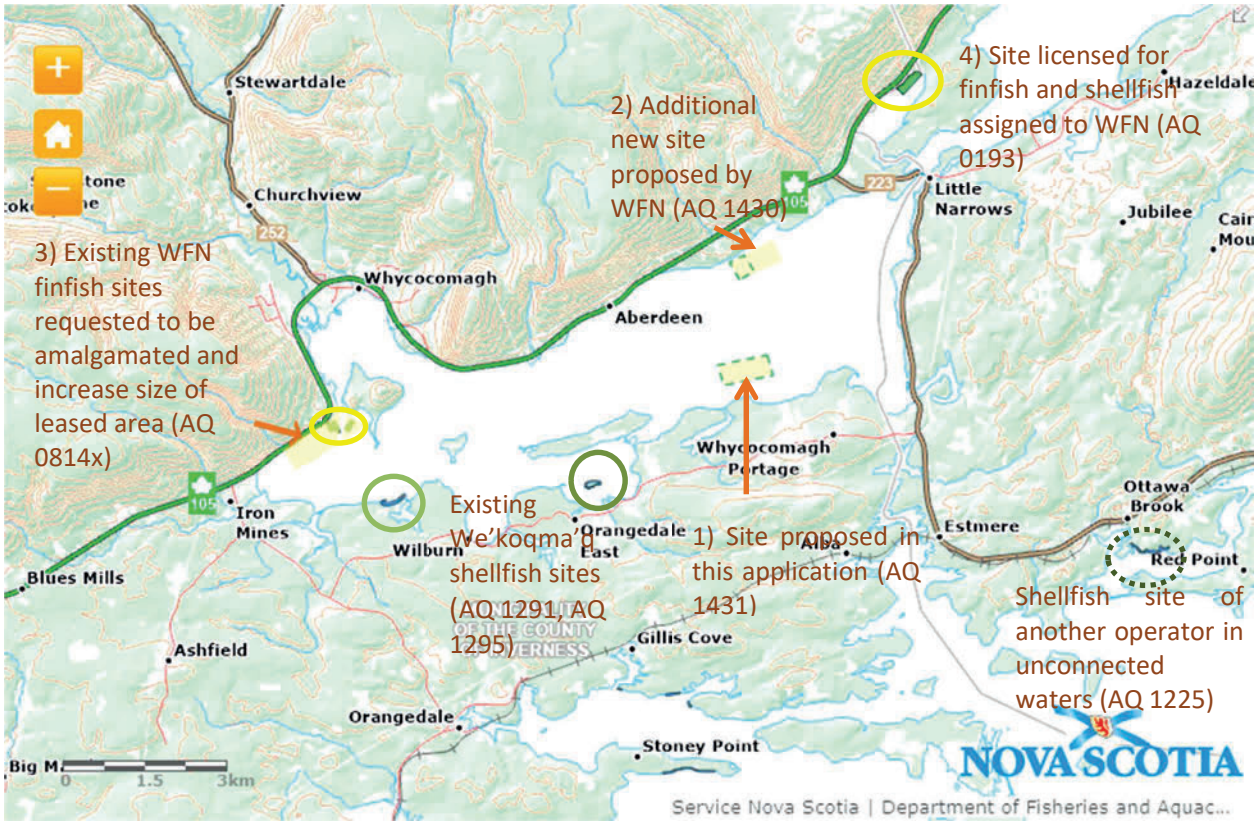


Figure 14: Map of the region of the proposed site showing existing aquaculture sites as well as sites proposed in other applications. The base map was acquired from https://novascotia.ca/fish/aquaculture/site-mapping-tool/ Accessed April 8, 2024.

As shown in Figure 14, Site 1 is the new commercial finfish site described in this Development Plan (AQ 1431). Site 2 is a new commercial finfish site proposed by WFN in another application (AQ 1430). Site 3 is the region where WFN is currently the lease holder for three small finfish leases; WFN is requesting an amendment to amalgamate and enlarge this area in another application (AQ 0814x). Site 4 is the finfish/shellfish site assigned to WFN since 2019 (AQ 0193); the future use of this site is being explored, including its potential use for oyster aquaculture. Two of We'koqma'q's existing shellfish sites in Whycocomagh Bay are also shown in the map (circled in green), along with a shellfish site in unconnected waters (hashed circle in green).

8.2 Interactions with other aquaculture operations

WFN's three proposed finfish sites (AQ 1430, AQ 1431, AQ 0814x) will be managed as a single farm to promote optimal fallowing regimes. Final stocking plans will be developed in conjunction with NSDFA and DFO to maximize fish health and minimize environmental impacts. When all sites are available for use, a rotating fallowing cycle is anticipated.

These three sites and their relative location to each other, along with grid arrays intended within the sites are shown in Figure 15.

In the past, the proposed sites AQ 1430 and AQ 1431 and the outer area ("production area") of AQ 0814x have been exposed to moving ice in the spring. As a result, cages are not left here over the winter and these production areas are used in the ice-free period, from April to December, only. For the winter months, cages are pulled into a sheltered area that is part of the requested 0814x site. Here, the ice floes do not push through. This is why 0814x has a designated production area and a designated over-wintering area, as explained further below.

A summary of the purpose for each site and array follows, as per current plans. Actual site stocking will depend on EMP results, I&T permissions and Stocking Level Approvals.

0814x

As shown in Figure 15, AQ 0814x will have both an over-wintering location and a production location. The overwintering location for all fish is shown as 0814x OW. The separate, single production array at 0814x #1 will regularly receive small fish in late fall. This production array at 0814x may also be occasionally used for small scale experimental trials (e.g. testing stocks, feeds). Biomass at this site will be kept low.

1430

As shown in Figure 15, AQ 1430 will house two arrays of 2 X 5 cages each. A single array will receive spring juveniles as well as the juveniles received the previous fall at AQ 0814x. The second array will be fallow. The array used will alternate between years.

1431

As shown in Figure 15, AQ 1431 will house two arrays of 2 X 5 cages each. A single array will receive second-year fish to be harvested in that year. The second array will be fallow. The array used will alternate between years.



Figure 15: Requested commercial leases are outlined in orange. Projected locations of cage arrays for the production season within the leases are the white polygons. Projected location for over-wintering cages is the light blue polygon.

Overview of all sites

The production plan for all sites for the next few years is shown below in a table format. This stocking plan is projected, and actual site stocking will be directed by fish performance, environmental monitoring results, fish health results, and introductions and transfers permissions.

Application No.	**Maximum site biomass (MT)**	**Maximum cage density (kg/m3)**	**Size(s) of cages, including net volumes**	**Maximum stocked cage number**	**Maximum number of fish per cage (at harvest size)**
1430 ("North Aberdeen")	940 MT	20	100m circumference, 6,350 m^3	10	56,000
1431 ("South Aberdeen")	1146 MT	20	100m circumference, 6,350 m^3	10	56,000
0814x ("Inner Bay"): production area	200 MT	20	100m circumference, 6,350 m^3	10	56,000
0814x ("Inner Bay"): over-wintering area	2000 MT (Winter months only, no feed inputs)	20	100m circumference, 6,350 m^3	30	56,000

Fallowing:

As explained previously, the plan is to rotate the production area within each of AQ 1430 and AQ 1431 on an annual basis to allow a fallowing time of a production area of 15 months. The requested site areas are large enough to house two grids and enable this to occur.

The production plan for all sites is shown below as a Gantt chart (Figure 16) to demonstrate array fallowing and lease fallowing plans. The colored blocks represent times when a specific array is stocked. The black blocks represent times when a specific array is fallow, with no fish stocked.

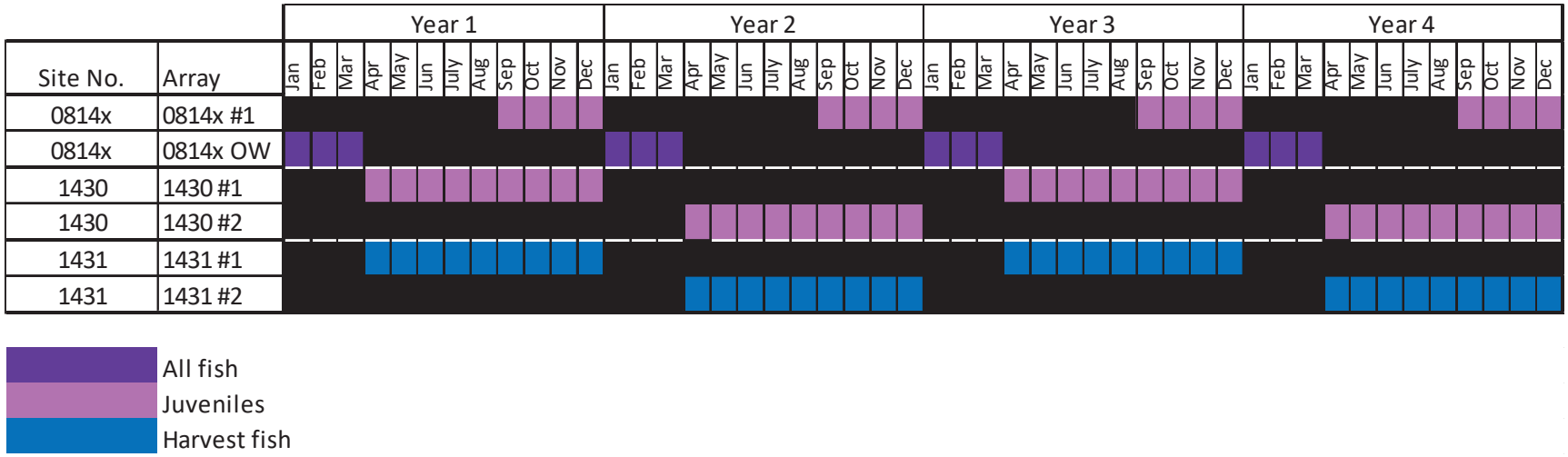


Figure 16: Gantt chart showing stocking and fallow periods for all of WFN finfish sites in Whycocomagh Bay. The black blocks represent times when a specific array is fallow, with no fish stocked.

References

Black, W.F. 1958. Biology of mysids of the Great Bras d'Or. MS. Rept. Fish. Res. BoardCan. #671. (Cited, not seen.)

Bricknell, I., Dalesman, S., O'Shea, B., Pert, C.C., and Mordue Luntz, A.J. 2006. Effect of environmental salinity on sea lice *Lepeoptheirus salmonis* success. Dis. Aquat. Org. 71(3):201-212.

CEPI. 2006. Bras D'Or Lakes Traditional Ecological Knowledge Workshop Proceedings. CEPI Workshop May 3-4, 2006, Eskasoni, NS.

DFO. 2017. Lobster (Homarus americanus) off the Atlantic Coast of Nova Scotia (Lobster Fishing Areas 27-33): 2017 Stock Status Update. DFO Can. Sci. Advis. Sec. Sci. Resp. 2017/026.

DFO. 2017. Stock Status Update of 4VWX Herring. DFO Can. Sci. Advis. Sec. Sci. Resp. 2017/037.

DFO. 2017. Stock Status Update of Atlantic Salmon in Salmon Fishing Areas (SFAs) 19-21 and 23. DFO Can. Sci. Advis. Sec. Sci. Resp. 2017/020.

DFO. 2021. Stock Status Update of Atlantic Salmon in Salmon Fishing Areas (SFAs) 19-21 and 23. DFO Can. Sci. Advis. Sec. Sci. Resp. 2020/031.

DFO. 2022. Lobster Fishing Areas 27 – 38: Integrated Fisheries Management Plan. https://www.dfo-mpo.gc.ca/fisheries-peches/ifmp-gmp/maritimes/2022/inshore-lobster-homard-cotiere-eng.html#toc2 Accessed April 11, 2024.

Dupont, F., Petrie, B. and Chaffey, J. 2003. Modeling the Tides of the Bras d'Or Lakes. Can. Tech. Rep. Hydrogr. Ocean Sci. ISSN 0711-6721. viii+53 p

Eskasoni Fish and Wildlife Commission and Dept. of Fisheries and Oceans. 1996. The Bras d'Or Lake Coastal Resources Mapping Project, managed by the Unama'ki Institute of Natural Resources (UINR), 4123 Shore Rd. Eskasoni, Nova Scotia B0A-1J0. Unpublished maps. (Cited, not seen.)

Foster, M. 2019. Economic Impact Study: The Aquaculture Industry in Nova Scotia. Presentation at Sea Farmers Conference 2019, Halifax, NS.

Krauel, D. 1976. A summary of the physical oceanography of the Bras d'Or Lake system. IN The proceedings of the Bras d'Or Lakes aquaculture conference, Sydney, Cape Breton. (Ed. M.G. McKay) College of Cape Breton Press, Sydney, N.S., 29-43. (Cited, not seen.)

Lambert, T.C. 2002. Overview of the ecology of the Bras d'Or Lakes with emphasis on the fish. Proc. N.S. Inst. Sci. 42:65-100.

Madden, J.R., MacMillan, J.L., and Apaloo, J. 2010. Examining the occurrence of wild rainbow trout in the Bras d'Or Lakes, Nova Scotia: using scale pattern analysis to differentiate hatchery and wild populations. In Proceedings of Wild Trout Symposium X, Conserving Wild Trout, Bozeman, Mont., 28–30 September 2010. pp. 184–195. Available from www.wildtroutsymposium.com/proceedings-10.pdf. Google Scholar

Mitchell S.O., and Rodger H.D. 2011. A review of infectious gill disease in marine salmonid fish. Journal of Fish Diseases. 34(6):411–32.

Parker, M., Westhead, M., Doherty, P. and Naug, J. 2007. Ecosystem Overview and Assessment Report for the Bras d'Or Lakes, Nova Scotia. Can. Manuscr. Rep. Fish. Aquat. Sci. 2789: xxii + 223 pp.

Petrie, B. 1999. Sea level variability in the Bras d'Or Lakes. Atmos.-Ocean37,221-239. (Cited, not seen.)

Petrie, B. and Bugden, G. 2002. The Physical Oceanography of the Bras d'Or Lakes. Proc. N. S. Inst. Sci. 42: 11-38.

Smith, J., Grant, J., and Stuart, R. 2002. Design of the Environmental Monitoring Program for the Marine Aquaculture Industry in Nova Scotia.

Stephenson M.F., McGladdery, S.E., Maillet, M, Veniot A., and Meyer, G. 2003. First reported occurrence of MSX in Canada. J. Shellfish Res. 22: 355

Strain, P. and Yeats, P. 2002. The Chemical Oceanography of the Bras d'Or Lakes. Proc. N .S. Inst. Sci. 42: 39-66.

Tremblay, W.J. 2002. Large epibenthic invertebrates in the Bras D'Or Lakes. Proc. N.S. Inst. Sci. 42:65-100.

Vercaemer, B., MacIsaac, A. and Drinnan, P. 2010. Initiation of a Bras Lake oyster breeding program and broodstock management for resistance to MSX. Aquaculture Collaborative Research and Development Program (ACRDP) 2005-2008. Part 1. Initiation of a Bras d'Or Lake oyster breeding program for resistance to MSX. Part 2. Broodstock management for the Bras d'Or Lake oyster breeding program - resistance to MSX. Can. Tech. Rep. Fish. Aq. Sci. 2871

ADDENDUM 1 – DEVELOPMENT PLAN APPENDICES

The following appendices apply to all site applications, except for Appendix E and Appendix G, which contain site-specific information.

A1.1 Appendix A – Baseline Survey 2015

Eskasoni Fish & Wildlife Commission
PO Box 8097, 4115 Shore Road, Eskasoni, NS, B1W 1C2
P: (902) 379-2024 F: (902) 379-2159 www.efwc.ca

Baseline Survey of sulfide levels in Whycocomagh Bay

Submitted to:

Waycobah Fisheries

Waycobah First Nation

June 2015

Eskasoni Fish & Wildlife Commission
PO Box 8097, 4115 Shore Road, Eskasoni, NS, B1W 1C2
P: (902) 379-2024 F: (902) 379-2159 www.efwc.ca

Contents

Introduction 1
Methodology 1
Results 3
Area A 4
Area B 5
Area C 6
Area D 7
Area E 7
Summary 7

Eskasoni Fish & Wildlife Commission
PO Box 8097, 4115 Shore Road, Eskasoni, NS, B1W 1C2
P: (902) 379-2024 F: (902) 379-2159 www.efwc.ca

Introduction

Whycocomagh Bay is located at the base of the St. Patrick's Channel in the Bras d'Or Lakes, Unama'ki (Cape Breton Island). Whycocomagh Bay has some of the lowest flushing times in the Bras d'Or Lakes; therefore, it is very important to record baseline information of the local environment prior to and during aquaculture activities in the area to monitor environmental health. Waycobah First Nation currently has a trout farm in Whycocomagh Bay and is in the process of developing a mitigation plan that best suits the environment. While the fish farm does contribute to enrichment of the area where open fish pens are located there are also other local contributors including rivers and sewage outflows. For proper management to take place, there are several issues to investigate including:

1) The potential effect of rivers and waste water on the local environment and impact to the farm site;
2) Oxygen levels at various areas of the bay for the purpose of identifying alternate lease sites;
3) Identification of benthic organisms to indicate the health of the seabed; and
4) Baseline sulphide levels at potential pen sites.

The purpose of this project was to collect baseline data assessing seafloor and benthic boundary layer enrichment prior to the development of fish farming or processing in areas of Whycocomagh Bay. To properly mitigate enrichment from the trout farm or processing plant it is important to identify other sources of enrichment (i.e., river and sewage outflows). This information will be applied to site selection and planning before applying for new leases as well as for management decision making for the operation of both the trout farm and the processing plant. Waycobah Fisheries has made a commitment to community members to be environmentally responsible when it comes to fish farming. This commitment along with the requirements under the Nova Scotia Department of Fisheries and Aquaculture leasing requirements will assist in estimating carrying capacity and identifying suitable areas for alternate net pen sites.

Methodology

Sampling stations were identified by Waycobah Fisheries and represented current lease areas, areas identified for possible farm expansion and areas that may impact farm operations , i.e., the outlfow of Skye River and the processing plant effluent. This varies slightly from the proposed sampling plan, but it provides valuable data for future farm operations and potential expansion. The sampling stations were grouped into 5 areas (figure 1) which clusters stations for easier comparison from an operations stand point. Though not along transects, these stations provided data on the current conditions of the sites that have been proposed for farm expansion or may impact the farm and therefore are important to current and future operations.

Eskasoni Fish & Wildlife Commission
PO Box 8097, 4115 Shore Road, Eskasoni, NS, B1W 1C2
P: (902) 379-2024 F: (902) 379-2159 www.efwc.ca



Figure 1: Sampling areas within Whycocomagh Bay.

Field protocols and laboratory analysis for sulphide level, redox, sediment porosity, total organic matter and video logs followed the standard operating procedures of for the environmental monitoring program outlined by the Nova Scotia Department of Fisheries and Aquaculture (NSDFA 2014) with the addition of protocols for benthic invertebrate analysis and dissolved oxygen (EFWC 2014). A summary of the methodology for the various sampling components is provided below.

Video Transect

Video was taken at each sampling station before sediment samples were collected to capture images of undisturbed sediment. A Seaviewer drop camera mounted to a metal frame with a 0.5 m^2 quadrate in viewing range was dropped at each station and video was recorded for a minimum of 2 minutes. Real time latitude and longitude were recorded by the camera which was equipped with a digital overlay, to verify station location. Video logs were kept and submitted in the electronic version of this report.

Sulphide and Benthic Community Sampling

Depending on bottom type, an Ekman or petite Ponar sediment grab was lowered in a controlled manner and deployed to collect benthic sediment samples (in triplicate) at each sample station. Pictures were taken of each sample and the depth of the sample was recorded. A 5 ml subsample was then collected to determine redox potential, total dissolved sulphide, porosity and total organic matter. A subsample of the remaining sediment was collected and brought back to the lab where they were sieved and any animals present were preserved in 10 % buffered formalin in seawater in an airtight container. All samples were kept on cool in a sealed container in the field and then placed in the refrigerator. A temperature logger was placed with the syringes from the field until laboratory analysis was complete.

Eskasoni Fish & Wildlife Commission
PO Box 8097, 4115 Shore Road, Eskasoni, NS, B1W 1C2
P: (902) 379-2024 F: (902) 379-2159 www.efwc.ca

Dissolved Oxygen

After careful consideration, it was decided that a dissolved oxygen probe would provide the best results for the purposes of this project. Unfortunately, the probe did not arrive in time to be used during the sampling. The probe with be deployed at each area over a period to time to record longer term profiles of dissolved oxygen in Whycocomagh Bay.

Results and Comments

Areas A and B were comprised of 9 sampling stations each, representing typical baseline sampling required by the NSDFA for proposed leases (i.e., 4 corner stations, 3 stations through the middle of the proposed area and 2 reference stations). Area C had 15 stations which represented stations that would fall within the area of expansion as well as stations as well as areas that may be impacted by deposition of material by a local river and sewage outfalls. Areas D & E each had 1 station (figure 2) that represented areas that could impact farm operations, i.e., river/ sewage outflows (station 35) and processing plant outlflow (station 33).



Figure 2: Sampling stations located throughout Whycocomagh Bay.

Eskasoni Fish & Wildlife Commission
PO Box 8097, 4115 Shore Road, Eskasoni, NS, B1W 1C2
P: (902) 379-2024 F: (902) 379-2159 www.efwc.ca

Area A

Stations 1, 2 and 3 represented the stations through the center of the proposed lease area, stations 4 through 7 serve to mark each corner of this area while stations 8 and 9 are reference stations. Reference stations would be sampled in the future to assess impacts, if any, of the farm on the local environment over time.



Figure 3: Location of stations within Area A (1 - 9).

All of the sampling stations in Area A (figure 3) were oxic (Table 1) based on the classification scheme found in the NSDFA environmental monitoring program standard operating procedures (NSDFA 2014). Brown mud was the dominant type of sediment found at stations 1 through 9.

Table 1: Summary of sediment analysis of stations within Area A.

Station #	Sediment Description	Odour	Mean Redox (mV_{NHE})	Mean Sulfide (µM)	Mean Sulfide (mV)	Mean Porosity (%)	Mean Percent Organic Matter (POM)	Sediment Classification
1	Light brown mud	None	309.1	11.40	-825.9	77.2	14.3	**Oxic A**
2	Light brown mud	None	171.3	71.73	-855.0	73.6	15.1	**Oxic A**
3	Rusty color mud	None	195.2	76.53	-857.4	72.9	14.2	**Oxic A**
4	Rusty brown mud, some air pockets	None	135.8	60.60	-852.6	75.3	15.5	**Oxic A**
5	Rusty brown mud	None	143.8	57.57	-853.7	77.4	15.2	**Oxic A**
6	Rusty brown mud	None	219.7	6.27	-824.9	72.8	12.7	**Oxic A**
7	Light brown mud	None	240.3	18.50	-819.9	72.7	12.1	**Oxic A**

Eskasoni Fish & Wildlife Commission
PO Box 8097, 4115 Shore Road, Eskasoni, NS, B1W 1C2
P: (902) 379-2024 F: (902) 379-2159 www.efwc.ca

8	Light brown mud with dark patches	None	412.5	63.50	-751.9	72.5	14.9	**Oxic A**
9	Light brown mud	None	216.1	6.20	-778.0	73.0	14.3	**Oxic A**

Area B



Figure 4: Location of stations within Areas B (10 - 18) and D (33).

All of the sampling stations in Area B (figure 4) were oxic (Table 2) based on the classification scheme (NSDFA 2014). Brown mud was the dominant type of sediment found at stations 10 through 18.

Table 2: **Summary of sediment analysis of stations within Area B.**

Station #	Sediment Description	Odour	Mean Redox (mV_{NHE})	Mean Sulfide (µM)	Mean Sulfide (mV)	Mean Porosity (%)	Mean Percent Organic Matter (POM)	Sediment Classification
10	Medium brown mud	None	315.2	2.85	-799.57	76.8	12.6	**Oxic A**
11	Medium brown mud	None	210.7	49.12	-807.4	78.8	15.1	**Oxic A**
12	Light brown mud	None	159.7	12.02	-812.13	76.9	13.9	**Oxic A**
13	Light brown mud	None	232.7	41.91	-826.4	74.3	12.8	**Oxic A**
14	Light brown mud	None	246.9	6.22	-785.9	77.3	12.8	**Oxic A**
15	Light brown mud	None	181.9	2.92	-788.67	72.0	13.0	**Oxic A**
16	Light brown mud	None	227.8	0.53	-774.77	74.9	13.3	**Oxic A**
17	Light brown mud	None	193.9	10.89	-817.77	73.5	12.6	**Oxic A**
18	Light brown mud	None	219.7	40.38	-826.3	71.5	13.4	**Oxic A**

Eskasoni Fish & Wildlife Commission
PO Box 8097, 4115 Shore Road, Eskasoni, NS, B1W 1C2
P: (902) 379-2024 F: (902) 379-2159 www.efwc.ca

Area C



Figure 5: Location of sampling stations with Areas C (19-32 & 34) and E (35).

The sediment classifications for stations in Area C (figure 5) ranged from Oxic A to Hypoxic B (Table 3) based on the classification scheme (NSDFA 2014). By combining the results into 2 classifications, oxic or hypoxic, the results show that 53% of the stations were oxic while 47% were hypoxic. However, there is a requirement to classify based on the most adverse sediment condition, therefore, Area C would be classified as hypoxic overall.

Stations 19 – 23 are found along the deepest boundary of the proposed lease expansion with stations 30 – 32 as reference stations. Stations 24 – 29 represent sampling within the proposed lease area where the cages may be placed. Stations 24 – 26 are also located near a sewage outfall location and may provide information as to the impact that this input may have over time. Stations 34 was chosen in an effort to quantify the impact from a local river where local knowledge has indicated that sediments are likely to deposit.

Table 3: Summary of sediment analysis of stations within Area C.

Station #	Sediment Description	Odour	Mean Redox (mV_{NHE})	Mean Sulfide (µM)	Mean Sulfide (mV)	Mean Porosity (%)	Mean Percent Organic Matter (POM)	Sediment Classification
19	Medium brown sandy mud	Slight	289.6	73.02	-827.3	**62.9**	**8.6**	**Oxic A**
20	Black mud	Strong	99.4	3,483.33	-888.6	**84.0**	**16.6**	**Hypoxic B**
21	Black mud	Strong	-35.6	3,183.33	-887.5	**82.9**	**16.3**	**Hypoxic B**

Eskasoni Fish & Wildlife Commission
PO Box 8097, 4115 Shore Road, Eskasoni, NS, B1W 1C2
P: (902) 379-2024 F: (902) 379-2159 www.efwc.ca

22	Black mud	Strong	-12.03	2,843.33	-844.6	**85.1**	**16.7**	**Hypoxic A**
23	Brown sand	None	217.6	166.23	-841.3	**45.9**	**7.5**	**Oxic A**
24	Brown mud	None	223.3	100.36	-834.1	**73.7**	**14.3**	**Oxic A**
25	Light brown mud	None	259.8	169.67	-848.7	**71.4**	**15.2**	**Oxic A**
26	Light brown mud	None	-70.9	2,893.33	-883.5	**84.4**	**17.9**	**Hypoxic A**
27	Light brown/ black mud	None	139.5	233.00	-849.9	**75.3**	**15.3**	**Oxic A**
28	Black mud	Slight	-75.5	2,146.67	-881.7	**79.2**	**17.4***	**Hypoxic A**
29	Black mud	Slight	-60.0	2,993.33	-884.4	**82.3**	**17.0**	**Hypoxic A**
30	Light brown mud	None	204.2	149.00	-847.6	**77.9**	**14.6**	**Oxic A**
31	Black mud	Slight	-17.0	2,120.00	-880.2	**81.3**	**17.2**	**Hypoxic A**
32	Light brown/ black mud	Slight	59.9	1,274.67	-865.7	**79.4**	**16.6**	**Oxic B**
34	Dark brown mud	Slight	105.2	1,053.00	-866.8	**75.3**	**19.3**	**Oxic B**

*This value is based on the average of replicate A and B. Replicate C was omitted due to human error.

Area D

The sediment in Area D was brown sand and classified as oxic (table 4).

Table 4: Summary of mean Redox (mV_{NHE}) and mean total sulfide (µM and mV) for Area D.

Station #	Sediment Description	Odour	Mean Redox (mV_{NHE})	Mean Sulfide (µM)	Mean Sulfide (mV)	Mean Porosity (%)	Mean Percent Organic Matter (POM)	Sediment Classification
33	Brown sand	None	375.4	55.20	-824.4	40.0	4.0	**Oxic A**

Area E

The sediment in Area E was brown sand and classified as oxic (table 5).

Table 5: Summary of mean Redox (mV_{NHE}) and mean total sulfide (µM and mV) for Area E.

Station #	Sediment Description	Odour	Mean Redox (mV_{NHE})	Mean Sulfide (µM)	Mean Sulfide (mV)	Mean Porosity (%)	Mean Percent Organic Matter (POM)	Sediment Classification
35	Brown mud	None	333.8	35.53	-826.9	40.9	5.2	**Oxic A**

Summary

The majority of the areas sampled in Whycocomagh Bay were classified as oxic based on the mean Redox and mean total sulfide data. Area C was the only area that had a mixture of classifications resulting in an overall classification of hypoxic. Mitigation measures will be required for this area.

Benthic invertebrate analysis was incomplete at the time of this report and will be added as an appendix once complete.

Eskasoni Fish & Wildlife Commission
PO Box 8097, 4115 Shore Road, Eskasoni, NS, B1W 1C2
P: (902) 379-2024 F: (902) 379-2159 www.efwc.ca

Appendix: Benthic Invertebrate Analysis

Approximately one cup of sediment was collected, in a re-sealable plastic bag for infaunal invertebrate identification. Samples were placed in a cooler with ice upon collection then stored in the refrigerator at 4°C until preparation. Samples were washed through a 300µm mesh sieve and placed in a vial containing 80:2 distilled water: 10% buffered formalin solution. The samples remained in the formalin for one week prior to identification. Identification occurred using a dissecting, stereo microscope. The following groups of organisms were identified and counted in the samples:

Phylum Annelida	-Tube worm -Polychaete - Worm tube piece
Phylum Arthropoda	- Copepod exoskeleton (*Calanus finmarchicus*) -claw piece -Gammarid -Insect wing
Phylum Mollusca	-Oyster shell fragment (*Crassostrea virginicia)* -Scallop -Scallop shell fragment -Mussel shell fragment (*Mytilus sp.)* -Mussel (*Mytilus sp.)* -Clam shell fragment -Clam -Razor clam (*Ensis directus)* -Gastropod shell fragment -Gastropod
Phylum Porifera	-Sponge (Class Demospongiae)
Kingdom Protista	-Foraminiferan
Kindom Plantae	-Unknown Seed -Maple seed -Seed coat -Pine needle -Decomposing leaf

All polychaetes as well as representative samples of various organisms found within the samples were placed back in the vials for future analysis (if required).

AEM Invertebrate counts from Baseline Survey of sulfide levels in Whycocomagh Bay 2015

Mean numbers per station (calculated from 3 samples/station)

Area	Station	Worm tube pieces	Tube worm pieces	Unknown Polychaetes	Fish scales and bones	Copepod exoskeleton Calanus Finmarchicus	Oyster shell fragments *Crassostrea virginicia*	Scallop	Scallop shell fragments	Gammarid	Mussel shell fragments *Mytilus sp.*	Mussel *Mytilus sp.*	Gastropod or shell fragments	Clam pieces	Small clam	Razor clam *Ensis directus*	Piece of claw	Insect wing	Sponge (Class Demopongiae)	Foraminiferan	Seed	Pine needles	Seed coat	Maple seed	Rotting leaf
A	1	122	7	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
A	2	277	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
A	3	50	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0
A	4	113	5	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0
A	5	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
A	6	10	0	3	0	0	9	0	0	0	1	0	0	0	0	0	6	1	0	0	1	0	0	0	0
A	7	59	7	4	0	0	3	0	0	0	1	0	0	0	1	0	3	2	0	0	0	0	0	0	0
A	8	215	5	6	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A	9	175	7	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0
B	10	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	1	0
B	11	69	6	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0
B	12	148	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
B	13	59	3	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B	14	21	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	3	0	0	0
B	15	93	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
B	16	132	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
B	17	112	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
B	18	153	3	2	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C	19	15	1	7	0	0	1	2	0	0	0	0	2	0	2	0	1	0	0	0	0	2	0	0	0
C	20	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
C	21	0	0	0	0	0	0	0	0	0	39	0	0	0	0	0	0	0	0	0	0	1	0	0	0
C	22	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0	0	1	0	0	0
C	23	7	0	3	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	1	0	0	0
C	24	9	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
C	25	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0
C	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C	27	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	1
C	28	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1
C	29	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
C	30	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
C	31	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0
C	32	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
D	33	15	0	1	0	0	0	0	0	0	14	0	0	0	2	1	0	0	0	0	0	3	0	0	0
C	34	3	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0
E	35	7	1	2	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	0	0	0
	Total of the mean numbers/station	**1915**	**68**	**55**	**0**	**0**	**22**	**3**	**0**	**0**	**73**	**2**	**3**	**1**	**6**	**1**	**11**	**6**	**0**	**1**	**4**	**59**	**1**	**2**	**2**

A1.2 Appendix B – BAP Farm Standard 2023

Aquaculture Facility Certification

BAP Farm Standard

Best Aquaculture Practices Certification Standards, Implementation Guidelines

Best Aquaculture Practices

• Food Safety • Social Accountability • Environmental Responsibility

• Animal Health and Welfare • Traceability

Previous Issue Invalid 01-March-2022

Aquaculture Facility Certification

BAP Farm Standard

Issue 3.1 – 07-February-2023
Best Aquaculture Practices
Certification Standards, Guidelines

Best Aquaculture Practices Certification

The following Best Aquaculture Practices (BAP) standards apply to the farming of finfish, crustaceans, and other aquatic invertebrates. They cover all production methods, including flow-through, partial exchange, and closed or recirculating aquaculture systems operated in ponds, cages, net pens, tanks, raceways, or closed-containment vessels.

Not covered under these standards are:

- Salmonids reared in net pens in marine waters (refer to BAP Salmon Farm Standard),
- Bivalve Mollusks (refer to the BAP Mollusk Farm Standard),
- Aquaculture facilities that produce eggs and/or juvenile aquatic animals for live transfer to other aquaculture facilities (refer to BAP Hatchery and Nursery Standard).

The BAP standards are achievable, science-based and continuously improved global performance standards for the aquaculture supply chain that assure healthful foods produced through environmentally and socially responsible means. They are designed to assist program applicants in performing self-assessments of the environmental and social impacts, and food safety controls of their facilities. BAP Standards lead to certification of compliance after verification of the applicant's facilities by BAP approved third-party certification bodies.

BAP Structure

The BAP program has four pillars and an overarching set of Traceability Requirements. The pillars comprise the first four sections of the standard:

1. Food Safety
2. Social Accountability
3. Environmental Responsibility
4. Animal Health and Welfare

The fifth section defines the Traceability Requirements that are essential to preserve product identity and to verify the validity of any BAP claims.

BAP standards demand compliance with local regulations as the first step toward certification. However, not all regulations are equally rigorous. For this reason, BAP standards set out requirements for documentation and procedures that shall be in farm management plans, whether they are prescribed by local regulations or not. By so doing, they seek, where possible, to impose consistency in performance among facilities in different producing regions and to engage the industry as a whole in a process of continuous improvement.

In common with ISO usage, these standards use the words "shall" to mean compliance is required or mandatory and "should" to mean compliance is recommended. Auditable points are "shall" statements listed at the beginning of each section.

The Certification Process

1. Program Management

Best Aquaculture Practices is a division of the Global Seafood Alliance (GSA), with offices headquartered in Portsmouth, New Hampshire, USA. Best Aquaculture Practices manages multiple GSA standards including the BAP Farm Standard on behalf of the GSA.

To obtain BAP certification, applicant farms shall be audited by an independent, BAP-approved certification body (CB). To apply for certification, please contact:

Best Aquaculture Practices
85 New Hampshire Avenue, Suite 200
Portsmouth, NH 03801 USA
Tel: +1-603-317-5000
Email: bapcert@bapcertification.org
BAP Website: www.bapcertification.org
GSA Website: www.globalseafood.org

2. Self-Assessment

New applicant farms are expected to carry out a self-assessment against the Standard to ascertain their preparedness for a third-party CB audit.

3. Third-party CB Assessments

Once a self-assessment has been carried out by the farm and it is satisfied that all deficiencies identified have been rectified, they can proceed to certification. To become certified, farms must be able to demonstrate compliance with this Standard, through an independent third-party on-site assessment by a GSA-approved CB.

The chosen CB will formulate an agreement between the farm and the CB detailing the requirements and commitments needed from the farm.

New farms must be in operation for at least three months from commencing production to ensure that they can demonstrate full compliance with the Standard during the assessment.

4. Assessment Frequency

Audits to the BAP Farm Standard are conducted at a frequency of once per year. However, additional audits, re-audits, short notice, or unannounced audits shall also be conducted at the discretion of GSA and Certification Bodies where facility compliance concerns arise.

5. Duration of Assessments

The duration of an assessment is dependent on factors such as size of the operation/farm and number of personnel. In most cases the actual on-site audit duration for an individual farm facility is one full day. CBs are required to inform GSA-BAP where a deviation in audit duration is foreseen. The assessment format includes systems review and physical inspection of the site and production process. Time allocation during the assessment shall be such to provide sufficient and proportionate time for each activity to be carried out in full and where appropriate, additional time may be given when the auditor is required to carry out further investigation.

6. Audit Process (Figure 1)

All requirements in the Standard shall be addressed. As with other BAP standards, the audit against the BAP Farm Standard will consist of elements listed in Figure 1 in accordance with ISO 19011.

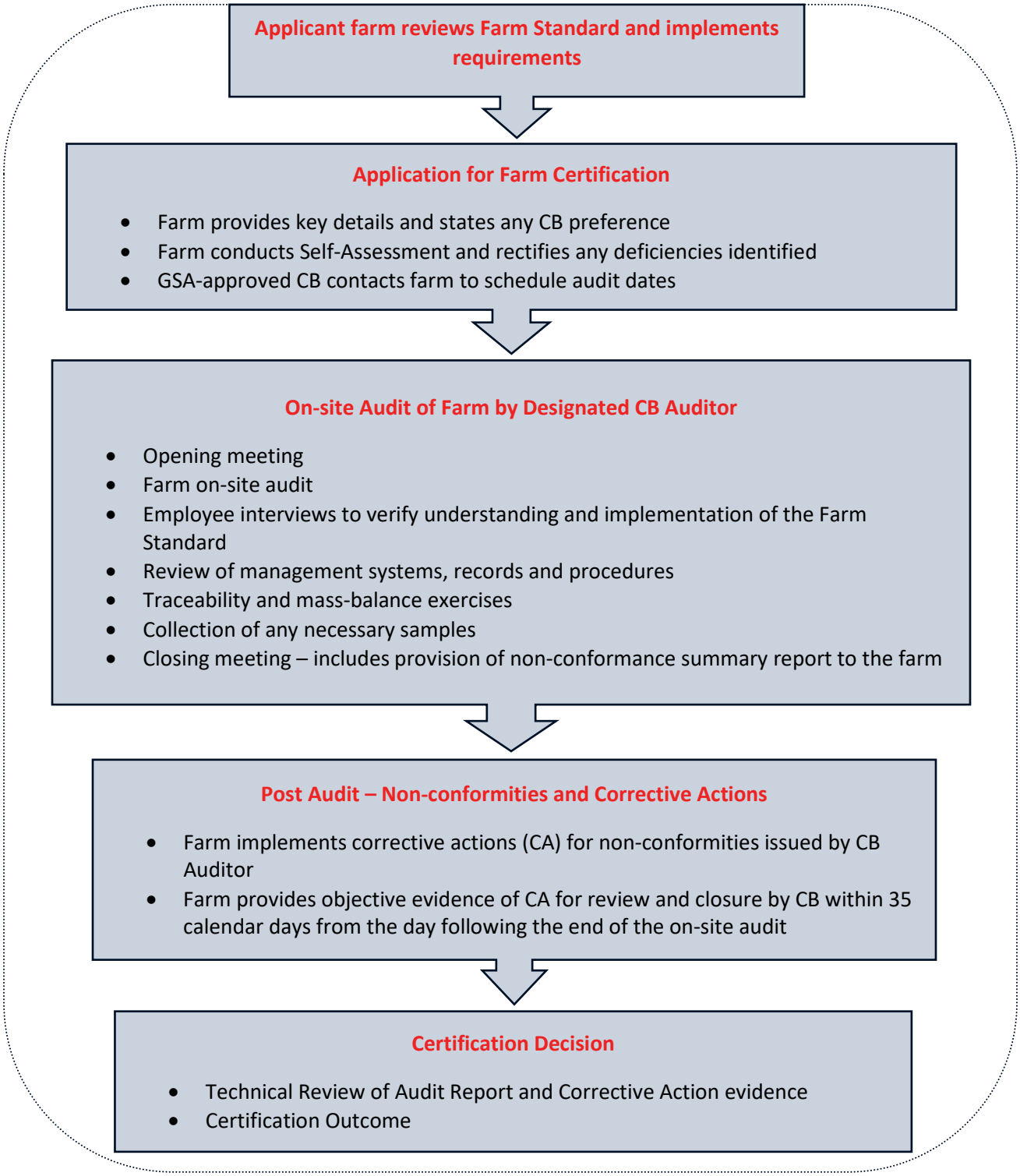


Figure 1. BAP Audit Process

7. Non-Conformities and Corrective Actions

Any non-conformity issued during the assessment will be recorded by the auditor as either:

NC Rating	Definition	Required Action
Minor	Where absolute compliance with requirements and/or the intent of any clause in the Standard has not been demonstrated. The matter does not rise to the level of Major or Critical and tends to be lower risk issues or isolated instances rather than patterns. Not indicative of an overall breakdown in compliance and systems.	Objective evidence verifying the proper implementation of corrective actions and closure of non-conformities must be submitted to the Certification Body in accordance with GSA/BAP certification management rules.
Major	Where there is a substantial failure to meet the requirements and/or intent of any clause in the Standard but there is no food safety risk and/or legal issue or immediate risk to the Integrity of the scheme. (Generally, policy)	Objective evidence verifying the proper implementation of corrective action and closing of non-conformities must be submitted to the Certification Body in accordance with GSA/BAP certification management rules.
Critical	Where there is a critical failure to comply with a food safety and/or legal issue or a risk to the integrity of the scheme.	The auditor will immediately inform the Certification Body, who will inform the GSA/BAP office. Immediate temporary suspension may ensue pending clarifications and a re-audit may be necessary.

At the closing meeting, the auditor shall present his/her findings and review all non-conformities that have been identified during the assessment but shall not make comment on the likely outcome of the assessment. A written summary of the non-conformities discussed at the closing meeting shall be agreed upon and signatures from the farm representative obtained. A copy of the non-conformity report must be left with the farm prior to the auditor departing the farm. The farm shall provide the CB, in accordance with GSA/BAP certification management rules, suitable and adequate objective evidence that corrective action has been implemented to rectify the non-conformity. This evidence shall also address root cause and future prevention. The evidence will be reviewed, and the CB will respond either confirming closure of the non-conformity or requesting further evidence. The farm must submit evidence to the CB to close out all non-conformities within 35 calendar days from the day following the end of the audit. Failure to close out non-conformities in the given timeframe will result in certification not being granted or continued, and facilities will be required to re-apply for a full assessment for certification.

8. Audit Reporting and the Certification Decision

The auditor will provide a full report of the assessment, including the details of any non-conformities issued. The auditor will submit the report to the CB. The report shall include brief statements of objective evidence of both conformity and non-conformity. The report shall follow the format specified by the GSA/BAP. The report shall be issued in accordance with the GSA/BAP Report Guidelines. Within the audit report there shall be a record of the duration of the assessment (expressed as hours) and any reason for the lengthening or shortening of the duration from that which is typical.

The audit report along with the corrective actions submitted by the farm will be evaluated by a Certification Committee of the CB, who will make the final certification decision post closure of all non-conformities. The timelines for audit, closure of non-conformities, technical review and certification decision are as specified in the GSA/BAP CB Requirements Document PI - Policy - BAP CB Requirements Document - Issue 14.8 - 18-September-2020.pdf (bapcertification.org) available on the BAP website. To achieve certification to the BAP Farm Standard, the applicant farm must meet all of the requirements of the Standard.

9. Standards Development

BAP standards are developed by committees of technical experts following a process aligned to the FAO Technical Guidelines on Aquaculture Certification.

References:

https://www.bapcertification.org/Standards
http://www.fao.org/3/a-i2296t.pdf

Acknowledgements

An expert group, the BAP Farm Standard Technical Committee, develops and endorses the Standard, with representatives throughout the supply chain and interested parties including industry associations, processors, producers, regulators, non-governmental organizations and conformity assessment and standards experts. The GSA is grateful to the members of the Farm Standard Technical Committee members who created the earlier versions of the Standard and to other specialists that offered valuable input during the review process. Special thanks are due to the Technical Committee that worked on this 2019-2020 update of the BAP Farm Standard:

BAP Farm Standard Technical Committee

John Hargreaves, **(Chair)**, independent consultant, TX, USA
Cecile Brugère, Soulfish Research and Consultancy, UK
Ken Corpron, (ex officio), BAP, Portsmouth, NH, USA
Bart Green, USDA-ARS, Harry K. Dupree Stuttgart National Aquaculture Research Center, Stuttgart, AR, USA
Cui He, China Aquatic Products Processing and Marketing Alliance (CAPPMA), Beijing, China
Robert Jones, The Nature Conservancy, Arlington, VA, USA
Tô Tường Lan, Vietnam Association of Seafood Exporters and Producers (VASEP), Vietnam
Robins McIntosh, CP Foods, Bangkok, Thailand
Francis J. Murray, Stirling University, Stirling, Scotland
Ralph Parkman, BAP Auditor (ret.), FL, USA
Yahira Piedrahita, Camara Nacional de Acuacultura, Guayaquil, Ecuador
Randy Rhodes, Harvest Select Catfish, Uniontown, AL, USA
Steve Summerfelt, Superior Fresh, Hixton, WI, USA
Matt Thompson, Anderson Cabot Center for Ocean Life, New England Aquarium, MA, USA
Wagner C. Valenti, Sao Paulo State University, Sao Paulo, Brazil
Michelle Walsh, Florida Keys Community College, Key West, FL, USA

Standard Version History

1999 – Codes of Practice for Responsible Shrimp Farming
2002 – Shrimp Farm Standards
2008 – Tilapia Farm Standards, Catfish Farm Standards
2009 – Shrimp Farm Standards, Revision 9-09
2010 – Pangasius Farm Standards
2012 – Shrimp Farm Standards, Revision 6-12
2013 – Finfish and Crustacean Farms Standards
2014 – Finfish and Crustacean Farms Standards, Revision 9-14
2016 – Finfish and Crustacean Farms Standards, Revision 4-16
2016 – Finfish and Crustacean Farms Standards, Revision 11-16
2017 – Finfish and Crustacean Farms Standards, Revision 5-17
2021 – Farm Standard

BAP Farm Standard – Contents

Pillar 1: Food Safety		Applies To	Page
A.	General Requirement	All Production Systems	10
B.	Chemical and Drug Management	All Production Systems	11
C.	Microbial Sanitation, Hygiene, Harvest and Transport	All Production Systems	16
Pillar 2: Social Accountability			
A.	Legal Rights and Regulatory Compliance	All Production Systems	18
B.	Local Community Relations	All Production Systems	19
C.	Worker Rights and Employee Relations	All Production Systems	20
Pillar 3. Environmental Responsibility			
A.	General Implementation Guidance	All Production Systems	26
B.	General Requirement	All Production Systems	27
C.	Effluent Management	Ponds, Non-Coastal Flow-through Systems and Recirculating Aquaculture Systems	28
D.	Habitat Protection and Site Selection	Ponds and All Other Land-based Systems	34
E.	Water Quality and Sediment Monitoring	Cages or Net Pens in Fresh or Brackish Water	36
F.	Sediment Monitoring	Marine Net Pens and Coastal Flow-through Farms	38
G.	Efficient Use of Fishmeal and Fish Oil	All Production Systems	41
H.	Stocking Sources and GMOs	All Production Systems	43
I.	Control of Escapes	All Production Systems	45
J.	Biodiversity and Wildlife Protection	All Production Systems	48
K.	Storage and Management of Farm Supplies and Solid Wastes	All Production Systems	51
Pillar 4. Animal Health and Welfare			
A.	Health and Biosecurity	All Production Systems	55
B.	Welfare	All Production Systems	57
Traceability			
		All Production Systems	60
Appendices			
A.	Calculation of Annual Effluent Volume and Annual Effluent Loads	All Production Systems	63
B.	BAP Effluent Water Quality Criteria	Ponds, Raceways and Recirculating Aquaculture Systems	67
C.	Sample Effluent Monitoring Forms	Ponds, Non-Coastal Flow-through Systems and Recirculating Aquaculture Systems	69
D.	Water Quality Monitoring	Cages and Net Pens in Lakes and Reservoirs	72
E.	Sample Product Traceability Form	All Production Systems	73

BAP Standards Compliance Requirements

Pillar 1: Food Safety

A. General Requirement - All Production Systems

Audit Clauses

1.1: Farms shall conduct an assessment that identifies potential contamination risks from the surrounding environment with potential to affect the food safety of products from an aquaculture farm, including monitoring any changes to watershed land use practices over time. The farm shall develop a management plan that describes procedures to monitor and control those risks and provide evidence that the plan is operational and effective.

Implementation

Contamination Risk Assessment

Aquaculture farms are embedded in a particular landscape and watershed or water body. Depending largely on the degree of openness of the culture system to the environment, the risk of product contamination by activities in surrounding areas will vary. Open systems are at much greater risk of potential product contamination from the watershed than more closed systems. Thus, each farm has its own particular set of risks of potential product contamination and these should be clearly identified and described in the Contamination Risk Assessment.

The risk assessment can use any approach that systematically evaluates risk sources and the severity and consequences of exposure to various environmental hazards present in the watershed. Elements of a qualitative Contamination Risk Assessment include:

- Identification of potential food safety hazards from the watershed
- Description of pathways for introduction of contaminants, with and estimation of the probability of occurrence. (In a HACCP plan, these are the critical control points.)
- Exposure assessment – pathways for exposure of potential contaminants to cultured aquatic animals, with estimation of probability of exposure and critical limits
- Direct consequence assessment – relationship between exposure and consequences of exposure, with estimation of probability of occurrence. Consequences of residue accumulation during the production cycle and short-term risks associated with exposure near harvest.
- Risk Assessment - integrating the results of the entry assessment, exposure assessment, and consequence assessment to produce overall measures of risks associated with the hazards identified (prioritization of contributions to overall risk)
- Risk Management – measures to address the risks identified in the risk assessment
    - Option identification
    - Implementation
    - Monitoring and review

Perhaps the best framework for the Contamination Risk Assessment is the Hazard Analysis and Critical Control Point (HACCP) system for management of food safety risks that is commonly used in aquatic animal processing plants. A farm-level HACCP plan would identify, evaluate and control the food safety risks that occur during production. Such a plan would meet the requirements of this audit clause. The plan should address hazard analysis, critical control point (CCP) identification, establishing critical limits, monitoring procedures, corrective actions, verification procedures, and record-keeping and documentation. The individual responsible for performing monitoring, corrective actions, verification procedures and record-keeping should be identified.

When considering site locations for new pond construction, soil samples should be taken in areas of high-risk contamination, such as low areas where runoff collects, previously used pesticide storage or disposal sites, and

washing and loading sites for spray applicators and agricultural aircraft. Producers should consider prior use of a site for crops where pesticides have been used and periodically review land use changes in the immediate vicinity that may result in potential increases in environmental contaminants. Surveys of land use or agricultural practice changes can be internally conducted and documented in a risk-based analysis. If contamination is suspected, laboratory analysis of the surrounding watershed may be required to verify safety of the water supply.

B. Chemical and Drug Management - All Production Systems

Audit Clauses

1.2: Use of any treatment with antimicrobial agents shall be based only on recommendations and authorizations overseen by a qualified aquatic animal health specialist or veterinarian and only to treat diagnosed diseases, supported by antimicrobial agent sensitivity testing conducted as soon as possible, in accordance with instructions on product labels and national regulations, as part of an Animal Health Management Plan.

1.3: For tilapia production, any usage of antimicrobial agents shall not exceed three treatments per on-growing cycle, where a treatment comprises a single course of antimicrobial agents given to treat a specific disease event over a defined period followed by the completion of an appropriate withdrawal period prior to harvest.

1.4: Records shall be maintained for every application of antimicrobial agents and other therapeutic chemicals that include the date, compound used, reason(s) for use, drug sensitivity test results, dose, required withdrawal period and harvest date for treated production lots. Antibiotic use shall be reported as kg API/MT of harvested aquatic animals.

1.5: Periodic verification testing of the effectiveness of the withdrawal period shall be conducted by measurements of antimicrobial agent residues in samples of harvested crops of aquatic animals.

1.6: Antimicrobial agents or chemicals that are prohibited in the producing or importing country shall not be used in feeds, pond additives or any other treatment.

1.7: Antimicrobial agents or hormones shall not be used for growth promotion or applied prophylactically to prevent disease outbreaks. However, metaphylactic treatments in response to diagnosed disease outbreaks are permitted.

1.8: For farms using seed (fry, fingerlings, post-larvae) provided by non-BAP certified sources, statements shall be provided by the hatcheries or nurseries that declare no proactively prohibited antimicrobial agents or other chemicals were applied to seed.

1.9: For farms using feed provided by non-BAP certified sources, statements shall be provided by the feed manufacturers that attest to production procedures that exclude prohibited antimicrobial agents, unsafe levels of additives or heavy metals and physical or other contaminants.

1.10: Farms shall present evidence, such as product testing and evaluation results, that any nutritional supplements, pond additives or farm-made feeds used, manufactured, or prepared on the farm do not contain unsafe levels of contaminants and contain only substances permitted by the appropriate regulatory authorities.

1.11: Any use of antifouling agents must be legally permitted and applied using protocols that prevent contamination of farmed aquatic animals.

1.12: If used at harvest of shrimp and other crustaceans, sulfites (e.g., sodium metabisulfite) shall be applied in a manner that will yield a tissue concentration of sulfite within regulatory limits of both producing and importing countries.

1.13: Any chemicals that are prohibited in the producing or importing country shall not be used during the transport of harvested aquatic animals to processing plants. Any chemicals used shall be listed and only applied according to a documented Standard Operating Procedure.

1.14: Antimicrobial agents designated as Critically Important for Human Medicine by the World Health Organization (WHO) shall not be used.

Implementation

The major chemical risks of concern to human food safety in aquaculture are residues of therapeutic drugs and chemicals applied directly through feeds or to water of production units. In open systems, farmed aquatic animals may be exposed to pesticide residues associated with agricultural land use. Substances known as persistent bioaccumulative and toxic substances (PBTs), also known as persistent organic pollutants, may also be of concern. Knowledge of historical and current land use changes in a watershed is needed, especially regarding activities that have resulted in discharges or spills of substances that can compromise the food safety of farmed aquatic animals.

Treatment with Antimicrobial Agents

Animal Health Management Plans shall explain the steps to be taken when a diagnosed disease will be treated with approved chemicals (see Pillar 4 – Animal Health and Welfare). Lists of approved chemicals can usually be obtained from government regulatory authorities, seafood processing plants, government health and agricultural agencies, or university aquaculture or fisheries research and extension programs.

Chapter 6.2 of the OIE Aquatic Animal Health Code (2019) describes the principles for responsible and prudent use of antimicrobial agents. Responsible and prudent use 1) maintains the efficacy of antimicrobial agents both for veterinary and human medicine and to ensure the rational use of antimicrobials in aquatic animals with the purpose of optimizing both their efficacy and safety; 2) complies with the ethical obligation and economic need to keep aquatic animals in good health; 3) prevents or reduces the transfer of both resistant microorganisms and resistance determinants from aquatic animals to humans and terrestrial animals; and 4) prevents antimicrobial residues that exceed the established maximum residue limit (MRL) occurring in the food.

Article 6.2.7 of the OIE Aquatic Animal Health Code (2019) describes the responsibilities of veterinarians and other aquatic animal health professionals. These include:

- Identification, prevention and treatment of aquatic animal diseases, as well as the promotion of sound animal husbandry methods, hygiene procedures, vaccination and other alternative strategies to minimize the need for antimicrobial use in aquatic animals.
- Prescription, dispensation or administration of a specific course of treatment with an antimicrobial agent for aquatic animals under their care.
- Carrying out a thorough clinical assessment of the aquatic animal(s), including as appropriate: clinical examination, post-mortem examination, bacteriology with culture and sensitivity, and other laboratory tests to arrive at the most definitive diagnosis possible before initiating a specific course of treatment with an antimicrobial agent.
- Evaluation of environmental factors and husbandry at the production site (e.g. water quality) should be considered as potential primary factors leading to infection and should be addressed prior to prescribing a course of antimicrobial agent treatment.

If therapy with an antimicrobial agent is deemed necessary, it should be initiated as soon as possible. Selection of the agent should be based on the knowledge and experience of the veterinarian or other aquatic animal health professional authorized to prescribe veterinary medicines. Sensitivity testing of the target microorganism should be used to confirm the choice of treatment. The veterinarian or other aquatic animal health professional should indicate precisely to the aquatic animal producer the treatment regime: dosage, method of application, treatment intervals, duration of the treatment, the withdrawal period and the amount of antimicrobial agents to be delivered, depending on the dosage and the number of aquatic animals to be treated. Antimicrobial agents shall only be used on the prescription of a veterinarian or other authorized aquatic animal health professional. Aquatic animal producers shall ensure that antimicrobial agents are properly stored, handled, and disposed of. If treatments are required to maintain good welfare for farmed aquatic animals, these should be provided.

The Animal Health Management Plan, and specifically disease treatments with antimicrobial agents, shall be overseen by a veterinarian or other authorized aquatic animal health professional. Recognizing that such expertise is not always available in farming areas, farm owners should endeavor to secure the services of experts or consultants with training, experience and expertise in aquatic animal health. In any case, the aquatic animal health professional or consultant should be identified, with qualifications or certifications held on file for review.

Recordkeeping

Detailed records on the use of antimicrobial agents shall be kept. Records shall include date, compound used, reason(s) for use, drug sensitivity test results, dose, required withdrawal period and harvest date for treated production lots. The BAP program aims to exclude the use of antimicrobials that the World Health Organization (WHO) categorizes as 'critically important' to human medicine and sensitivity testing shall accompany any application of antibiotics. Farms shall report total quantity of each antibiotic used (kg of active pharmaceutical ingredient (API) per metric ton of harvested aquatic animals). Records shall be retained for a period that exceeds both 12 months from expected harvest date and the expected shelf life of the processed aquaculture products. Records for disease diagnosis should provide supporting evidence to justify cases where the decision is made to use therapeutants. Results of sensitivity tests should be made available to the Competent Authority on request. The supervising aquatic animal health expert should review farm records on the use of antimicrobial agents to ensure compliance with their directions and use these records to evaluate the efficacy of treatment regimens. See Traceability section for additional record-keeping requirements. All records related to use of antimicrobial agents shall be available for review during farm audits.

Residue Testing

When approved antimicrobial agents are used for therapeutic purposes, residue tests shall be carried out after the withdrawal period and before harvest to ensure that withdrawal periods are of sufficient duration to ensure that regulatory limits on antimicrobial agent residues are not exceeded. Testing should be done in accredited (ISO 17025) laboratories using standard analytical procedures at least twice annually. Where available, farms may use residue testing data from government surveillance or processing plant preharvest screening programs. Alternatively, where published information on acceptable withdrawal periods for a particular antimicrobial agent is available for a particular species of aquatic animal, producers can extend the withdrawal period to 1.5× the published withdrawal period and not be required to conduct residue testing.

Prohibited Antimicrobial Agents

Chloramphenicol and nitrofuran antibiotics are proactively prohibited for use in food production in all countries. Other drugs and chemicals, such as antibiotics, malachite green, heavy metals, parasiticides and hormones, may be proactively prohibited in specific countries. Farms shall have lists of antimicrobial agents prohibited for use in the country where production occurs as well as in the country or countries representing the primary markets for farmed aquatic animals. The recordkeeping system and inspection of drug storage containers shall demonstrate that prohibited antimicrobial agents are not in use on the farm.

Prohibition on Use on Antimicrobial Agents or Hormones for Growth Promotion

Low, sub-therapeutic doses of antibiotics provided to healthy livestock like cattle, pigs or poultry in water or feed can improve growth rate. One of the major concerns associated with this practice is the selection of antimicrobial resistant bacteria during low-dose, long-term treatment of healthy animals. This practice was banned in the EU in 2006 and in the US in 2017 and is now banned in many other countries. The ban refers specifically to antibiotics important in human health, not all antibiotics, and other growth promoters remain legally permitted. For aquatic animal production under this BAP standard, the use of antimicrobial agents and hormones for growth promotion during grow-out is prohibited. (Hormone use for sex reversal at the fry or fingerling stage is permitted under the BAP Finfish, Crustacean and Mollusk Hatcheries and Nurseries standard.) The use of antimicrobial agents should be reserved to treat specific diseases in aquatic animals with those diseases.

Similarly, prophylactic use of antibiotics is prohibited. Prophylaxis is the treatment of healthy aquatic animals to prevent infection and disease. However, metaphylactic use of antibiotics is allowed. Metaphylaxis is the treatment of a group of aquatic animals, some of which are healthy and some of which are diseased, that are in close contact, with the goal of preventing disease spread from diseased to healthy aquatic animals, thereby protecting the overall health of the group. As is the case with conventional disease treatment, metaphylactic

treatment shall only be initiated following a diagnosis of infection or disease by a trained aquatic animal health specialist.

Statements from Seed and Feed Suppliers

Statements from non-BAP seed and feed suppliers that attest to production procedures that exclude prohibited antimicrobial agents, unsafe levels of additives or heavy metals and physical or other contaminants are required to be maintained on file in the record-keeping system. Statements shall be updated annually at a minimum and shall be available for all seed shipments and all feeds used. For farms using feed provided by non-BAP certified sources, statements shall be provided by feed manufacturers.

Feed Additives Applied on Farm

Nutritional supplements, pond additives or farm-made feeds used, manufactured, or prepared on the farm shall include product testing and evaluation procedures to ensure that these substances do not contain unsafe levels of contaminants and contain only substances permitted by the appropriate national authorities. Any use of approved food additives must involve monitoring the amount and method of application to prevent illegal residues in the edible portion of the products and assure product labeling to designate prior usage. Farms shall maintain a list of all nutritional supplements or pond additives used and provide evidence of the implementation of product testing and evaluation procedures to ensure product safety.

Antifouling Agents

Antifouling agents are often used to prevent or minimize biofouling of mesh material used to construct cages and net pens that are typically placed in the marine environment. Residues of antifouling agents may accumulate in sediment beneath net pens or enter marine food webs. Any antifouling agents used must be legally permitted and applied using protocols that prevent contamination of farmed aquatic animals. Farms using authorized antifoulant treatments must retain a copy of permits and the relevant laws or regulations on file.

Metabisulfite Use

Metabisulfites are used as a post-harvest treatment for shrimp to prevent melanization that can affect product quality. Sulfites are not considered toxic but can cause health problems in some humans. Typically, shrimp are dipped in clean, chilled water and then in chilled metabisulfite solution. Farms using this practice shall develop a Standard Operating Procedure for metabisulfite treatment to ensure good treatment efficiency and that metabisulfite residues in treated shrimp do not exceed levels authorized by importing countries. For example, the maximum sodium metabisulfite residue in shrimp imported to the US and Japan may not exceed 100 ppm. The farm should have a plan or standard operating procedure to maintain sodium metabisulfite residues below action levels of the countries to which they export shrimp. Product labels must include a clear indication if sulfites are used in shrimp post-harvest treatment and processing.

Chemical Use in Transport

Aquatic animals may be transported at any life stage, typically from hatcheries or nurseries to grow-out facilities. This audit clause refers specifically to chemical use in transport of aquatic animals (live or dead) after harvest from farms to processing plants. Chemicals used in transport are sedatives/anesthetics/tranquilizers to reduce aquatic animal metabolic rate, salts for enhanced osmoregulation and handling stress reduction, oxygen-producing chemicals (e.g. hydrogen peroxide), pH buffering chemicals, ammonia control chemicals (e.g. zeolite), and antifoaming agents to improve visibility to allow better observation of aquatic animals. Antimicrobial agents shall not be used during transport from farm to processing plant. All chemicals used during transport shall be approved by government regulatory authorities for application to aquatic animals. A list of such approved chemicals shall be maintained on file at the farm. In addition, a Standard Operating Procedure for aquatic animal transport shall be prepared and available for review during the farm audit.

Antimicrobial Agents Designated as Critically Important for Human Medicine

Antimicrobial agents designated as Critically Important for Human Medicine by the World Health Organization (WHO) shall not be used. Antimicrobial agents designated as Critically Important for Human Medicine by the World Health Organization (WHO) are categorized by meeting two criteria: 1) the antimicrobial class is the sole, or one of limited available therapies, to treat serious bacterial infections in people, and 2) the antimicrobial class is used to treat infections in people caused by either: a) bacteria that may be transmitted to humans from non-human sources, or b) bacteria that may acquire resistance genes from non-human sources.

Critically important antimicrobials include Aminoglycosides (e.g. gentamicin), Ansamycins (e.g. rifampicin), Carbapenems and other penems (e.g. meropenem), Cephalosporins (3rd,4th and 5th generation; e.g. ceftriaxone, cefepime, ceftaroline, ceftobiprole), Glycopeptides (e.g. vancomycin), Glycylcyclines (e.g. tigecycline), Lipopeptides (e.g., daptomycin), Macrolides and ketolides (e.g. azithromycin, erythromycin, telithromycin), Monobactams (e.g., aztreonam), Oxazolidinones (e.g. linezolid), Penicillins (antipseudomonal; e.g. piperacillin), Penicillins (aminopenicillins; e.g. ampicillin), Penicillins (aminopenicillin with betalactamase inhibitors; e.g. amoxicillin-clavulanic-acid), Phosphonic acid derivatives (e.g. Fosfomycin), Polymyxins (e.g. colistin), Quinolones (e.g. ciprofloxacin), and drugs used solely to treat tuberculosis or other mycobacterial diseases (e.g. isoniazid).

Additional Information

US FDA (2017), HACCP Principles & Application Guidelines
https://www.fda.gov/food/hazard-analysis-critical-control-point-haccp/haccp-principles-application-guidelines

Bowker, J.D. and J.T. Trushenski, Editors. 2019. Guide to Using Drugs, Biologics, and Other Chemicals in Aquaculture. American Fisheries Society Fish Culture Section.
https://fishculture.fisheries.org/working-group-on-aquaculture-drugs-chemicals-biologics/wgadcb-resources-tools/guide-to-using-drugs-biologics-and-other-chemicals-in-aquaculture/

WHO (2018), Critically Important Antimicrobials for Human Medicine, 6th Revision, 45 pp.
https://www.who.int/foodsafety/publications/antimicrobials-sixth/en/

WHO (2019), Highest Priority Critically Important Antimicrobials
https://www.who.int/foodsafety/cia/en/

OIE Aquatic Animal Health Code (2019), Section 4 – Disease Prevention and Control
OIE Aquatic Animal Health Code (2019), Section 6 – Antimicrobial Use in Aquatic Animals
https://www.oie.int/international-standard-setting/aquatic-code

OIE (2019), Manual of Diagnostic Tests for Aquatic Animals
http://www.oie.int/en/international-standard-setting/aquatic-manual/access-online

Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (revised in 2017)
http://www.pic.int/

Stockholm Convention on Persistent Organic Pollutants (POPs) (revised in 2017)
http://chm.pops.int/

C. Microbial Sanitation, Hygiene, Harvest and Transport - All Production Systems

Audit Clauses

1.15: Human waste shall be properly collected, treated and disposed of to avoid contamination of farmed aquatic animals and surrounding areas.

1.16: Terrestrial livestock, guard dogs and domestic pets shall not be allowed to access production units/areas unless such animals are subject to veterinary oversight and control and are certified to be free of parasites and other diseases of concern to human or aquatic animal health.

1.17: Human wastes and unpasteurized animal manures shall not be used as fertilizers in and around production units.

1.18: Uncooked whole organisms and their uncooked by-products shall not be used as feed in any production system.

1.19: If chilled at harvest, fish and crustaceans shall be chilled rapidly to an internal product temperature of 4^{o}C or less.

1.20: Ice for chilling harvested products shall be made from water that complies with microbial and chemical limits for potable water or water certified as safe for use on aquatic animals intended for human consumption by government regulatory authorities.

1.21: Equipment and containers used to harvest and transport fish or crustaceans shall be cleaned, sanitized, and free of lubricants, fuel, metal fragments and other foreign material that presents a potential food safety hazard.

1.22: Workers with open wounds, sores or skin infections shall be prohibited from handling harvested products.

1.23: Workers shall be trained in good personal health and hygiene to ensure they are aware of their roles and responsibilities in protecting aquaculture products from food safety risks.

Implementation

The major biological risks of concern to human food safety are pathogenic bacteria and viruses, parasites and biological toxins. Human pathogens may contaminate harvested aquatic animals in farming systems that use inputs such as organic fertilizers or where standards of worker hygiene during production are poor.

Sanitation

Sanitary facilities shall be provided for farm workers, management staff and visitors. Housing for managers or workers sometimes is located near production ponds. Wastewater from bathrooms, kitchens and other facilities shall be collected and stored in septic tanks. Waste oxidation lagoons are also an acceptable treatment method on large farms. Farms with toilets located near canals or waste treatment systems shall not discharge or leak into ponds or farm canals and any deficiencies shall be corrected. At cage farms, workers often spend long hours on floating cage platforms. Portable toilets shall be provided, and sanitary procedures for disposal of wastes onshore shall be established. In all cases, untreated wastewater shall not be allowed to enter ponds or be discharged directly to natural water bodies. Human waste collected in septic tanks or portable toilets shall be removed periodically by trained individuals or specialized contract haulers.

Exclusion of Livestock

In general, terrestrial livestock, guard dogs and domestic pets shall not be allowed free access to production ponds. Fences should be installed to prevent these animals from drinking, wading or swimming in ponds. Farms should provide a water source outside the pond area to discourage livestock from seeking access to ponds for drinking water or heat relief. Runoff from livestock barns and other holding facilities shall not enter ponds.

Access by terrestrial livestock, guard dogs and domestic pets is allowed under specific conditions. All farms are required to conduct a comprehensive contamination risk assessment (see 1.1). With respect to these animals, the risk assessment should consider 1) risks related to livestock species, behavior and physiology, 2) disease risk from the livestock and potential diseases in relation to aquatic animal or human health, 3) information on any drugs used on the livestock, 4) any actions that could trigger increased interactions between livestock and culture ponds, and 5) the potential risks of animal manure.

Livestock with access to production ponds shall be submitted to veterinary oversight and control and shall be certified to be free of parasites and other diseases. A certified veterinarian should be available to assess livestock health. Livestock that must be treated with veterinary medicines shall be placed in quarantine away from the pond

area until the drug has cleared following treatment termination. Whole herd treatment with veterinary drugs is prohibited. Records must show drug treatments administered and quarantine dates associated with treatments

Pond Fertilizers

Some farmers of aquatic animals in earthen ponds will occasionally use organic fertilizers to stimulate a bloom of zooplankton. This practice is acceptable but human wastes and unpasteurized animal manures shall not be used.

Harvested Product Chilling

For aquatic animal products that are harvested and chilled at harvest, products shall be chilled rapidly to 4 ^{o}C or less to maintain product quality and avoid microbial spoilage. For fish or crustaceans placed on ice or in iced water at the farm, alternating layers of ice and product are recommended to avoid temperature fluctuations. Temperature logs during harvest and transport should be kept demonstrating compliance.

Unclean water can cause contamination of aquatic animals during transit from ponds to processing plants or markets. Water used to make ice used to chill aquatic animal products shall be made from water that complies with microbial and chemical limits for potable water (i.e. human drinking water quality) or is certified as safe for use on aquatic animals intended for human consumption by government regulatory authorities.

Harvest and Transport

Equipment and containers used to harvest and transport fish or crustaceans shall be cleaned, sanitized, and free of lubricants, fuel, metal fragments and other foreign material that represent an injury risk or a potential food safety hazard. This equipment should be maintained in good working order and cleaned after each use and inspected for potential food safety hazards prior to each use.

Worker Health and Training

Workers with open wounds, sores or skin infections shall be prohibited from handling harvested products. Workers shall be trained in good personal health and hygiene to ensure they are aware of their roles and responsibilities in protecting aquaculture products from food safety risks. Workers should be trained in the importance of their role in the production of safe aquatic animals, including control of all specific contamination hazards for each farm. Workers responsible for monitoring critical control points should be aware of the monitoring procedures and practices applied to maintain food safety. Training records shall be available for inspection.

Additional Information

WHO/FAO (2012), Code of Practice for Fish and Fishery Products, 2nd edition
http://www.fao.org/3/a-i2382e.pdf

Pillar 2: Social Accountability

A. Legal Rights and Regulatory Compliance - All Production Systems

Audit Clauses

2.1: The farm shall have current and valid documents to prove legal land and water use by the farm.

2.2: The farm shall have current and valid documents to prove all business and operating licenses have been acquired.

2.3: The farm shall have current and valid documents to prove compliance with applicable local and national environmental regulations for farm siting, construction, operation and liability for environmental damage.

Implementation

Laws, regulations, licenses and permits regarding the operation and resource use of farms vary significantly from place to place. Among other requirements, they can call for:

- business licenses
- aquaculture licenses
- land deeds, leases or concession agreements
- land use taxes
- construction or habitat modification permits
- water use permits
- protection of mangroves or other sensitive habitats
- effluent or waste discharge permits
- adherence to veterinary and aquatic animal health regulations
- use of therapeutics and antimicrobial agents
- permits related to non-native species
- introductions or movements of seed (fingerlings, juveniles, post-larvae)
- use of genetically modified or bioengineered organisms
- predator control permits
- well operation permits
- landfill operation permits
- disposal of mortalities
- adherence to environmental regulations (e.g., water quality monitoring)
- environmental impact assessments
- bonds for potential environmental damage.

Individual auditors cannot know all laws that apply to aquaculture farms in all nations. Participating farms have the responsibility to obtain all necessary documentation for siting, constructing and operating their facilities. Assistance in determining these necessary permits and licenses can be sought from governmental agencies responsible for agriculture, environmental protection, fisheries, aquaculture, water management and transportation, as well as local aquaculture associations. Auditors should also become familiar with the legal requirements within the areas they service.

A farm representative, such as compliance officer, shall present all necessary documents to the auditor prior to or during the audit. Farms shall be in compliance with the requirements stipulated by the documents. For example, if a farm has an effluent discharge permit with water quality standards, those standards shall be enforced. In cases where governmental agencies have waived one or more permits, proof of these waivers shall be available.

B. Local Community Relations - All Production Systems

Audit Clauses

2.4: The farm shall accommodate local residents by not blocking traditional access routes to fishing grounds, wetland areas and other public resources.

2.5: The farm shall manage usage of open-access water resources to avoid restricting the amount of water available to other users.

2.6: The farm shall maintain a favorable general appearance and prevent unnecessary and excessive odors and noises that may be a nuisance to neighbors.

2.7: The farm shall demonstrate constructive interactions with the local community to avoid or resolve complaints or conflicts through meetings, committees, correspondence, service projects or other activities performed at least annually.

Implementation

Access to Public Resources

Farms shall strive for good community relations and not block access to public areas, common land, fishing grounds or other traditional natural resources used by local communities. Aquaculture farms are often located in rural areas, where some individuals may rely on local natural resources to supplement their livelihoods. Some local residents benefit from employment or infrastructure improvements associated with large-scale aquaculture development, but others may face reduced access to areas used for fishing, hunting, gathering, domestic water supply or recreation. Farms shall not block traditional access corridors to public mangrove areas and fishing grounds. In some cases, it may be necessary to provide a designated access route across the farm. Farm management shall attempt to accommodate traditional uses of coastal resources through a cooperative attitude toward established local interests and environmental stewardship.

During farm visit, the auditor shall verify compliance with this standard through examination of maps that define public and private zones; inspection of fences, canals and other barriers; and interviews with local people and farm workers. The auditor shall select the individuals for interview. This selection can include, but not be limited to, interviewees provided by farm management.

Farm Appearance

Farms shall maintain a neat and attractive appearance to avoid becoming an eyesore to local residents. It should be apparent that buildings and facilities are well-maintained and in keeping with local architecture and landscapes to minimize visual intrusion. Sanitary measures shall be employed to prevent odors from affecting nearby neighbors. No obvious objectionable or foul odors should be present. Machinery shall be maintained in good working order to avoid unnecessary noises that may disturb neighbors.

Community Engagement

Farms should make a good-faith effort to have at least one face-to-face meeting annually with community representatives or with the community at large in an open meeting. Evidence of the effort to hold community meetings can include posters advertising a meeting, email messages to community leaders or representatives, posts on social media platforms and meeting minutes. Other evidence of community engagement or in-kind contributions can include invoices, receipts, signed declarations of donations or contributions to community events, construction of facilities (e.g. a playground), timesheet records of staff volunteering time at community events (e.g. replanting of mangroves), records of the applicant's initiative towards engagement. Farms are encouraged to contribute to the provision of facilities such as access roads, schools, community centers and other tangible and intangible contributions to community cohesion and building social capital. Local community members should have the opportunity and a mechanism or procedure to register complaints.

C. Worker Rights and Employee Relations - All Production Systems

Audit Clauses

General Requirement

2.8: Farms shall operate in compliance with this standard and all local, national, and applicable, ratified international conventions, rules and regulations, whichever provides the highest protection to the worker. Farms shall have in place policies and non-discriminatory procedures pertaining to, but not limited to: worker health and safety and compliance with requirements regarding wages, benefits, hours, hiring practices, minimum age, status of workers, and good employee relations that provide the highest protection to the workers.

2.9: All records of recruitment, compensation, benefits, access to training, promotion and termination shall be separated by sex.

Wages and Benefits

2.10: The farm shall ensure that workers are paid at least the legal minimum wage, or the wage rate established by an employment contract or collective bargaining agreement, whichever is higher. Regular wages and compensation shall cover the workers' basic expenses and allow for some discretionary funds for use by workers and their families.

2.11: The farm shall provide benefits that, at a minimum, are required by local or national law (such as paid holidays, maternity leave, health insurance, paid sick time, etc. as applicable).

2.12: The farm shall not have inappropriate access to the worker's bank account. Payment of wages shall not be made to someone other than the worker or into an account not controlled by the worker, unless otherwise required by law.

2.13: The farm shall issue wages directly to workers and not withhold or delay or make irregular payments. All wage payments shall be documented. A record of wage payment (such as a pay slip) shall be provided to the worker and include itemized detail of all benefit provided and deductions made.

Working Hours

2.14: The farm shall abide by the mandatory national work week, and where that is absent, an average work week of no more than 48 hours. The specific timing and organization of the working day may be agreed in a voluntary agreement between farm owners/management and workers.

2.15: Overtime shall not exceed 12 hours per week except as permitted by national law and agreed to between the facility and workers in a voluntary contractual agreement. The facility shall demonstrate any overtime that exceeded 12 hours per week only occurs under exceptional circumstances with due measures taken to ensure workers' health and safety during overtime work.

2.16: The farm shall not terminate a worker's contract for refusal to work overtime or deploy any other detriment for noncompliance.

2.17: Farms shall comply, at a minimum, with national laws regarding meal and rest breaks during work shifts. Farms shall respect the right to a rest day after six consecutive days worked.

2.18: Documentation of the time each worker starts and finishes each workday shall be accurately recorded and accessible to both farm managers and each worker.

Forced, Bonded, Indentured, Trafficked, and Prison Labor

2.19: All work, including overtime, shall be voluntary, and shall not be under threat of any penalty or sanctions.

2.20: The farm shall not engage in any form of forced or indentured labor. This includes human trafficking, use of prison labor, the confiscation or holding of original identity papers and other valuable possessions, prohibiting workers from leaving the premises after their shift or other means of coercion intended to force anyone to work. Where the holding of original identity papers is required by national law, such papers must be immediately returned to workers upon request and readily available to them at all times.

2.21: Bonded labor shall be prohibited. The farm shall not require the payment of deposits, bonds or other financial or collateral guarantees that may result in debt bondage. This includes recruitment fees, fines,

and deductions from wages, and withholding of pay that are not part of a written contractual agreement with the worker.

2.22: Workers shall have the right to leave the premises after their work shift. Workers shall also have the right to terminate their employment after reasonable notice. The farm shall not otherwise unreasonably restrict workers' freedom of movement including but not limited to surveillance during rest or non-work hours, during transportation, in dormitories provided by the farm.

Child Labor and Young Workers

2.23: The farm shall not engage in or support the use of child labor. The farm shall comply with local child labor laws regarding minimum working age, or the age of compulsory education, or the ILO Minimum Age Convention 138, whichever is higher. Although the ILO Minimum Age Convention 138 states that the minimum age shall be 15, local law of minimum age of 14 may apply if it is in accordance with developing nation's country exceptions under this convention. Records shall be collected, verified and retained to verify age requirements are met.

2.24: The employment of young workers (above the minimum age but under 18 years old) shall be in compliance with local or national laws, including required access to compulsory education and any restrictions on hours and time of day.

2.25: Young workers (above the minimum age but under 18 years old) shall not be subjected to conditions which compromise their health, safety, or moral integrity, or which harms their physical, mental, spiritual, moral or social development. This includes restrictions on working hours and prohibiting night work and hazardous work.

2.26: The farm shall have in place procedures for support to anyone identified as a child laborer on the farm. Depending on the age of the child, support must include at a minimum removal and reintegration into education (for children below the minimum age and/or children who have not completed basic education and/or changing job functions for young workers above the minimum age to non-hazardous tasks).

2.27: The farm may accept young people into trainee and apprenticeships programs in accordance with national regulations and provided the young person has completed compulsory education and that the young person receives adequate training and supervision at all times.

Hiring and Terms of Employment

2.28: The farm shall only employ workers with a legal right to work in the country, whether national citizens or migrants. Work performed and terms of employment shall be in compliance with local, national law or international labor standards, whichever is stricter. Records shall be collected, verified and retained to document right to work documents.

2.29: The farm shall maintain all relevant documents that verify that any contracted/subcontracted workers, whether contracted through a labor service or otherwise, are paid in compliance with all local wage, hour and overtime laws.

2.30: The farm shall not use contractors, subcontractors, temporary workers, homeworkers, apprentices or other non-full-time employment schemes to avoid the payment of social security and other benefits required by local or national law under a regular employment relationship.

2.31: All labor recruiting agencies or employment services used by the farm must be licensed to operate by the local or national government as a labor provider. Workers shall not be subject to recruitment practices that utilizes threats, penalties, coercions, physical force, or fraud.

2.32: The farm shall provide to all workers, prior to hire and during employment, with written and understandable information regarding the terms and conditions of employment, worker's rights, benefits, compensation, expected working hours, details of wages for each pay period each time they are paid; and farm policies regarding disciplinary actions, grievance procedures, any authorized deductions from pay, physical work requirements, environment and housing, and workplace safety. This information shall be provided in the appropriate language of the employees. This requirement shall apply to all workers

regardless of status, including but not limited to hourly, salary, piece rate, temporary and seasonal workers.

2.33: Where contracted/subcontracted or temporary workers are hired through a labor recruiting agency, the farm shall ensure that these services provide the above information prior to and during hire, in appropriate languages, to ensure workers are aware of their rights and conditions of employment as described above.

2.34: The farm shall document the agencies used to recruit, hire, and/or employ workers, in addition to any known fees paid by or debts accrued by workers in order to secure employment.

2.35: If provided or mandated by the farm or employment agency/labor agency, worker housing shall meet local and/or national standards. Such housing conditions shall include at minimum, ensuring that structures are safe and watertight, that space is adequate as per occupational load for the buildings, and that heating/ventilation/cooling, pest control, sink, shower and toilet facilities are provided.

Discrimination, Discipline, Abuse and Harassment

2.36: The farm shall provide for equal opportunity with respect to recruitment, hiring, terms of employment, compensation, access to training, promotion, termination and retirement.

2.37: The farm shall not engage in or permit discrimination in any aspects of employment, including but not limited to recruitment, hiring, compensation, terms of employment, discipline, access to training, promotion, termination, or retirement on the basis of race, color, gender, national origin/ heritage, religion, age, nationality, social or ethnic origin, maternity, sexual orientation, political opinion, disability or any other status. There shall be no discrepancy in wages and benefits between men, women, ethnic or religious groups for equal qualifications, experience and/or responsibilities. Terms and conditions of employment shall be based upon the ability to do the job, not on personal characteristics or beliefs.

2.38: The farm shall treat workers with respect and not engage in or permit physical, verbal or sexual abuse, bullying or harassment.

2.39: The farm shall not terminate workers for pregnancy, subject workers to pregnancy or virginity testing, force the use of contraception, or reduce wages after maternity leave.

2.40: The farm shall have a written disciplinary procedure made available in appropriate language of the workers. Records shall be maintained of all disciplinary actions.

2.41: The farm shall have a written worker grievance process/procedure and make it available to all workers, that allows for the anonymous reporting of grievances to management without fear of retaliation.

2.42: The farm shall have in place an established complaints and remediation system to handle cases and allegations of sexual abuse/harassment, bullying, or discriminatory practices. This process shall, at a minimum, include a confidential reporting mechanism, information on any hotlines or other outside support services available and the possibility of calling in independent assessment/arbitration.

2.43: The farm shall have the information regarding hotlines, competent authorities, and other resources for victims of labor rights abuse displayed prominently for easy access to workers.

Freedom of Association and Collective Bargaining

2.44: Workers shall have the right to associate, organize, and bargain collectively (or refrain from doing so) without the need of prior authorization from management. Farms shall not interfere with, restrict, or prevent such activities and shall not discriminate against or retaliate against workers exercising their right to representation in accordance with international labor standards.

2.45: Where the right to freedom of association and collective bargaining is prohibited or restricted under local law, the farm shall not prevent alternative means to facilitate worker representation and negotiation (for example, the election of one or more workers by other workers to represent them to management).

Worker Health and Safety

2.46: Safe drinking water shall be readily available to workers. If meals are provided, they shall be wholesome and commensurate with local eating customs.

2.47: The farm shall have a sufficient number of toilets for men and women in compliance with local and national laws. These shall be readily accessible to workers and kept in good repair.

2.48: The farm shall designate a management person responsible for managing worker health, safety and training.

2.49: The farm shall identify, prevent, eliminate or minimize any workplace health and safety hazards. This includes a requirement for documenting incidents, and investigations of accidents and their cause and correction.

2.50: An Emergency Response Plan shall be prepared for serious illnesses, accidents, natural disasters or other incidents.

2.51: Select workers shall be trained in the details of the Emergency Response Plan and in first aid to include electrical shock, profuse bleeding, drowning, boat accidents and other possible medical emergencies. A list of the trained workers shall be available.

2.52: In the event of accidents or emergencies, the farm shall provide basic medical care, including access to or communication with medical authorities. Additionally, first aid kits shall be readily available to workers, and any expired content shall be replaced.

2.53: Personal protective gear and equipment (e.g., eye protection for welding, gloves for shop work, boots for wet areas, life jackets on boats) in good working order and in alignment with local laws and work conditions shall be provided to and used by workers based on an assessment of workplace risks.

2.54: Electrical pumps and aerators shall be connected to power supplies according to standard safe procedures that include proper wiring, grounding of cables, and coverage of circuit boxes. Machinery shall have proper driveshaft and/or drivebelt safety guards.

2.55: The farm shall provide training in personal health and hygiene to promote worker health and safety at least annually.

2.56: The farm shall have a training program to ensure workers that handle or are exposed to antimicrobial agents, agricultural chemicals, fuels, or other toxic substances that represents a physical, human health, food safety or environmental hazard are properly trained in their safe use.

2.57: The farm shall have in place a policy that workers can refuse to work in an unsafe environment, without disciplinary action being taken against the worker.

2.58: If applicable, the farm shall comply with laws that govern diving on aquaculture facilities and develop a written Dive Safety Plan that documents procedures for safe diving, response to diver emergencies, and equipment maintenance. Limits for time under water shall be established and monitored through diver logs. Diver safety training is required.

2.59: If the farm requires boat usage, the farm shall provide written procedures and staff training for the safe operation of boats to avoid accidents and the risk of drowning.

Implementation

Worker Rights and Employee Relations

At a minimum, certified farms shall provide legal wages, a safe working environment and adequate living conditions. Auditors shall take into account national regulations and local standards to evaluate this aspect. Efforts should be made to exceed the minimum requirements, because certified farms should be progressive and socially responsible.

Certified farms must comply with local and national labor laws, including those related to young workers, overtime pay and compensation, worker safety, and where applicable, on-site living conditions. Auditors shall take into account national and local regulations, however, if the law differs from a BAP requirement, the provision that provides the greatest protection to the worker applies. Recommendations of the International Labor Organization

(ILO) should be used as a normative reference when local and national legislation regarding worker/employee safety, wellbeing and rights is not sufficiently comprehensive in comparison.

Certified farms must demonstrate compliance through worker contracts, documented method of payment, timesheets, disciplinary records, and piece rate records, among others. Farms must maintain policies related to working hours, benefits, anti-discrimination, and remediation for anyone identified as a child worker. In addition, farms should maintain thorough records regarding their labor supply chains including recruitment agency agreements, any fees paid by the worker, and the legal status of each worker. Age documentation for every worker should also be maintained and available at the time of the onsite audit. When hiring foreign workers, farms shall require documentation of legal status. Records shall be maintained of all disciplinary actions, worker grievances and mediation. Records of disciplinary actions should document the date, time, personnel involved, evidence reviewed, and disciplinary action taken, and corrective actions to address the issue. Workers should sign the record to indicate awareness. These records should be available to the auditor.

The principal of equal opportunity shall be adhered to throughout this section of the Standard. All records of recruitment, compensation, benefits, access to training, promotion and termination shall be disaggregated (separated) by sex. Men and women shall receive equal pay for similar tasks.

Living quarters shall be well ventilated and have adequate shower and toilet facilities. Meals, where provided for workers, shall be wholesome, with food storage and preparation done in a responsible manner. Trash and garbage shall not accumulate in living, food preparation or dining areas.

During farm inspection, the auditor will evaluate whether farms comply with labor laws. The auditor will select a random sample of workers to interview to obtain information about wages, safety and living conditions.

Worker Health and Safety

Workers should be provided with:

- Knowledge and skills needed to do their work safely and avoid creating hazards that could place themselves or others at risk.
- Awareness and understanding of workplace hazards and how to identify, report, and control them.
- Specialized training, when their work involves unique hazards.

Staff and workers shall be given initial orientation training as new workers as well as refresher training on safety in all areas of farm operations. Farms should take the approach that workers have a “right to know” about worker safety and hazardous conditions associated with employment. Training programs should be accurate, credible, clear and practical. Training materials should be prepared by qualified individuals and updated as needed. Trainers should have a general safety background or have practical experience in safety or be a subject matter expert. Training programs must be clear and presented in terms understandable by workers. Training programs should be useful to workers, with demonstrated application on the farm.

Workers shall be trained in first aid for electrical shock, profuse bleeding, drowning and other possible medical emergencies. A plan shall be available for obtaining medical assistance for injured or ill workers. Training should be provided on response to natural disasters such as severe floods and tropical cyclones.

Safety equipment such as goggles, gloves, hard hats, life jackets and ear protection, shall be provided when appropriate. Machinery shall have protective guards or covers where appropriate, and electrical devices shall be correctly and safely wired. Tractors should have roll bars, shields over power take-offs and other appropriate safety devices. Use of personal protective gear and equipment should align with local conditions and local dress customs. However, these conditions and customs should not preclude use of personal protective gear when the job or task requires their use.

Farms that use divers to clear sludge from pond bottoms or perform other underwater tasks shall develop a written Dive Safety Plan to assure safety and require directly employed or contracted divers to follow the plan. The plan shall require specialized diver safety training, maintenance records for diving equipment and procedures for diving emergencies.

If sulfites are used during harvesting, procedures shall be adopted to minimize health risks to workers.

Workers shall also be aware of their roles in producing safe food. Workers should be provided with information about controlling hazards that could compromise food safety during production of aquatic animals. Workers should be aware of their roles and responsibilities in monitoring any critical control points to maintain food safety during production. Workers should be aware of the role of their personal health and hygiene in maintaining the food safety of aquatic animals produced on the farm.

Additional Information

ILO Conventions and Protocols (www.ilo.org)

- Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87)
- Right to Organise and Collective Bargaining Convention, 1949 (No. 98)
- Workers' Representatives Convention, 1971 (No. 135)
- Collective Bargaining Convention, 1981 (No. 154)
- Forced Labour Convention, 1930 (No. 29)
- Protocol of 2014 to the Forced Labour Convention, 1930 (No. P029)
- Minimum Age Convention, 1973 (No. 138)
- Equal Remuneration Convention, 1951 (No. 100)
- Discrimination (Employment and Occupation) Convention, 1958 (No. 111)
- Employment Policy Convention, 1964 (No. 122)
- Protection of Wages Convention, 1949 (No. 95)
- Occupational Safety and Health Convention, 1981 (No. 155)
- Safety and Health in Agriculture Convention, 2001 (No. 184)
- Migration for Employment Convention (Revised), 1949 (No. 97)
- Migrant Workers (Supplementary Provisions) Convention, 1975 (No. 143)
- ILO Declaration on Fundamental Principles and Rights at Work and its Follow-up (1998, rev. 2010)
- ILO Declaration on Social Justice for a Fair Globalization (2008)

Occupational Safety and Health Administration (OSHA, 2016). Recommended Practices for Safety and Health Programs https://www.osha.gov/shpguidelines/education-training.html

Pillar 3. Environmental Responsibility

A. General Implementation Guidance - All Production Systems

Environmental Impact Assessment and Management Plan

The BAP Environmental Responsibility pillar includes audit clauses that are specific to manage what are identified and considered to be the most important environmental impacts. However, every farm and the environment in which it is embedded is different. Environmental impacts and their management will vary with type of production system (e.g. ponds, net pens, flow-through systems, RAS), production system intensity and, to a lesser extent, species farmed. Thus, management plans should be flexible and responsive to address the impacts identified for a particular farm.

Some of the potential issues that may be considered in an Environmental Impact Assessment and Management Plan may include:

- Location of farm with respect to wetlands or sensitive habitats
- Quality of waters receiving farm wastes
- Salinization of local areas near farm
- Environmental capacity of water bodies receiving farm wastes
- Characteristics of sediments beneath net pens
- Use of chemicals and drugs
- Disease transmission between wild and farmed fish
- Disposal of mortalities
- Use of non-native species
- Escapes from culture systems
- Impacts on biodiversity, especially threatened and endangered species
- Conflicts with other resource users
- Impacts on cultural and recreational resources
- Resource use (i.e., water, land, energy, feed ingredients)

Every BAP-certified farm should conduct an assessment that identifies the impacts from construction and operation of the farm to the surrounding environment. The identification and assessment of the type, magnitude and extent of environmental impacts is the first step in developing options for impact management. The Environmental Impact Assessment need not be formal or conducted by an independent third party. Some farms may be required to conduct a formal Environmental Impact Assessment by government regulatory agencies as a condition of permitting.

Although aquaculture production has global-scale environmental impacts, the main focus of the Environmental Impact Assessment and Management Plan should be on local- to regional-scale impacts. The emphasis should be on impacts and management during farm operation, although impacts of farm construction should also be considered for new farms. Stakeholder consultation during and communication after the environmental impact assessment process is strongly encouraged.

The farm should develop an Environmental Management Plan that describes procedures to monitor and control farm impacts and provide evidence that the plan is operational and effective. The Environmental Management Plan should include the following elements:

- Description of an environmental quality baseline based upon available science that indicates the sensitivity of the environment to the impacts identified.
- Identification of significant but easily identifiable impacts and environmental issues of concern at the production site with an estimation or prediction of the magnitude, spatial extent, duration and frequency of occurrence of each impact.
- Impacts to any nearby ecologically sensitive areas (e.g., freshwater and marine wetlands, mangrove forests, seagrass beds, coral reefs, salt marshes, tidal flats) should also be identified. The significance of each impact

should be evaluated and assessed. For significant, high-risk, or irreversible impacts, a more comprehensive impact assessment should be conducted.

- Identification and quantification of inputs and outputs of production, emissions to water, and resource use (land, water, fishmeal, etc.). The contribution of inputs, outputs, emissions and resource use to eutrophication, water stress, and resource depletion should be estimated using appropriate methods.
- For each impact identified, a description of actions that will be taken to reduce, mitigate or manage the impact.
- Description of the environmental monitoring and reporting system that will be followed.
- Specification of the time interval between internal reviews of the risk assessment and management plan.

An environmental manual should be compiled that includes the documents and standard operating procedures used to address each environmental impact. Each section should describe the procedures for management of each impact. Include training materials for workers. A team to implement the management plan should be organized. An employee or worker responsible for implementation of the plan should be identified and other responsibilities assigned as appropriate. Regular internal meetings should be held to assess the current situation and such meetings should be documented, with document review by auditors.

Additional Information

FAO (2009). Environmental impact assessment and monitoring in aquaculture. Requirements, practices, effectiveness and improvements. FAO Fisheries and Aquaculture Technical Paper 527.
http://www.fao.org/3/i0970e/i0970e00.htm

B. General Requirements

Audit Clauses

3.1: Farms shall calculate environmental loading indices for total nitrogen and total phosphorus based on data collected on production system type, feed conversion ratio and water exchange.

3.2: The farm shall keep records of annual direct energy (fuel and electricity) consumption.

Implementation

Environmental Loading Indices

Environmental loading indices can be used to estimate the eutrophication (pollution) potential of aquaculture production and are more indicative of the pollution potential of farm effluents than separate measurements of concentrations of effluent water quality variables and effluent volume. Environmental loading varies widely, depending on type of production system, production system intensity and any waste treatment technology or approaches (e.g. sedimentation) deployed to reduce waste loading to the environment. Fundamentally, environmental loading is estimated by multiplying effluent volume by effluent nutrient concentration and then dividing by fish or shrimp production. Thus, regular measurements of each of these variables is required, as dictated by production system. Estimates of water use and effluent volume can be derived from water pump station logs, weir measurements and flow meters. Recordkeeping for estimation of effluent volume should be demonstrated. Similarly, a recordkeeping system for the concentration of total nitrogen and total phosphorus in effluent should be demonstrated. Examples of environmental loading calculations for different production systems are provided in Appendix A. Environmental loading indices should be calculated for each crop completed in a calendar year, expressed as an annual average and range (minimum, maximum).

Direct Energy Consumption

Direct consumption of energy on farms is used primarily for water pumping and mechanical aeration but is also used to operate other farm equipment (e.g. tractors and vehicles) and farm support activities (e.g. electricity for office equipment, lighting, etc.). Farms are required to keep records of their direct annual energy use, based on

fuel (L/yr) and electricity consumption (kWh/yr). These data will be anonymized and compiled by BAP to gauge industry performance and enable the setting of future standards for energy efficiency. Improvements in energy efficiency will contribute to reducing CO_2 emissions per ton of fish or shrimp produced.

C. Effluent Management - Ponds, Non-Coastal Flow-through Systems and Recirculating Aquaculture Systems

This section applies to effluents from 1) earthen or lined ponds, irrespective of production intensity or salinity, 2) freshwater flow-through systems (e.g., trout raceways), and 3) recirculating aquaculture systems (RAS). It does not apply to 1) cage culture in freshwater or brackishwater water bodies (see Section E), 2) net pen culture in marine or estuarine environments (see Section F) or 3) coastal flow-through facilities (see Section F).

Audit Clauses

3.3 Effluent Compliance Options

3.3.1: Effluent water quality from ponds, flow-through and recirculating aquaculture systems shall comply with BAP Effluent Water Quality Criteria (Appendix B) or applicable regulations if they are equivalent or more rigorous.

3.3.2: Farms that can demonstrate that water quality at the edge of the mixing zone (samples taken nearby and down-current of discharge) and outside the mixing zone (samples taken nearby and up-current of discharge) does not deteriorate.

3.3.3: Farms that use source water with individual water quality variables that exceed limits established as BAP Effluent Water Quality Criteria. In this case, concentrations of those variables shall reflect no deterioration between intake and discharge of the relevant variable. For variables of source water that do not exceed BAP Effluent Water Quality Criteria, compliance with these effluent criteria is required. Values of influent water quality variables shall be recorded.

3.3.4: Farms that demonstrate water reuse, only occasional water exchange and no intentional discharge of effluents into natural water bodies during grow-out, such that less than 1% of the culture water volume is exchanged daily on an annual basis and discharged to a receiving watershed.

3.3.5: Farms that undertake a formal Environmental Impact Assessment, conducted by a qualified third-party, that includes a favorable assessment of assimilative capacity of the receiving water body and an Environmental Management Plan.

3.3.6: Farms that operate within a freshwater irrigation system such that effluent water is exclusively destined to irrigate agricultural crops.

3.4: Records and summaries of the volume of farm intake water use shall be maintained and available.

3.5: The farm shall take effective measures to control erosion and other impacts caused by culture unit outfalls.

3.6: If ponds are constructed on permeable soil, measures (such as the use of pond liners) shall be taken to control seepage and avoid contamination of aquifers, lakes, streams and other natural bodies of freshwater.

3.7: For inland brackishwater ponds, quarterly monitoring of neighboring well and surface water shall show that chloride levels are not increasing due to farm operations.

3.8: If a farm produces more than 20 mt of aquatic animals per hectare per crop, the farm shall maintain sufficient sedimentation basin capacity or implement other technical or engineering solutions to capture at least 50% of the biosolids produced from feeding.

3.9: Any accumulated sludge removed from ponds, reservoirs or sedimentation basins shall be confined within the farm property, consolidated and used locally for landfill or agriculture, or some other technical or engineering solution applied to reduce sludge volume (e.g. biogas digestor). Collected sludge/sediment shall not be placed in sensitive wetland or mangrove areas, or in public water bodies.

3.10: Removed sediment shall be properly contained and located to prevent the salinization of soil and groundwater and not cause other ecological nuisances.

3.11: If sulfite is used during shrimp harvest, solutions shall be deactivated or neutralized, for example by 48-hour retention, prior to release into natural water bodies.

Implementation

Best Management Practices for Pond Effluents

Compliance with the effluent management standard usually requires farms to improve their production practices in some areas. These areas can include practices for erosion control, feed management, water and bottom soil quality, and water exchange that can reduce and improve pond effluents. The main practices for improving water quality are the use of stocking and feeding rates that do not exceed the assimilative capacity of ponds, application of good-quality feed and feed management, installation of mechanical aeration, liming of acidic ponds and erosion control. Management practices that reduce effluent volume include harvesting by seining rather than draining, maintaining storage volume to capture normal rainfall and runoff by diverting excess runoff around ponds, and maintaining water quality by mechanical aeration rather than pond flushing.

Where possible, seine harvest fish and do not drain ponds for several years. This practice is highly recommended, because it conserves water and reduces effluent volume and pumping costs. Use the drop-fill method to capture rainfall and runoff and reduce the use of water from other sources. In applying this method, water should not be added to ponds during dry weather until the water level has fallen 15 to 20 cm below the overflow level. Water should then be added to increase the water surface level by not more than 7.5 to 10 cm. This practice provides storage volume sufficient to capture normal rainfall and runoff.

If best management practices to improve water quality or reduce effluent volume are not sufficient to meet the BAP Effluent Water Quality Criteria, a settling basin should be installed to provide water treatment before final discharge. If a settling basin is used, the water quality criteria shall apply to its final outfall. In cases where source water has high concentrations of suspended solids, a pre-settling basin to improve water quality before the water reaches production ponds can lessen sediment accumulation in ponds and possibly benefit effluent quality.

In some cases, the use of a natural or constructed “filter strip” can provide effective treatment for effluents before they are discharged into public waters. Effluent water flows in a thin sheet across the strips, which allows the capture of sediment, organic matter and other pollutants by deposition, infiltration, absorption, decomposition and volatilization. Another approach is the use of retention, evaporation or percolation ponds in areas with highly porous soils. For freshwater effluent, application for irrigation purposes to fields with sustained vegetative cover at less than the rate that causes runoff into natural waters is an option.

Effluent Monitoring and Management

The intention of this standard is that all pond- and other land-based farms, irrespective of salinity, demonstrate that effluent of good quality, as defined by the BAP Effluent Water Quality Criteria, is discharged to receiving waters. The water quality criteria also assure that the effluents from aquaculture facilities have no greater concentrations of pollutants than typically allowed for effluents from other point sources. To confirm compliance with BAP water quality criteria at farms, the auditor will review the written effluent sampling and analysis protocols used by the farm. These protocols should conform to the guidelines outlined in Appendix B. Analysis should be done by an independent laboratory that uses standard methods as published by the American Public Health Association, American Water Works Association and Water Environment Federation – http://www.standardmethods.org. Any on-farm water quality laboratories will be inspected during an audit. If effluents are released regularly (more frequently than weekly), farms shall maintain records for effluent data. (See sample form in Appendix C).

At least 3 months of effluent data are required for initial farm certification, including those variables that are to be recorded quarterly. for each variable measured monthly, at least 10 of the values obtained during a 12-month period shall comply with the criteria, provided the 12-month average of the monthly data remains below the BAP limit for each variable. For variables measured quarterly, only one non-compliance is permitted for each

variable during a 12-month/4 quarter period, provided the average of the quarterly data remains below the BAP limit for each variable. When non-compliances occur, farms should make every effort to correct the problems within 90 days.

In recognition of the diversity of production system types and intensities, this standard provides several options and exemptions to achieve conformity. These options should demonstrate that application of good management practices is effective in reducing the volume and improving the quality of farm effluents.

Mixing zone

When effluents are discharged, the effluent plume interacts with the receiving waters, which vary widely in quality and movement patterns. Exchange of the receiving waters with adjacent larger water bodies also varies widely. In high water exchange environments, mixing and dilution may be rapid. In more static receiving waters, a distinct zone of influence of farm effluents can be easily identified. The mixing zone option allows farms to achieve conformity with 3.3 by demonstrating that water quality inside and outside the mixing zone does not differ, even though the effluent water quality exceeds BAP Effluent Water Quality Criteria for some variables. This requires identification of sampling locations upcurrent and downcurrent of discharge and regular monitoring of effluent water quality. A review of the sampling program and effluent and mixing zone water quality records and inspection of sampling sites will be conducted during the farm audit.

Source water quality

Some farms may use surface waters from streams, rivers, lakes or estuaries as source water for fish or shrimp production. On occasion, the concentration of some of the water quality variables in the source water exceeds the limits for effluents as defined in the BAP Effluent Water Quality Criteria. For those variables, farms shall demonstrate that there is no deterioration in water quality between intake and discharge points. Specifically, farms shall demonstrate that there is no increase in concentrations of total suspended solids, soluble phosphorus, total ammonia-nitrogen, 5-d biochemical oxygen demand and no decreases in dissolved oxygen concentration. This option does not apply to pH and chloride concentration. For those variables that do not exceed BAP Effluent Water Quality Criteria, compliance with these criteria is expected and required. To demonstrate no deterioration in water quality between and intake and discharge, water quality variables at both points shall be measured and records available for inspection. Samples must be collected according to the frequencies stated in Appendix B.

Low water exchange rate systems

The mass discharge of nutrients and organic matter from ponds and other land-based production systems is the product of concentration multiplied by effluent volume. As a practical matter, it is much easier to reduce mass discharge by reducing effluent volume. In recognition of this, an exemption to meeting BAP Effluent Water Quality Criteria is established for farms that limit the volume of effluent discharged. Farms that qualify for this exemption shall demonstrate water reuse, only occasional water exchange and no intentional discharge of effluents into natural water bodies during grow-out, such that less than 1% of the culture water volume is exchanged daily on an annual basis and effluent is discharged to a receiving watershed. An estimate of the total water volume used in production of aquatic animals shall be reported. Records indicating the volume of effluent discharged shall be available for review during the farm audit. Farms qualifying for this exemption are required to report an annual effluent discharge volume. An estimation of annual effluent volume, water use and nutrient load indices shall be determined as described in Appendix A. Farm intake water volume shall be recorded monthly.

Environmental Impact Assessment

Some farms may be required to undertake a formal Environmental Impact Assessment (EIA) as a condition of operational permitting by government regulatory agencies. Farms may also choose to undertake a formal EIA voluntarily. Such an assessment must be conducted by a qualified professional individual or organization with no affiliation with the farm. Suitable qualifications of the technical expert that conducts the EIA include 1) holding environmental assessment certificate or license, 2) registration as an environmental assessor, 3) having three years

of experience and a portfolio of EIAs, or 4) being an employee of an environmental consulting firm with capacity to undertake EIAs. Formal EIAs will address a range of environmental impacts, including the discharge of effluents. Management of impacts will be described in an Environmental Management Plan, which is part of the EIA. The EIA must also include an assessment of the capacity of the receiving water body to assimilate farm effluent and justify a determination that farm effluent discharges will not result in exceeding the assimilative capacity of receiving waters.

Crop Irrigation

Farm effluents are typically released to public waters. However, some farms may draw from and discharge water to irrigation canals. Nutrients contained in these aquaculture farm effluents may be beneficial if applied to irrigate crops. Farms that operate within a freshwater irrigation system such that effluent water is exclusively destined to irrigate agricultural crops are exempt from monitoring effluent water quality. Use of water from irrigation systems shall be in accordance with regulations and effluents shall be returned to the irrigation system. Farms claiming this exemption shall provide maps and measurements of effluent volumes that verifies that all effluent water is being used for crop irrigation.

Erosion Control

When effluent is released from ponds, the energy from the flowing water can impact adjacent embankments and cause scouring of drainage canals or ditches. Effluent should be released from ponds in a controlled manner to limit the water velocity to a level that will not cause scouring and erosion. Drainage pipes should extend at least 1 m beyond the base of pond embankments. Drainage pipes should release water at an elevation near the bottom of the drainage canal. The drainage outlet area should be protected with a splash shield or a layer of stones (riprap) or concrete armor to reduce effluent energy. Drainpipes that discharge directly into streams should extend over the stream bank to prevent erosion and be located near the stream's normal water level. A sample of drainage structure outlets will be inspected during the farm audit.

Seepage Control

Construction of ponds in areas with permeable soils, typically containing a high proportion of sand, is undesirable because more water is required to maintain operational water levels. Furthermore, seepage water will contain nutrients and salts that may contaminate groundwater aquifers or adjacent surface waters. Fundamentally, seepage control is a site selection issue and thus the best approach is to prevent seepage by avoiding construction of ponds in areas with permeable soils. There are a number of options to control seepage, including installation of plastic liners or mixing native soils with clay, followed by compaction. Evidence must be provided to demonstrate that the soil type is suitable for pond aquaculture. Examples include soil maps or results of soil permeability testing. For permeable soils, the presence of a liner will indicate conformity with this standard.

Salinization

Some inland shrimp farms use brackish groundwater as a water source or may import concentrated brine from coastal salt ponds. Discharge of this water into low salinity receiving waters can cause salinization of those waters or the soils and wells of nearby agricultural crop farms that draw from those surface waters. Several practices can be adopted to reduce the risk of salinization. One of the most important is to avoid constructing ponds in highly permeable, sandy soil, or to provide clay or plastic liners to minimize seepage. Saline water should not be discharged into freshwater areas. Excessive pumping of groundwater from freshwater aquifers should be avoided and freshwater from wells should not be used to dilute salinity in grow-out ponds. Farm ponds should be surrounded by a ditch to intercept seepage. This ditch should be large enough to capture overflow from ponds following rainfall. When ponds are drained for harvest, water should be stored in a reservoir or transferred to other ponds for reuse. A vegetative barrier of salt-sensitive vegetation around farms can help detect movement of salt into adjacent areas.

For farms supplied by naturally saline groundwater with over 550 mg/L of chloride, pond effluent should be captured in a reservoir and reused. If brackishwater ponds are drained into a freshwater stream, the water

should be discharged when stream flow is high. The water should be discharged slowly to avoid increases in chloride concentration greater than 250 mg/L in the receiving water body. To determine if salinization is occurring, monitoring of chloride concentration in nearby (within 1 km) groundwater wells and surface waters must demonstrate that chloride concentrations are not increasing as a result of discharges of brackishwater effluent.

On inland shrimp farms, runoff from spoil piles of saline sediment onto non-saline soil or into freshwater can cause salinization. Saline sediment should be confined to prevent overflow after rainfall events. The confinement structures should be large enough to hold the largest amount of rainfall expected within any 24-hour period over 25 years. If the soil is highly pervious, downward seepage can result in salinization of freshwater aquifers. In this case, the confinement area must be lined to prevent seepage. When sediment is disposed of outside the immediate farm area, it should be confined to an earthen containment area where soils are saline to prevent runoff. Overflow or seepage of saline soil and water from the confinement area must not cause harm in adjacent areas. Once sediment is leached of salt by rainfall, it can be disposed of by using as construction fill or for other purposes.

Sediment and Sludge Management

Most aquaculture ponds have long hydraulic retention times and solids generated during production from feeding will settle and to some extent be treated on the pond bottom. However, negative environmental impacts can arise when sediments are resuspended during harvest or when sediment is pumped from ponds during the culture period and discharged as a highly fluid sludge. The sludge contains organic material from feces, uneaten feed, and dead algae and mineral particles from source water, if rivers and streams are used, and scoured from embankments or resuspended from the pond bottom.

The first principles of sediment management on farms are to prevent excessive sedimentation through good management practices and confine sedimentation to specific parts of the farm. Where farm supply water has a large sediment load, reservoirs for pre-sedimentation can remove much of the suspended material so it will not settle in water supply canals and production ponds.

Sediment accumulation in ponds and canals can be reduced by:

- implementing proper earthen infrastructure design and construction to reduce erosion by rainfall and water currents,
- placing aerators to avoid impingement of water currents on embankments that cause scouring,
- placing a layer of large stones (riprap) or other lining materials in erosion-prone areas, and
- covering bare areas of embankments with gravel or grass.

Discharge of sludge may not be an issue for ponds with production of less than 20 mt/ha per crop, but above this threshold, sedimentation basins for sludge storage are needed. The minimum required sedimentation basin volume can be estimated using the following equation:

Sedimentation basin volume = 37.5 x [Fish production (mt) ÷ Sludge transfers (times/crop)] + [Fish production (mt) ÷ 0.6]

In this equation, fish production is the total quantity of fish produced in all ponds that discharge into a sedimentation basin, and sludge transfers are the mean frequency at which sludge is moved from ponds to a sedimentation basin. It is also assumed that:

- The minimum hydraulic retention time to allow coarse and medium solids to settle out is six hours.
- One mt of fish production equates to 1 mt sediment.
- Sludge removal can be spread over a 24-hour period.
- Sediment bulk density is 0.6 t/m^3.
- The solids content of sludge is 6.5 kg/m^3.

- Accumulated sediments in the basin are removed at the end of each crop to return the basin to its original capacity.

If sludge is removed more frequently from ponds, the required size of the sedimentation basin can be reduced.

For farms producing more than 20 mt/ha per crop, the farm operator shall provide the auditor with mean values for fish production and sludge transfer frequency so the required sedimentation basin volume can be calculated. The auditor will verify that the farm has the required volume of basins in use and available for sludge containment.

Basins should be configured so that raw sludge enters at the surface at one end of the basin and the resulting effluent exits at the surface at the other end of the basin. Five or six calibrated poles should be installed in basins to allow the accumulation of settled solids to be monitored and ensure the available capacity can always support a minimum six-hour hydraulic retention time.

Raceways or similar flow-through systems have short retention times, and in high-intensity operations, sediment loads can often exceed acceptable limits. Therefore, such farms must incorporate suitably sized settling zones or other engineered solutions that assure removal of the majority of settleable solids. Accumulated solids must be pumped or siphoned periodically to offline sludge basins, where they can be dewatered and subsequently removed for use as fertilizer in land-based agriculture crops.

Any accumulated sludge removed from ponds, reservoirs or sedimentation basins shall be confined within the farm property or consolidated and used locally as fill material or for agriculture. Pond sediment from bank erosion can usually be reused to restore the slope of eroded pond embankments. Sludge or sediment shall not be applied to sensitive natural wetlands or wetland buffers. On large farms, sediments removed by dredging shall discharge into containment areas rather than directly into streams or other estuarine areas. These can be installed along the margins of canals or on areas of salt flats above high tide. When sediment is stored, it shall be confined within a diked area so that solids resuspended by rainfall can be retained. The sediment can also be spread in a thin layer over the land and vegetative cover established. If dredged accumulated sediment is disposed of outside water-holding structures, care shall be exercised to prevent the formation of spoil piles that can cause ecological disruption through erosion and transport to surrounding areas.

Sulfite Treatment

Immediately after harvest, shrimp are often treated with sodium sulfite or sodium metabisulfite to preserve product quality by preventing spotting (melanosis). Typically, shrimp are dipped into a bath of ice water and then another bath of chilled metabisulfite. The concentration of metabisulfite ranges from 6 to 15 percent, depending on shrimp size. If shrimp are treated on farm at harvest with sulfites, the protocol for this practice shall be provided during the audit. The protocol should include the specifics of sulfite use to preserve shrimp product quality and disposal of used solutions. Sulfite should be used according to specifications provided in the product's Material Safety Data Sheet that should be maintained on file.

Used sulfite solutions can cause localized dissolved oxygen depletion in the water bodies into which it is discharged. Solutions should be held in a tank or small pond until the sulfites have oxidized completely, typically for at least 48 hours. Sulfite oxidation can be accelerated by providing mechanical aeration. When the dissolved oxygen concentration of the solution reaches 4 or 5 mg/L, the sulfite has been completely converted to sulfate. To neutralize acidity, sulfite solution can then be treated with 0.4 kg lime/L before final release into natural waters.

D. Habitat Protection and Site Selection - Ponds and All Other Land-based Systems

Audit Clauses

3.12: New farms shall not be located in mangrove forests, sensitive wetlands or any other critical or vulnerable habitats.

3.13: New farms shall not result in the loss of critical habitat for endangered or critically endangered species.

3.14: If net loss of wetland habitat (delineated by evaluation of hydrological conditions and the presence of wetland vegetation) occurred on farm property since 1999, the loss shall have been due to allowable purposes.

3.15: If net loss of wetland habitat occurred on farm property since 1999, the loss shall have been mitigated by restoring an area three times as large with the equivalent diversity of native species or by an equivalent donation to measurably successful restoration projects.

3.16: If wetland restoration has been conducted, the restored vegetation shall be maintained in a healthy state, viable and appropriately diverse.

3.17: Dredge and fill activities shall not be conducted in sensitive wetlands or wetland buffers to increase the area for farm construction.

3.18: Dredged material shall be properly contained and not placed in mangrove areas, natural water bodies, or other sensitive habitats.

3.19: Farm operations shall not cause vegetation at the farm perimeter to die off.

3.20: Farm operations shall not permanently impede the flow of fresh water in watersheds, and the normal flow of brackish water to mangroves or fresh water to wetlands, unless specific permits apply.

3.21: If a farm extracts groundwater, water levels in nearby wells shall be monitored at least annually during the dry season to establish that aquaculture does not result in reducing the water table below historical levels of normal seasonal variation.

3.22: Use of water from wells, lakes, streams, springs or other natural sources shall not cause ecological damage or land subsidence in surrounding areas.

Implementation

Sensitive or Critical Habitats

For the purposes of this standard, wetlands are defined as areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support – and that under normal conditions do support – a prevalence of perennial vegetation typically adapted for life in saturated soil conditions.

This standard applies to new farms and does not apply to farms that were constructed in former wetland habitats that were converted or lost prior to the publication of the Global Seafood Alliance's Codes of Practice for Responsible Shrimp Farming in 1999. New farms may not be constructed in sites designated in the Ramsar Convention on Wetlands of International Importance.

Farm construction and operations, including all building works, shall take place outside wetland areas and not lead to their loss. In coastal zones, aquaculture ponds shall be located behind mangrove areas on land that is above the average tidal zone and inundated no more than a few times per month by the highest tides. In some cases, the use of constructed wetlands can provide effective treatment for effluents before they are discharged into public waters. Constructed wetlands must be wholly within farm boundaries, or the farm must have the necessary permits for off-site land use. Dredge and fill operations shall be restricted to areas within the farm boundaries.

Construction and operation of new farms shall not result in the loss of critical habitat. Critical habitat, as defined by the International Finance Corporation (2012), is "any area of the planet with high biodiversity conservation significance based on the existence of habitat of significant importance to critically endangered or endangered species, restricted range or endemic species, globally significant concentrations of migratory and/or congregatory species, highly threatened and/or unique ecosystems and key evolutionary processes." Critical habitat for species classified as Endangered or Critically Endangered according to the IUCN Red List of Threatened Species

or any species on the list by the Convention on International Trade in Endangered Species (CITES) of Wild Fauna and Flora shall not be lost by construction and operation of new farms. New farms shall not be constructed in legally protected areas, particularly IUCN Protected Area Categories I through IV.

Allowable Wetland Transformation and Restoration

For farms constructed before 1999, some loss of wetland habitat after that year is allowed, but only for specific purposes. If a farm operation requires access to water resources, wetland habitat transformation and removal of wetland vegetation shall only be allowed for the installation of inlet and outlet canals, pump stations and docks. Wetlands removed for such purposes shall be mitigated by restoring a wetland area that is three times the size of the area removed using a wetland plant community that is representative of the area. Wetland restoration is allowable only if permitted by local or national regulatory authorities.

Farms constructed in former mangrove or wetland areas are encouraged to demonstrate environmental stewardship by re-establishing mangrove or wetland vegetation. However, many farms may not own or have access to suitable habitat and to the expertise needed to develop wetland restoration projects. Thus, the most reliable mitigation approach is to contribute to mangrove or wetland rehabilitation projects. The donation should be equivalent to the local cost of mangrove or wetland restoration of an appropriately sized area. Whether the restoration is conducted by the farm or through an independent restoration program, the auditor will verify that the wetland is viable by confirming it is initially healthy, with an appropriately diverse wetland plant community, and continues to be healthy at subsequent audits. In cases where the auditor is not able to inspect the restored wetlands in person, the farm shall provide the auditor with evidence (e.g., maps, GPS coordinates, recent photographs and aerial photographs) of wetland viability.

During initial inspection, the auditor will record farm areas occupied by mangroves or wetland vegetation. If dying vegetation is observed around farms, the auditor will determine if that die-off is the result of farm operations. If it is, a warning will be issued and the deficiency shall be corrected as a condition of continued certification. Wetland removal for purposes other than those identified previously (for inlet and outlet canals, pump stations and docks) or failure to mitigate allowable removal will result in loss of certification.

Hydrological Alteration

Water is an obvious input for aquaculture farms. In general, farms should operate in a way that normal surface water flows and groundwater aquifer levels are maintained within the range of natural variation. Hydrological conditions shall not be altered in a way that deprives water that leads to the loss of wetland vegetation or causes erosion and sedimentation where farm drainage canals meet natural water bodies (i.e. streams, rivers, estuaries). To demonstrate compliance, farms shall provide maps indicating natural water flows and how these flows are affected by farm construction and operations.

In freshwater floodplains, excessive pond construction can reduce the cross-sectional area of flow and increase flood levels and water velocities. This can result in water overtopping pond embankments, erosion of farm earthwork and damage to other property on the floodplain. The problem usually can be avoided if no more than 40% of the floodplain is blocked by pond embankments. Maps should be provided to demonstrate the proportion of a floodplain developed into the aquaculture farm. When farms constructed in former mangrove or wetland areas are closed, pond embankments shall be breached to restore natural water flow so that wetland vegetation can reestablish.

Excessive pumping of groundwater can lead to aquifer depletion and affect the availability of water to other users in the area. Farms using groundwater shall provide the results of a groundwater level monitoring program, including wells within 1 km of the farm perimeter, taking into consideration natural variation in aquifer level and withdrawals by other users of groundwater resources.

Additional Information
IUCN Red List of Threatened Species
https://www.iucnredlist.org/

Convention on International Trade in Endangered Species of Wild Fauna and Flora, 1975 (Appendix I)
https://www.cites.org/eng/app/appendices.php

IUCN Protected Area Categories
https://www.iucn.org/theme/protected-areas/about/protected-area-categories

Convention on Biological Diversity, 1992
https://www.cbd.int/

Convention on Wetlands of International Importance, 1971 (Ramsar Convention)
https://www.ramsar.org/

E. Water Quality and Sediment Monitoring - Cages or Net Pens in Fresh or Brackish Water

Audit Clauses

3.23: Water quality in the surface mixed layer of water bodies used for cage culture shall conform to at least two out of three of the following: not more than 40 µg/L for total phosphorus, not more than 15 µg/L for chlorophyll a, not less than 3 m for Secchi disk visibility as an average of sample collections encompassing four consecutive months. In addition, average daily dissolved oxygen concentration at 50 cm depth shall not be less than 4 mg/L for more than four consecutive months.

3.24: From a baseline established by an independent (third-party) during the first year following initial certification, any increase in annual average total phosphorus, or chlorophyll *a* concentrations, or any decrease in annual average Secchi disk visibility shall not exceed 25%. In addition, any decrease in annual average dissolved oxygen concentration shall not exceed 25%.

3.25: In water bodies with a Secchi disk visibility less than 5 m, scum-forming or potentially toxic blue-green algae or other potentially harmful algae shall not comprise more than 60% of the phytoplankton biomass over consecutive sampling periods encompassing four months.

3.26: For cages in lakes or reservoirs, cages shall be placed in locations with an average water depth of greater than 10 m or at least twice the depth of the cage, whichever is greater.

3.27: For cages in water less than 30 m deep, and where sediments are usually aerobic in the absence of cages, divers or cameras shall be used periodically, at least once per production cycle, to inspect the bottom for accumulation of feces and uneaten feed. When such conditions are identified, aerobic benthic conditions shall be restored by fallowing or other means.

Implementation

Production Practices for Cages and Net Pens in Freshwater

The best way to reduce nutrient outputs from cage and net pen culture is to increase the efficiency of feed use (i.e. reduce FCR). Feed should be manufactured by a reputable feed mill and meet the nutritional needs and presented in a form (i.e. pellet size) that is suitable for each particular life stage of the fish. The feed should contain ingredients of high digestibility and contain no more nitrogen and phosphorus than necessary.

Feed should be provided at a frequency and duration to maximize efficiency. Farm personnel responsible for feeding should assure that fish consume all feed offered. Fish should have access to the feed for sufficient time so that it is consumed before feed is lost through the cage or pen mesh. Feeding rings that retain floating feed

should be used in low-volume (<25 m^3) cages. Feeding rates should be monitored to avoid overfeeding. Observations of fish feeding activity are facilitated by using floating feed for certain species.

It is currently not practical to collect and treat wastes from cages and net pens. The main precaution against pollution is to locate culture units in open-water areas where water currents are sufficiently high to transport wastes away from cages and rapidly mix and dilute wastes.

High fish biomass in a particular location can increase the likelihood of pollution. In bodies of water that stratify thermally, a high fish biomass can result in severe organic enrichment and dissolved oxygen depletion in the bottom water layer (hypolimnion). Subsequent sudden thermal destratification, a naturally occurring process, can result in dissolved oxygen depletion throughout the water column. This phenomenon has been responsible for serious fish mortality of caged fish as well as wild fish populations outside cages. Although there are no specific guidelines for the biomass that can be safely sustained at a particular cage site, monitoring shall be used to track the status of water quality and anticipate the need to take action in the event of sudden destratification.

Water Quality Limits

Cages and net pens may be installed in lakes, reservoirs, rivers, streams, irrigation systems, ponds, estuaries and embayments. Uneaten feed, fish feces and metabolic excretions of fish enter directly the water bodies that contain the cages or net pens. The release of these wastes, derived from feeding, can cause enrichment (eutrophication) of the water bodies used for cage farming. The potential of cage and net pen culture to cause eutrophication of lakes and reservoirs depends primarily on the total amount of feed added, location of production facilities relative to the water body outlet, the area and depth of the water body and the hydraulic retention time (HRT) or flushing rate of the water body. Nutrients and organic matter are removed from water bodies by outflow, and systems with short HRTs are less likely to become eutrophic as a result of aquaculture operations than systems with longer HRTs. Collectively these factors affect the capacity of the water body to assimilate the wastes from feeding, often called the carrying capacity. Assimilation capacity is impractical to measure for purposes of aquaculture certification.

The approach used to demonstrate environmental responsibility with respect to the effects of feed-derived wastes released during cage and net-pen fish farming is water quality monitoring. Specifically, this standard sets limits for certain water quality variables that are indicative of a mesotrophic or intermediate state of eutrophication. In mesotrophic conditions, an extreme level of environmental enrichment is avoided. In mesotrophic waters, the risk of dissolved oxygen depletion is less than in eutrophic or hypereutrophic waters. Thus, a mesotrophic condition simultaneously limits the extent of environmental enrichment and protects fish welfare to enable conditions suitable for good fish and growth and efficient feed conversion. The water quality limits provide some flexibility because each water body responds uniquely. Furthermore, water quality in many water bodies varies seasonally (cold, warm / dry, rainy) and these water quality limits account for that variation. Natural water bodies can already be eutrophic when certification is sought. Sites at which water quality in the water body containing cages or net pens does not comply with BAP effluent guidelines shall not be eligible for certification.

Water samples shall be collected once every two months for analysis of total phosphorus and chlorophyll *a* concentration by standard laboratory methods. Samples shall be collected within the lease or concession at a depth of 50 cm. Secchi disk visibility shall be measured once every two weeks during clear weather and around mid-day. Dissolved oxygen concentration shall be measured once monthly in the morning, between 0600 and 0900 h, at 50 cm depth. Appendix D has additional information on water sampling and analysis.

One of the typical consequences of eutrophication in water bodies used for cage or net-pen culture is a shift in the composition of phytoplankton communities towards species that are tolerant of low light intensities. Often these species can be broadly categorized as blue-green algae (cyanobacteria), which are undesirable because they are potentially toxic to fish or livestock, produce unsightly surface scums, and may cause off-flavor in farmed and wild fish. These algae typically appear in water of low transparency.

Once every two months, in water bodies with a Secchi disk visibility less than 5 m, a water sample shall be collected at 50 cm depth and the percentage of blue-green or other potentially harmful algae assessed. There are numerous examples of suitable methodological approaches for sampling and enumeration of phytoplankton. One

example is "A Phytoplankton Methods Manual for Australian Freshwaters" (http://phytobioimaging.unisalento.it/Portals/7/Documents/General_Documentation/A%20Phytoplankton%20Manual%20methods%20Australia.pdf). Blue-green algae have a wide size variation but the focus of sampling should be directed towards the relatively large-sized, scum-forming blue-green algae, including but not limited to representatives of the following genera: *Anabaena*, *Aphanizomenon*, *Microcystis* and *Planktothrix/Oscillatoria*. Blue-green and other algae should be enumerated to estimate relative community composition. Sub-samples can be used periodically to estimate algal biovolume by multiplying cell or colony counts by estimates of cell volume for the main species identified.

Allowable Water Quality Changes

To assure that environmental quality is maintained at a level to support good fish welfare and mesotrophic conditions, farms shall evaluate changes in water quality that may anticipate reaching the water quality limits established in 3.23. During the first year after initial certification, an independent laboratory shall be contracted to establish a baseline of environmental quality. Specifically, the laboratory shall measure concentrations of total phosphorus and chlorophyll a concentration in samples collected from 50 cm depth within the lease or concession every two months. Farms shall measure baselines for Secchi disk visibility and minimum dissolved oxygen concentration. Measurements of Secchi disk visibility shall be done every two weeks and dissolved oxygen concentration monthly. In subsequent years, the monitoring program shall proceed as outlined in 3.23. Changes in any water quality variable greater than 25% of the value of the baseline will be considered a non-conformity and require corrective action, typically a reduction in fish biomass.

Sediment Monitoring

Wastes can accumulate beneath cages and cause deterioration of sediment quality. This is environmentally undesirable and can have negative impacts on the welfare of fish in cages as well. Sediment quality in areas with fish cages can be protected by fallowing – periodically moving cages to new sites in a concession and allowing the sediment beneath the original sites to recover. Observations on sediment quality shall be used to determine if and when to move cages. For cages located in rivers or in reservoirs with extremely short HRT's (<5 days), the restriction concerning location of cages where depths are >10 m or where the reservoir depth is at least twice the depth of the cage, is not applicable.

Some freshwater lakes and reservoirs are normally stratified throughout the year, with a bottom layer of water with little or no oxygen. In such conditions, restoration of bottom condition is not possible or practical because the processes leading to anaerobic bottom waters are naturally occurring. In this case, farms are not required to inspect sediment. However, farms shall demonstrate that bottom waters are anaerobic with monthly sampling of dissolved oxygen concentration in the hypolimnion (bottom layer), with specification of the depth sampled. Farms placed in locations with water depths greater than 30 m are exempt from sediment monitoring.

F. Sediment Monitoring - Marine Net Pens and Coastal Flow-through Farms

This section applies to net pens in marine and brackishwater environments. It also applies to coastal flow-through facilities that operate with a high rate of water exchange, greater than one system volume exchange per hour.

Audit Clauses

3.28: Monitoring of sediment conditions shall be undertaken within 30 days of the peak sustained feeding period during the production cycle and shall be conducted according to the requirements of the farm's operating permits or its own Sediment Monitoring Plan in countries or regions where sediment monitoring is not required, and as specified in the implementation guidance.

3.29: Sediment sampling and analysis performed as part of the monitoring program shall apply generally accepted international methods and be adapted to the local hydrographic or benthic conditions.

3.30: For newly established farms (first production cycle) or farms that have expanded and do not yet have enough monitoring data, the farm shall provide an independent study that characterizes the hydrographic and benthic characteristics of the area and provides a consultant's opinion (without liability) that the farm can meet or exceed sediment and water quality criteria if operated correctly.

3.31: For established farms (after first production cycle), the farm shall provide sediment monitoring data for the most recent production cycle to show that the farm meets or exceeds the sediment quality criteria specified in its operating permits and/or its own Sediment Monitoring Plan at current operating levels.

3.32: The farm shall provide documents that describe local standards for benthic impacts under net pen farms or at water discharge sites from coastal flow-through facilities. These standards shall include benthic indicator "trigger levels" above which the farm would not be in compliance with local standards. In the absence of benthic trigger levels set by regulatory bodies, the farm shall define these trigger levels based on the benthic characteristics study as per 3.30.

3.33: The results of sediment monitoring shall be reported to and reviewed and accepted by the appropriate regulators. Where regulatory approval is conditional upon implementing a program of remedial action, this shall have been implemented and completed.

3.34: For farms located in areas with other neighboring BAP-certified farms, or with members of an established Area Management Agreement, production cycles and fallowing shall be coordinated.

3.35: For farms located in areas with neighboring farms that are not BAP certified, or where an Area Management Agreement has not been established, the farm shall demonstrate that a good-faith effort has been made to cooperate with neighboring farms on matters of stocking, fallowing, animal health and biosecurity within an area twice the regulatory minimum separation distance to an upper limit of a 5-km radius from the farm.

3.36: Where sediment monitoring is not required as described above and/or where an allowed sediment impact zone is not defined, the farm shall document and implement a Sediment Monitoring Plan. The Plan shall incorporate:

- Securing the services of an independent individual or company with demonstrated expertise in sediment sampling and analysis to design a sediment sampling and analysis program appropriate to the farm conditions and to conduct sediment monitoring as required below.
- Establishing and mapping an allowable sediment impact zone that shall not exceed the total area of the farm plus a boundary zone of 40 m around it. The footprint may be shifted in any direction to account for normally occurring current patterns as long as the total area remains the same.
- Monitoring organic matter accumulation on the seabed within this zone by the method deemed best for the type of sediment that exists there. The choice of method shall be justified by prior documentation of the type of sediments over which the farm is located.
- Conducting sediment sampling to coincide with the period of peak sustained feeding during each crop cycle.

Implementation

Local Standards

In some countries and regions, cage farms are subject to specific regulations about benthic impacts, but in other places, regulations may be inadequate or non-existent. This standard reinforces any existing regulations and describes minimum requirements where effective rules are not already in place.

Farms shall provide documents that describe local standards for benthic impacts under cage farms. Farm permits and/or local regulations usually define an allowed "sediment impact zone," "allowable zone of effect" or "footprint of deposition," and prescribe monitoring protocols to evaluate this area. Because biological sampling of sediments (i.e. benthic invertebrate community composition) requires special expertise and is time-consuming and expensive, chemical sediment properties are usually used as leading indicators of sediment condition. Biological sampling is only required in some jurisdictions if a chemical indicator trigger point is exceeded.

Production cycles and fallowing should be coordinated with neighboring farms, whether or not they are BAP-certified, or with members of an established Area Management Agreement. Whole leases, not only bays with

cages, should be fallowed for at least six months. BAP-certified farms are encouraged to make a good-faith effort to participate in the creation and implementation of Area Management Agreements to address cumulative benthic impacts associated with multiple farms. BAP-certified operations that operate in isolation should have a statement of intent to enter an AMA, if another operation moves into the area.

Hydrographic and Benthic Characterization

Cage farms are usually located following a hydrographic, biological and physical study of the site to determine that farm operations will not have significant negative impacts on animal populations that comprise the benthos under or near the farm. Then "allowable" benthic impacts are set as conditions in the operating permits for the farm, which are defined in terms of one or more of several chemical properties of the sediments. Sometimes these are then correlated with species density and diversity determinations that are based on prior knowledge of local sediment biology or analysis of sediment reference samples collected from the farm location.

Sediment Monitoring Plan

Chemical indicators used for sediment monitoring include sediment oxidation-reduction potential; concentrations of dissolved oxygen, sulfide, total organic carbon or total volatile solids; or visual inspection with documentation by video. Certain variables are better suited to some environments than others. For example, sulfide determination works well in silt or clay sediments containing up to 50% sand, as does determination of total organic carbon. Above this level of sand, an indicator such as total organic carbon concentration works better. On hard bottoms with over 10% gravel, visual recording by video is best because grab sampling is impossible, and many such sea bottoms are erosional in nature, not depositional.

An existing farm shall provide at least one production cycle of monitoring data to show that the farm meets or exceeds benthic standards required by operating permits at current production levels. Newly established farms (first production cycle) shall have completed a baseline study, with review by an independent expert, that describes hydrographic and benthic conditions at the farm site, and that in the expert's opinion (given without liability), the farm can meet or exceed the benthic standards required by its operating permits at current or proposed production levels. This opinion shall be verified by reference to sampling results at the subsequent audit.

Sediment Sampling and Analysis

Samples shall be taken along at least two transects that pass directly through the farm and align with the dominant flow of water at the farm site. One sample with three replicates shall be taken at the edge of the farm and another at the 25-m or 40-m boundary. Five replicate samples shall also be taken from at least two reference stations within 1 km of the farm that have similar depth and sediment characteristics as occur at the farm and where there is no fish production.

Farms shall provide documents to show that sediment quality was determined using generally accepted sample collection and analytical methods. As different methods or combinations of methods may be required in different jurisdictions based on local hydrographic or benthic conditions, no preferred method is specified in this standard, only that whatever method is used shall be undertaken using standard methods of sampling and analysis that conform to generally accepted international standards.

Farms shall demonstrate by statistical analysis of the results that there is no organic matter accumulation from farming activities at the boundary of the allowable sediment impact zone in comparison to the reference station, as determined by the monitoring method chosen.

Additional Information

Australia Marine Farm License Conditions, Schedule 3
Farm Site Inspection Checklist

British Columbia Salmon Farmers and Province of British Columbia – 2001
http://www.salmonfarmers.org

Guide to the Assessment of Sediment Condition at Marine Finfish Farms in Tasmania
C. Macleod and S. Forbes (editors)
Tasmanian Aquaculture and Fisheries Institute, University of Tasmania
Hobart, Tasmania, Australia
http://www.imas.utas.edu.au/__data/assets/pdf_file/0011/68384/AquafinCRC_ProjectNo4.1.pdf

Norwegian Standard N.S. 9410.E
Environmental Monitoring of Marine Fish Farms

Code of Good Practice for Scottish Finfish Culture
Scottish Salmon Producers' Organization
http://www.scottishsalmon.co.uk

Washington State Legislature, WAC 173-204-420
Sediment Impact Zone Maximum Criteria
http://apps.leg.wa.gov/WAC/default.aspx?cite=173-204-200

FAO Fisheries and Aquaculture Technical Paper No. 527
Environmental Impact Assessment and Monitoring in Aquaculture, pp. 455–535
A. Wilson, S. Magill, K. D. Black – 2009
FAO. Rome, Italy

G. Efficient Use of Fishmeal and Fish Oil - All Production Systems

Audit Clauses

3.37: The farm shall use feed for which the manufacturer has provided data on the inclusion rate (%) in feeds of total fishmeal, fishmeal from byproducts, fish oil, and fish oil from byproducts.

3.38: The farm shall record the inclusion rates, as indicated in 3.37, and protein levels of all feeds used, the total amounts of each feed used each year and the total annual aquatic animal production.

3.39: The farm shall calculate and record an average feed conversion ratio for completed crops in a calendar year.

3.40: The farm shall calculate and record a final Fish-in Fish-out (FIFO) ratio and Forage Fish Dependency Ratio (FFDR) value for all completed crops in a calendar year.

3.41: Depending on the species farmed, the FIFO shall not exceed the following values:

- Whiteleg shrimp (*Litopenaeus vannamei*) – 1.0
- Black tiger shrimp (*Penaeus monodon*) – 1.2
- Tilapia – 0.5
- Pangasius catfish – 0.3
- Channel catfish – 0.3
- Rainbow trout – 1.2 (note: does not include steelhead salmon raised in sea cages).
- Atlantic salmon – 1.4 (note: in recirculating systems only).

3.42: For species not named in 3.41, the FIFO shall not exceed 4, or 5 if fish processing byproducts are included in the feed.

3.43: The farm shall obtain feed either from a BAP-certified feed mill or from a feed mill that provides declarations that it complies with BAP Feed Mill standards regarding:

- The recording of species and fishery origins of each batch of fishmeal and fish oil, and;
- Having a written Plan of Action defining policies for responsibly sourcing fishmeal and fish oil from reduction fisheries and setting clear goals for responsibly sourcing soy ingredients.

Implementation

Average FCR Calculation

Feed conversion ratio (FCR) is the fundamental measure of feed efficiency in aquaculture and is calculated as the amount of feed needed to produce a unit weight of aquatic animals. Farms shall calculate and record FCR yearly as follows: Feed conversion ratio = Annual feed use ÷ Net biomass (live weight) of aquatic animals produced. The amount of feed used and net biomass of aquatic animals produced can be reported in metric tons or kilograms, but the same units shall be used for both in the calculation. The net biomass of fish or shrimp produced is calculated by subtracting the total weight of stocked juveniles from the total live weight of the harvested aquatic animals. The FCR shall be reported on an annual basis for all crop cycles completed within a calendar year.

FCR as calculated for the purpose of BAP certification is also known as economic FCR (eFCR). Economic FCR is very sensitive to survival rate, rising sharply if the survival rate drops significantly.

Although BAP for FCR have not been established, producers should always strive to reduce FCR because it is among the best indicators of potential profitability and is direct evidence of efficient use of marine feed ingredients. Farms should always attempt to demonstrate continuous improvement after initial certification by progressive reductions in FCR. Proposed FCR targets, which may become limits in future versions of this standard, are: *L. vannamei*, 1.2; *P. monodon,* 1.5; tilapia, 1.5; *Pangasius* catfish, 1.5; channel catfish, 2.0; rainbow trout, 1.2; Atlantic salmon, 1.1.

FIFO and FFDR Calculation

Aquaculture producers should strive to use marine feed ingredients efficiently, relative to current industry standards, as well as in the global context of livestock feeds and the different species and system intensity combinations. The fish-in fish-out (FIFO) ratio and forage fish dependency ratio (FFDR) are two related indices of the ecological efficiency of fishmeal and fish oil use in an aquaculture system. In short, FIFO considers fishmeal and fish oil together and FFDR considers fishmeal and fish oil separately. Many aquaculture feeds incorporate only small amounts of fishmeal and fish oil and farms that use these feeds can have FIFO and FFDR values less than 1, indicating that they make a net contribution to global fish supplies.

Farms shall obtain the percent fishmeal and fish oil in feeds from feed manufacturers or suppliers. The inclusion levels in feeds shall include any meal or oil derived from whole, wild-caught fish, squid, krill, mollusks or any other wild aquatic animals. However, they shall exclude meal or oil derived from by-products such as trimmings, offal and their derivatives such as squid liver powder, aquaculture by-products such as shrimp head meal and ingredients derived from invasive aquatic species. The quantity of each feed type used, along with the fishmeal and fish oil content of each feed shall be recorded in the audit report.

For calculation of FIFO and FFDR, in the absence of better, specific data from feed suppliers, the industrial processing yields from the reduction of wet, whole, forage fish to fishmeal is assumed to be 22.5% and for forage fish to fish oil is assumed to be 4.8%. However, feed mills should supply farmers with more precise estimates if the default values are not valid in specific cases, with appropriate documentation from suppliers of fishmeal and fish oil.

The feed fish inclusion factor (FFIF) estimates the combined fishmeal and fish oil concentration of the feed on a dry weight basis, relative to the wild fish, and is calculated as follows:

Feed fish inclusion factor = (Percent fishmeal in feed + Percent fish oil in feed) / (22.5 + 4.8)

Using the resulting value for FFIF, farms shall calculate and record a final yearly FIFO ratio as follows:

Fish-in fish-out ratio = Feed fish inclusion factor x Feed Conversion Ratio

Calculation of the FFDR separately compares the amount of fishmeal and fish oil provided in feed to the production system with the wet weight amount of fish produced and then uses the greater of these two values as the total FFDR for the system. In cases where aquatic animals are provided with feed of relatively high protein and

lipid to meet requirements, fish oil derived from forage fish is more limiting than fishmeal. In that case, the FFDR for fish oil is reported. Farms shall calculate and record a final production cycle FFDR as follows:

$FFDR_{fishmeal}$ = (Percent fishmeal in feed x Feed Conversion Ratio)/22.5
$FFDR_{fish\ oil}$ = (Percent fish oil in feed x Feed Conversion Ratio)/4.8
FFDR = The greater of $FFDR_{fishmeal}$ or $FFDR_{fish\ oil}$

Metric standards for FIFO for production of some key aquaculture species have been set based on available industry data and used to reward efficient operations within those sectors with certification. For farms producing novel or uncommon species (particularly higher trophic level marine fish species), insufficient or unreliable data limits the potential to set a species-specific standard at this time. However, given the limited availability of marine ingredient resources for aquafeeds, there is a need to set a global maximum limit for "responsible" products in the market. For this reason, an absolute maximum FIFO for BAP certification has been set at four where byproducts are excluded and five if byproducts are included in the FIFO calculation. Auditors must collect data during audits that shall be used in the future to establish metric standards for other species.

Compliance with BAP Feedmill Standards

To promote responsible sourcing of marine ingredients, the farm shall obtain feed from a BAP-certified feed mill or a feed mill that declares and documents compliance with BAP Feed Mill Standards - Issue 3.0 clauses 4.1 and 4.4. BAP Feed Mill Standard 4.1 requires declarations from suppliers on the species and fishery origins of each batch of fishmeal and fish oil. BAP Feed Mill Standard 4.4 requires a clear, written Plan of Action defining policies for responsibly sourcing fishmeal and fish oil from reduction fisheries and setting clear goals for responsibly sourcing soy ingredients. Additional implementation guidance regarding options for the Plan of Action can be found in the BAP Feed Mill Standard – Issue 3.0.

Additional Information

MarinTrust Standard (formerly IFFO RS Version 2.0 Standard) – Global Standard for Responsible Supply of Marine Ingredients
https://www.marin-trust.com/sites/marintrust/files/2017-07/FINAL%20V2.0%20Standard%20for%20publication.pdf

Fish In:Fish Out (FIFO) Ratios
https://www.iffo.net/fish-fish-out-fifo-ratios-conversion-wild-feed

H. Stocking Sources and GMOs - All Production System

Audit Clauses

3.44: The farm shall keep complete and accurate records of the sources, purchases of stocking material and numbers of seed (e.g. post-larvae, juveniles, fingerlings) stocked in each culture unit for each crop, stocking dates, species stocked and, if applicable, species characteristic specifications such as non-native, specific pathogen-free, specific pathogen-resistant, hybrid, triploid, sex-reversed, genetically modified (GM) or bioengineered (BE).

3.45: If government regulations control the use or importation of any of the species or stocks farmed, relevant permits shall be made available for inspection, even if imported fry were purchased from an intermediary.

3.46: Wild juveniles shall not be stocked, other than as incidental introductions in extensive ponds that rely on tides for pond filling and water exchange.

3.47: Where the species farmed is not native, not escaped and subsequently established in the wild, or not already farmed, further documents shall be provided to demonstrate that regulatory approval for farming is based on the 2005 ICES Code of Practice on Introductions and Transfers of Marine Organisms or, for

freshwater species, the Codes of Practice and Manual of Procedures for Consideration of Introduction and Transfers of Marine and Freshwater Organisms, FAO 1988.

3.48: Farms that produce genetically modified or bioengineered aquatic animals shall comply with all regulations in producing and consuming countries.

Implementation

Recordkeeping

From the standpoint of product traceability, at the farm level, records of stocking and sources of seed are the fundamental first step. For each production unit (pond, tank, cage) and each production cycle, comprehensive records about the source, seed attributes and characteristics, and number stocked and number surviving shall be maintained. The list of examples of species characteristics given in the audit clause is not exclusive; there may be other relevant characteristics that should be noted. For example, some aquatic animal seed batches may have been vaccinated or treated with chemicals as disease prophylaxis prior to stocking. The flow of aquatic animal seed through the farm as the animals grow, including transfers among production units, shall be tracked with the recordkeeping system. Farms shall demonstrate that groups of aquatic animals in a production unit can be traced back to the source hatchery at any time while the group is being grown. A sample Traceability Form that records these data is provided in Appendix E.

Importation Permits

During an audit, documentation of compliance with government regulations (i.e. permits) relating to the importation of aquatic animal seed (fry, fingerlings or postlarvae) and any associated health certificates shall be available for review. The farm should demonstrate awareness of the relevant national and local laws and regulations regarding introductions and transfers of live aquatic animals. The farm should establish a link to the domestic competent authority (veterinary health authority or other government regulatory body) to verify international importation requirements and follow the International Health Certificate protocol defined by the OIE. Government regulations differ by country and the certification body is not expected to maintain complete records of the requirements in every country. However, auditors should become familiar with relevant regulations and importation procedures in countries where they regularly perform audits. Farms importing a new species for the first time should be scrutinized with extra vigilance to demonstrate that legal channels were followed.

Wild Juveniles

The BAP Farms standard requires that only aquatic animals produced in hatcheries can be used to stock production units on farms. Wild juveniles shall not be stocked, other than as incidental introductions in extensive ponds that rely on tides for pond filling and water exchange. Collection of wild seed with fixed or mobile fishing gear, explosives or toxins is not allowed.

Non-native Species

Many non-native species are a major segment of productive aquaculture sectors in many countries. Tilapia have been spread to many countries outside native ranges in Africa and the Middle East. White shrimp have been introduced from the Americas to many countries in Asia. For intentional introductions of non-native species, farms shall demonstrate regulatory approval that is based on the 2005 ICES Code of Practice on Introductions of Marine Organisms or the Codes of Practice and Manual of Procedures for Consideration of Introduction and Transfers of Marine and Freshwater Organisms (FAO 1988). A non-native species is considered established if it has a reproducing population within the watershed, as inferred from multiple discoveries of adult and juvenile life stages over at least two consecutive years. Given that successful establishment may require multiple introductions, species are not considered established if their records of discoveries are based on only one or a few non-reproducing individuals whose occurrence may reflect merely transient species or unsuccessful invasions. To reduce the potential deleterious impact of escapes, technologies such as sterility, ploidy and monosex production are encouraged.

Genetically Modified or Bioengineered Organisms

Bioengineered (BE) organisms, otherwise also referred to in some jurisdictions as Genetically Modified Organisms (GMOs) or transgenic organisms are defined as organisms that have been genetically modified by artificial transfer of genetic material from another species. Sterile or sex-reversed organisms and their offspring, and organisms created by hybridization and polyploidy are not GMOs. Should genetically modified fish or crustaceans be commercialized in the future, producers shall comply with all regulations in producing and consuming countries regarding such organisms and verify that any GMO introduction complies with Clause 3.47. Consumers should be provided with reliable information regarding the BE/GMO status of farmed aquatic animals to enable informed food choices. Traceability standard T12 specifies that information regarding the BE status of harvested aquatic animals be transferred from the farm to processing plants that receive those animals.

Additional Information

ICES Code of Practice on Introductions and Transfers of Marine Organisms 2005
International Council for the Exploration of the Sea
http://www.ices.dk/publications/Documents/Miscellaneous%20pubs/ICES%20Code%20of%20Practice.pdf

Codes of Practice and Manual of Procedures for Consideration of Introduction and Transfers of Marine and Freshwater Organisms
European Inland Fisheries Advisories Commission Food and Agriculture Organization of the United Nations Rome (1988)
ftp://ftp.fao.org/docrep/fao/009/ae989e/ae989e.pdf

OIE Aquatic Animal Health Code (2019), Section 5 – Trade Measures, Importation/Exportation Procedures and Health Certification
https://www.oie.int/standard-setting/aquatic-code/access-online/

BAP Interpretation Guidelines – Supplementary Interpretation of Requirements for “BE” (Bioengineered) Products Labeling – Issue 1.0 – 12 December 2019
https://www.bapcertification.org/Downloadables/pdf/standards/PI%20-%20Interpretation%20Guidelines%20-%20Supplementary%20Interpretation%20of%20Reqs%20for%20BE%20(Bioengineered)%20Products%20Labeling%20-%20Issue%201.0%20-%2012-December-2019.pdf

I. Control of Escapes - All Production Systems

Audit Clauses

All Production Systems

3.49: All holding, transport and culture systems shall be designed, operated and maintained to minimize the release of aquatic animals at any life stage.

3.50: Screens and nets of a size to retain the smallest farmed animals present at the farm shall be installed as a barrier between the culture unit and the environment.

3.51: During harvesting and stock transfer operations, effective secondary containment measures shall be applied to control the escape of animals.

3.52: All incidents involving escapes of aquaculture animals shall be accurately documented.

3.53: For tilapia farms in watersheds where tilapia are not indigenous and not established, farms shall have at least two independent containment systems to prevent escapes. Additionally, they shall only stock monosex juveniles (minimum 99% phenotypically monosex).

Net Pens

3.54: The farm shall have a written Containment Plan that includes procedures to prevent, detect and respond to incidences of escapes of aquatic animals from culture units.

3.55: The farm shall provide documents to show that all staff members have received training in the Containment Plan, which shall be verifiable by training certificates in workers' files and verified during the audit by interviews with a subset of workers.

3.56: Cages, nets and pens shall be labeled and maintained in good condition, and records of repairs shall be kept.

3.57: Regular inspections by divers or underwater cameras of mooring lines and cage mesh condition shall be documented.

3.58: Jump nets that extend above the water line shall surround the perimeter or cover the entire surface of net pens and shall have appropriate mesh sizes to contain the aquatic animals.

Ponds - Shrimp

3.59: The mean water exchange rate of shrimp ponds shall not exceed 10% per day (i.e., on an annual basis, 36.5 x total pond volume) unless necessary to maintain salinity within physiological limits to support shrimp welfare.

Implementation

Containment System Integrity

Avoiding breaches in containment leading to escapes of aquatic animals is in the economic interest of producers. It is also in the interest of minimizing environmental interactions between farmed and wild organisms, such as disease transfer and changes in gene frequency in wild populations. Thus, containment systems for any life stage shall be designed, constructed and operated to minimize the escape of culture animals. These containment systems can be used to grow, hold temporarily or transport cultured aquatic animals.

Containment systems should be designed and constructed using applicable standards or best practices. For example, earthen pond embankments should be designed with proper slopes, using soils that are suitable for holding water, and construction techniques that provide sufficient compaction to avoid embankment failure.

The infrastructure and equipment used to contain aquatic animals shall be inspected according to a regular schedule. A program should be in place for regular preventative maintenance and repair of containment infrastructure and equipment. A reporting system shall be in place to indicate inspection results and preventative maintenance undertaken.

Screening

Screens and nets of a size to retain the smallest aquatic animals present shall be installed as a barrier between the culture unit and the environment. This applies to cages or net pens and outlets (pipes, gates, etc.) from land-based pond, tank or flow-through systems. Examples of acceptable filter devices include a series of mesh screens capable of screening all water, dry-bed filters constructed with gravel and sand, microscreen solids filters, and pond traps with screened discharge.

Escape Detection and Incidence Response

All incidents involving animal escapes shall be accurately documented, including the reason for the escape, the number of organisms that escaped, the health status of the escapes, and any recovery plans/effectiveness statistics. Farms shall maintain equipment for attempted recapture of escaped animals and have written procedures for its use. The procedures must enable rapid response, subject to legal constraints on the types of equipment that can be used. If an escape is known or suspected to have occurred, the root cause shall be investigated immediately, the steps shall be taken to correct it, and plans and actions proposed to address future escape risks. These actions shall be documented in farm records. If, after investigation, there are grounds for believing an escape occurred, the remaining aquatic animals in the culture system shall be counted, if and/or when

water and welfare indicators indicate this can be done without causing excessive distress to the aquatic animals, and any loss of inventory shall be recorded.

Net Pens

Every effort shall be made to assure that fish do not escape from enclosures in water bodies. Cages and net pens shall be constructed of sturdy material and maintained in good condition to minimize the likelihood of holes and rips in the cage mesh through which fish can escape. It is particularly important to use material that does not corrode, as holes can suddenly appear without warning in nets made of corrodible wire.

Cages and pens should be placed in areas where there is little danger of collisions with boats or floating debris and where heavy waves are not likely to damage them. Brightly colored buoys or navigation lights should be placed to mark location of cage arrays. Placement of cages and pens in navigable waters may need approval from governmental authorities. Divers or underwater cameras shall periodically inspect cages for holes, rips and tears.

Containment Plan

Farms using cages or net pens shall have a written Containment Plan that covers escape prevention and deals with known or suspected escapes. The Containment Plan shall include the following elements:

- Integrity of Infrastructure and Equipment – design and construction standards for an effective containment system, equipment testing
- Inspections – inspection program for infrastructure and equipment, including preventative maintenance program and repair
- Inventory Control Procedures – counting methodology and verification, aquatic animal inventory reconciliation
- Aquatic Animal Handling Practices – precautions during transfers, counting, grading, disease treatment, harvesting, transport and other farm operations
- Predator Deterrence and Control Plan – predator control structures (as appropriate), control of predator access, control methods
- Response Procedures and Escape Mitigation – recapture and recovery of stock, escape incident reporting requirements, root cause analysis of escapes or containment failure
- Recordkeeping – equipment testing results, aquatic animal inventory reconciliation or escape detection, escape event log, training activities.
- Training – definition of employee responsibilities, oversight.

Escape Prevention

- Documents shall show the farm's moorings were installed according to the manufacturer's and/or marine engineer's specifications.
- A site risk analysis updated at least annually shall identify the potential and actual causes of fish escapes, determine their relative likelihood of occurrence or recurrence at the farm site, and identify critical control points for effective escape risk monitoring, reduction and response by farm staff.
- Procedures based on the risk analysis shall include management protocols and actions designed to monitor escape risks, reduce them when identified and respond to escape events in a timely and effective manner. The efficacy of these measures shall be verified and documented through the year.
- Procedures shall require the main surface components of the system to be inspected at least annually and repaired or replaced as needed. The sub-surface components must be inspected and replaced as needed at least every two years or between each crop cycle, whichever is shorter. Equipment shall be replaced as needed.
- Net inventory management procedures shall track the ages of all nets on the farm or in storage, and provide strength tests on all nets between crops or every two years, whichever period is shorter. Nets shall be

retired when their strength is below levels specified in local regulations or, where there are none, below the manufacturer's or supplier's recommendations.

- Cage inspection procedures shall ensure all operational nets are surface checked for holes at least weekly and checked sub-surface at least every four weeks. Nets and cage superstructure shall be checked for holes and other indications of structural damage after risk events such as storms or big tides.
- Predator deterrence procedures shall minimize the risk that predators can make holes in nets.
- Boat equipment shall include guards on propellers and staff training procedures that minimize the risk of contact between boats and farm nets.
- At marine sites, procedures and equipment consistent with local Coast Guard rules shall warn non-farm marine traffic of the farm's presence.
- Procedures for handling live fish shall prevent "spillage" during transfers.

Ponds

To minimize escapes from shrimp ponds, the mean water exchange rate of shrimp ponds shall not exceed 10% per day (i.e., on an annual basis, 36.5 x total pond volume), unless necessary to maintain salinity within physiological limits to support shrimp welfare. Pump station records shall be maintained and annual summaries of water use provided to verify the 10% limit. The 10% limit on water exchange rate for shrimp farms does not apply if farms use oceanic water to adjust pond salinity and compensate for evaporative water loss. However, this exemption is only allowed if the pond salinity is kept at 40 ppt or more. In arid zones, pumping oceanic water to maintain a salinity below 40 ppt would not be efficient.

For freshwater ponds, the elevation of pond embankments should be sufficient to avoid flooding (i.e. overtopping) by a 100-year precipitation event. Pond production facilities should be constructed so as to prevent overtopping by storm surges, waves or flood water. When heavy rainfall is expected, pond levels should be drawn down to prevent rainfall from raising water levels and overtopping embankments.

J. Biodiversity and Wildlife Protection - All Production Systems

Audit Clauses

3.60: The farm shall have a written Wildlife Interaction Plan (WIP) and demonstrate compliance with the procedural, performance and reporting requirements of the plan.

3.61: Farm managers and workers shall be familiar with the provisions of the Wildlife Interaction Plan (WIP) and be trained in its implementation.

3.62: Where applicable, government permits for predator control shall be made available for review.

3.63: The farm shall use humane methods of predator exclusion and deterrence, actively favor non-lethal methods and avoid lethal methods.

3.64: No predator controls other than non-lethal exclusion and deterrence shall be applied to species that are listed as endangered or critically endangered on the IUCN Red List or that are protected by local or national laws.

3.65: The farm shall maintain a recordkeeping system that records the species and numbers of all avian, mammalian (except rodent pests) and reptilian mortalities associated with predator control efforts.

Implementation

Wildlife Interaction Plan

Farms shall have a written Wildlife Interaction Plan (WIP) that includes provisions stipulated in local laws and the farms' operating permits, as well as the following requirements, if not stipulated in local laws. Farms that fully enclose culture units within a building or greenhouse that effectively exclude wildlife are exempt from the requirements of a WIP, other than meeting the required legal compliance. The farm should designate an individual in the farm management team to be responsible for implementation of the WIP. The WIP shall include but not be limited to the following elements:

- A list of relevant local laws and specific conditions of the farm's operating permits that apply to wildlife management and protection and allowed wildlife deterrent measures.
- A list of local species classified as endangered or threatened under local laws and/or listed as "Critically Endangered" or "Endangered" on the IUCN Red List.
- Staff training and proactive searching for information and surveys on endangered or threatened species in the vicinity of the farm.
- A map that identifies officially designated "critical" and/or "sensitive" protected areas in the region and the location of any wildlife colonies or migratory corridors.
- If the farm is in or near an area designated as critical or sensitive habitat, a list of endangered non-migratory species within a 2-km radius of the farm and of migratory species within the region, updated when necessary as new habitat is designated.
- A recordkeeping system for reporting observations of endangered, threatened and protected species.
- Designation of workers or management staff responsible for implementing lethal control measures, if needed.
- Description of the farm's passive measures (barriers) to deter the entry of predatory birds, mammals or reptiles into production units (ponds, tanks, cages, etc.).
- Procedures for regular inspections to evaluate and report on the integrity of culture units and the effectiveness of wildlife barriers.
- At marine net pen sites with carnivorous marine mammals (seals, otters, sea lions, orcas) and predatory sharks, a description of the farm's passive measures (primary or secondary barriers) to protect net pens from underwater attack.
- At marine net pen sites, the WIP shall include documentation to show that any acoustic harassment devices used are approved by regulators through a review of environmental impacts with specific reference to endangered, protected, threatened or cetacean species in the area. Such devices shall not be deployed if the review indicates they can adversely affect these species.
- At marine net pen sites, the farm may only use acoustic harassment devices to control predators if independent expert opinion verifies that their use will not harm endangered, protected or threatened species or any cetaceans, and if they are legally approved and/or permitted for use.
- Documentation that any active, non-lethal wildlife deterrent measures used by the farm are approved by government regulators.
- Reporting procedures in the event that control measures cause the accidental death of wildlife and proposed actions to prevent reoccurrence.
- Procedures that state that legally approved lethal methods shall only be used after all non-lethal methods are attempted.
- Prohibition of deliberate lethal controls on species classified as endangered or critically endangered, except under exceptional circumstances, such as risk to human life, and then only after specific written authorization is obtained from regulators.
- Procedures for regulatory authorization, implementation and reporting of lethal control measures when these are deemed necessary.

Worker Training

The management staff member responsible for implementation of the WIP should be responsible for training workers and other management staff on elements of the plan. Workers should be trained in aspects of wildlife predator deterrence and control that they may be called upon to implement. Farm workers and management staff shall be trained to recognize and report endangered, threatened and protected species observed on the farm. The individual designated to carry out lethal control measures should be adequately trained to implement humane and effective lethal control methods.

Predator Exclusion and Deterrence

Humane, non-lethal methods for exclusion and deterrence of wildlife predators is required. Farms shall keep records to demonstrate that, if used, a wildlife predator exclusion and deterrence program is operational and effective. A farm inspection during the audit will assess ongoing wildlife predator exclusion and deterrence activities. As site characteristics and conditions vary widely, the use and effectiveness of various predator control methods will vary and no single approach is likely to be effective. A combination of approaches is encouraged and an empirical approach should be taken to evaluate effectiveness. Compliance with laws and regulations that apply to wildlife (especially threatened and endangered species) and permitted predator deterrence methods is expected.

Creating a barrier between wildlife predators and farmed aquatic animals is often the most effective approach to control the impacts of predation. Ponds can be partially covered with line, wire, netting or screens. Marine net pens can use top nets to control bird or marine mammal predators. Marine net pens can also use secondary perimeter nets or shark guards. Although the primary purpose of partial barriers is exclusion and physical protection, they can also serve as a visual deterrent.

Deterrent methods are active and non-lethal approaches to discourage or deter potential predators from approaching or entering culture units. Typically these can be classified as acoustic or auditory, visual or physical. The number and types of devices should be sufficient to be effective. Often, the effectiveness of devices is short-term because wildlife predators will habituate to the method. Thus, several approaches are needed in combination, in sequence or in rotation and with shifting locations, to be effective.

Various acoustic deterrents are used to control birds, seals and other potentially predatory wildlife. Noise generators include pyrotechnic devices, electronic noisemakers and recordings of distress calls, as examples. Visual deterrence devices include various types of lights, predator models (“scarecrows”) and mirrors or reflectors. Other examples of non-lethal control methods include water spray devices, aerial drones or underwater submersibles, vehicle patrols and deployment of guard dogs.

If humane, non-lethal methods for exclusion and deterrence of wildlife predators fails after every effort is made, then attempts should be made to capture, remove and relocate the potential predator from the farm. In extreme cases, after all non-lethal methods are attempted, and especially when worker safety is at risk, lethal methods can be considered. Lethal control methods must only be those allowed by applicable national laws and regulations. Lethal methods must be rapid, safe and done as humanely as possible. If firearms are used, they must be within the scope of government permits, weapons appropriate for the predator should be used, , only properly trained workers licensed to use firearms should kill the predator, and any attack and predator kill should be documented and reported properly. Only predators actively engaged in an attack that endangers worker safety should be shot without a permit. No lethal predator controls can be used with species that are listed as endangered or critically endangered on the IUCN Red List or that are protected by local or national laws.

Managing Entanglement Risk

Aquaculture gear in marine environments can represent an entanglement risk to wildlife. Farms sited in marine waters where endangered and critically endangered species exist and have the potential to become entangled in lines used on the farm should apply effective gear modifications and best practices to address these risks, including using “whale release” lines, reducing line length, and reducing vertical lines in the water to the greatest extent possible.

Recordkeeping

The Wildlife Interaction Plan has a recordkeeping requirement for reporting observations of endangered, threatened and protected species on the farm. Farms are encouraged to be transparent with stakeholders in providing public access to these records. Farms shall maintain a recordkeeping system that records the species and numbers of all avian, mammalian (except rodent pests) and reptilian mortalities associated with predator control efforts. It is not necessary to record mortalities of these species that are not caused by predator control efforts.

Additional Information

IUCN Red List of Threatened Species

https://www.iucnredlist.org/

IUCN Protected Area Categories
https://www.iucn.org/theme/protected-areas/about/protected-area-categories

K. Storage and Management of Farm Supplies and Solid Wastes - All Production Systems

Audit Clauses

3.66: Fuel, lubricants, feed and agricultural chemicals shall be labelled, stored, used and disposed of in a safe and responsible manner.

3.67: Fuel, lubricants and agricultural chemicals shall not be stored near feed, in worker housing or kitchen areas, or near harvest equipment and supplies.

3.68: Fuel, lubricant and chemical storage areas shall be marked with warning signs and risk indicators.

3.69: Secondary fuel containment volume shall be at minimum equivalent to the total fuel container capacity plus 10%.

3.70: Precautions shall be taken to prevent spills, fires and explosions, and procedures and supplies shall be readily available to manage chemical and fuel spills or leaks. Designated staff shall be trained to manage such spills and leaks.

3.71: Decomposable wastes from housing and food preparation shall be retained in water-tight receptacles with covers to protect contents from insects, rodents and other animals.

3.72: Solid wastes generated on farms shall be collected promptly and stored appropriately before disposal and shall not be dumped in mangrove areas, adjacent wetlands or vacant land.

3.73: Solid wastes shall be disposed of in ways that avoid environmental contamination and odor problems and comply with local regulations.

3.74: Damaged, discarded, decommissioned or derelict net pen facilities or other floating gear shall be collected and removed promptly from oceans, lakes, rivers, shorelines or other water bodies to avoid accumulation or loss.

3.75: Measures shall be taken to prevent infestation of feed storage areas by animal and insect vectors and pests.

3.76: Mortalities from acute die-offs or euthanized diseased animals shall be removed from culture units promptly and disposed of responsibly by rendering, incineration, sterilization, composting, biogas production or ensiling. Disposal by burial is also permitted, with the assistance of a competent contractor if needed and in accordance with applicable regulations.

3.77: Where slaughtering is conducted at the farm, blood water and other effluents generated shall be contained or treated so they do not contaminate the environment or present a biosecurity risk.

Implementation

The range of chemicals and supplies used and solid wastes generated on aquaculture farms is diverse, depending on type of culture system, production intensity and species grown. Release of those materials can compromise the food safety of farmed aquatic animals, environmental pollution or the spread of disease pathogens. Farms are encouraged to develop a systematic approach to the management of chemical and solid wastes in their particular production context. The goal of such a system should be to track the flow, generation and disposal of materials that result in waste and to reduce their volume.

Safe Storage

Some materials used in the operation and maintenance of aquaculture farms represent an environmental risk if released intentionally or inadvertently to the environment. Safe storage of these materials is the initial barrier between the material and the environment.

Labels, risk indicators and warning signs should align with the Globally Harmonized System of Classification and Labelling of Chemicals (GHS). All physical, human health and environmental hazards should be identified and labeled as such. Material Safety Data Sheets (MSDS) should be available for all chemicals used on the farm. A chemical inventory should be maintained. Chemicals should be labeled with the date received and date opened.

Storage and containment facilities that are safe, secure, and properly designed, well ventilated and properly managed must be provided for all fuel, lubricants and agricultural chemicals used. Chemicals shall be stored in secure area with access only to authorized personnel. Chemicals shall never be stored on the floor. Materials should be segregated by hazard class and according to compatibility to prevent undesirable chemical reactions should two or more chemicals accidently mix. Material used in shelving should be compatible with the chemical being stored. Chemicals must not be stored in direct sunlight or near any heat source. Cylinders of compressed gases should be secured properly such as by using chains and not using breakable materials such as rope or raffia string. Highly toxic or controlled substances and veterinary medicines should be stored in a locked cabinet. Secondary containment shall be provided for individual or multiple fuel storage tanks. The containment volume shall be equivalent to the total stored volume plus 10%.

Chemicals such as insecticides, herbicides, algicides, and sodium metabisulfite used for shrimp should be stored in locked, well-ventilated water-tight buildings. The buildings' concrete floors should slope to a center basin for containing spills. Risk indicators and warning signs for these materials should be posted.

Fertilizers, liming materials, salt and other less hazardous agricultural chemicals shall be stored under a roof, where rainfall will not wash them into surface water. Particular care shall be taken with nitrate fertilizers, which are strong oxidants that are particularly explosive when contaminated with diesel fuel or other oils.

Oil leaks from tractors, trucks and other equipment should be prevented through regular scheduled maintenance. Spills should be avoided during oil changes and refueling of vehicles, generators and pump motors. Used oil should be sent to a recycling or aggregation center. Used chemicals and leaking or deteriorating containers shall be disposed of responsibly.

Procedures shall be developed for managing spills of chemicals and other products, and the supplies needed for cleaning up spills shall be readily available. Workers shall be trained to properly use the equipment and handle the contained waste. First aid supplies, emergency phone numbers, eyewash and emergency shower equipment, fire extinguishers, spill cleanup supplies and personal protective equipment should be readily available and workers trained in their use.

Feed Storage

Feed represents the largest variable cost item in fed aquaculture. Thus, care must be taken to guard the quality of feeds during on-farm storage. During storage, lipids (fats) in the feed break down, causing rancidity that reduces the palatability of feed. Mold can create mycotoxins that affect fish kidney and liver function. The potency of vitamins, especially vitamin C and thiamine, also decreases during storage. Spoilage of feed can be caused by excessive moisture from rain, condensation and high humidity; high temperatures; scavenger pests such as rodents and birds; insect infestations by weevils, beetles and moths; and spoilage by fungi, which can cause mold. Moldy feed should never be fed to aquatic animals. Spoiled feed represents a resource efficiency and financial loss.

A covered, well-ventilated and secure building should be constructed for the specific purpose of feed storage. The roof should protect the feed from rainfall and direct sunlight. All ventilation openings and junctions between the roof and walls should be sealed with mesh coverings to prevent entry by scavenging rodents and birds. The air in the building should be as dry and cool as possible.

The feed storage building should be kept clean. Any spilled feed should be collected and removed to avoid attracting rodents. The storage building should be cleaned before new feed enters storage. When the storage building is empty, the walls, floors and storage pallets can be sprayed with insecticide. The outside area around the feed storage building should not have tall weeds or other overgrown plants that provide cover for rodents or other pests. There should not be any stagnant water near the feed storage building.

Feed bags should be arranged in stacks on pallets or above-ground racks. Feed should not be stored on the floor because spoilage may occur from condensation. There should be a 1-m gap between and around stacks and

between stacks and storage building walls and at least 1.5 m between the top of a stack and the roof. Stacks that are more than 4 m high can cause damage of feed pellets in bags at the stack bottom, creating fine feed particles that are usually not consumed by fish and can contribute to environmental waste loading. Bagged feed should be handled carefully because rough handling can damage pellets and create fines. Excessive handling of feed bags should be avoided. Walking or sleeping on feed bags should be discouraged.

The farm should keep an accurate and current inventory of all feed types used. The oldest feeds should be used first (first in, first out). Feeds should not be stored past the manufacturer's recommended use date, usually 90 days, especially in the tropics. Feed purchases should be managed to keep feed fresh.

Measures shall be taken to prevent infestation of feed storage buildings by animal and insect vectors and pests. Farms should have a Pest Management Plan for the control of key pests. The farm shall designate an individual responsible for pest management in the feed storage building, for documenting regular inspections of the feed storage building to monitor for pest activity or infestation, and for training workers on proper feed handling and storage. Traps should be placed in the feed storage building for control of rodents. Pesticide applications may be necessary and these should be documented and done using only legally approved chemicals and safe application methods by trained workers.

Spoiled or expired feed can be disposed of in a landfill and handled similarly to other solid wastes generated by the farm. Given that feed is decomposable, spoiled feed can be composted or used as an agricultural fertilizer for plant or tree crops. Spoiled feed should never be dumped directly into aquatic ecosystems.

Solid Waste Disposal

Solid wastes generated on farms include decomposable wastes such as kitchen and housing wastes (garbage) and expired or moldy feed, dry materials such as paper and glass, various bulky items, discarded farm supplies and equipment (tires, pallets, bags used for feed, fertilizer, liming agents and other chemicals, chemical barrels, aerators and aerator paddles and motors, and vehicle parts), construction debris, and electronic wastes (computers, mobile phones). Solid wastes may also include biofouling organisms removed during onshore net-cleaning operations. If these wastes are not disposed of properly, there is a risk of environmental pollution and unsanitary farm conditions. Farms should take a systematic approach to managing solid wastes by developing a plan that specifies procedures for the collection, storage and disposal of solid wastes. In general, the approach should be to reduce, reuse, or recycle potential wastes of any kind. Paper and plastic should be recycled if possible. Waste collection for recycling requires readily accessible waste containers that are serviced at regular intervals.

Solid wastes should not be allowed to accumulate on farm property. Such wastes shall be collected promptly as it is generated and placed in temporary solid waste storage areas (dumpsters, bins) prior to final disposal. Solid wastes should be disposed of responsibly in a well-designed and legally-operated sanitary landfill. Solid wastes shall not be dumped in open areas of mangroves or other wetlands or vacant land. Farm solid wastes should not be incinerated, unless part of a waste-to-energy production facility. If wastes are composted, the process should not create an odor problem or attract wild animals. Biofouling organisms on net cages should not be cleaned at the production site. Nets should be transported to a shore-based facility for cleaning in facilities designed to capture solid wastes from net cleaning. Biofouling solid wastes should be diverted into a sedimentation pond, sanitary sewer or other treatment system.

Managing Derelict Gear, Marine Litter and Plastic Waste

Some aquaculture production systems require deployment of cages or net pens, rafts, racks, moorings, marker buoys, floating docks or other gear that floats or is submerged near the water surface. All deployed gear should be clearly marked or identified as property of the farm. During extreme weather events with high wind, waves and flooding, gear may become detached or damaged. Once safe to do so, every effort shall be made to retrieve this gear from the bottom, adjacent shorelines or water surfaces. Damaged gear that is retrieved can be repaired or disposed of like other solid wastes in a sanitary landfill. A procedure should be in place for the management and recording of lost, "end of life" or recovered aquaculture gear to control any risks of entanglement with wildlife.

Aquaculture uses many plastic items, including synthetic ropes, netting, floats and buoys, drums, buckets, trays, feed bags, plastic bags for transport of fry or post-larvae, Styrofoam cooler boxes, various packaging materials, boats, pipes, tanks and pond liners, among many other items. Farms are encouraged to conduct a plastics inventory to track the procurement, use and disposal of all plastic items in an effort to avoid release to the environment. All plastics should be disposed of in a manner that will not generate marine litter or have other detrimental impacts on the environment. Records of how this waste material is disposed of should be retained.

Mortality Disposal

Occasionally large numbers of aquatic animals will die as a result of natural causes or human error. Dead aquatic animals, whether arising from an acute mortality episode or chronic daily mortality, shall be removed promptly and placed in dedicated containers. Containers of stored aquatic animal waste should be leak-proof and secured to prevent contact with aquatic animals, other animals or birds and unauthorized personnel. Aquatic animal waste containers should be labeled with regarding content. Dead aquatic animals should be stored for the minimum time that is practical before disposal and storage containers should be cleaned to prevent insect infestation. The storage area should be separated from farm production sites and bodies of water to minimize the risk of spread of pathogenic agents. Transport should be accompanied by appropriate documentation detailing origin, content and destination to allow tracing if required.

Aquatic animal waste infected by an agent causing a disease referred to as “listed” in the OIE Aquatic Animal Health Code, or suspected of being so, may not be transported without permission from the Competent Authority. The Competent Authority may assess the requirement for this condition based on the disease situation in the Member Country (e.g. where a disease referred to in the Aquatic Animal Health Code is enzootic in the Member Country).

Mortalities shall be disposed of on land by responsible procedures, including rendering, incineration, sterilization, composting, biogas production, ensiling or burial after removal by a competent contractor and in accordance with all applicable regulations. Carcasses should never be discarded in water bodies. Equipment used for transportation of aquatic animal waste should be cleaned and disinfected before being returned to the farm.

On-farm Processing Waste Disposal

To preserve or improve product quality, some fish are slaughtered directly upon harvest or are partially processed on farm before transport to processing plants. Fish should be rendered unconscious by stunning with electricity, percussion stunning or other means that protects the welfare of the animal prior to exsanguination. After stunning, fish can be bled to death quickly by cutting major blood vessels in the throat, thereby removing blood from fish muscle. Blood should be stored in sealed containers for transport to an acceptable treatment facility.

Blood water waste must be treated before being discharged. Under no circumstances is untreated blood water waste to be released directly to surface fresh waters or the sea. Treatment of blood water waste requires reduction of total suspended solids, biochemical oxygen demand and disinfection of pathogens. Treatment options include dissolved air flotation, aeration contact chambers and sedimentation ponds. Ultraviolet light can be used to disinfect blood water prior to discharge.

On-farm processing plants must be compliant with all local laws, regulations and permits required for operation. Such facilities should also meet the requirements of the US FDA Hazard Analysis and Critical Control Point (HACCP) program. Fish solid waste (offal) shall be stored in sealed containers. This material can be disposed of as described in the previous section on Mortality Disposal.

Additional Information

Marine Litter Inventory
https://aqua-lit.eu/assets/content/MARINE%20LITTER%20INVENTORY.pdf

OIE Aquatic Animal Health Code (2019), Chapter 4.7 – Handling, disposal and treatment of aquatic animal waste

https://www.oie.int/standard-setting/aquatic-code/access-online/

United Nations (2011), Globally Harmonized System of Classification and Labelling of Chemicals (GHS)
https://www.unece.org/fileadmin/DAM/trans/danger/publi/ghs/ghs_rev04/English/ST-SG-AC10-30-Rev4e.pdf

Pillar 4. Animal Health and Welfare

A. Health and Biosecurity - All Production Systems

Audit Clauses

4.1: The farm shall have in place an operational Animal Health Management Plan or manual, reviewed and approved by an aquatic animal health specialist, that includes the listed elements in the Implementation Guidelines.

4.2: The farm shall have in place biosecurity controls that seek to prevent the introduction and spread of disease agents and disease on the farm or to neighboring farms and these controls shall be detailed in an operational Biosecurity Plan that includes the listed elements in the Implementation Guidelines.

4.3: Farm staff shall be trained in biosecurity procedures and shall, along with all visitors, comply with them.

4.4: The farm shall obtain written assurance from the feed manufacturer that the feed does not contain aquatic feed protein from the same genus as the species being farmed. However, protein hydrolysates verified to <10,000 daltons are permissible.

4.5: Farms located in an area with more than three aquaculture facilities (hatcheries, farms, processing plants) per 10 km^2 sharing the same surface water body shall initiate or participate in an Area Management Plan to coordinate biosecurity measures with neighboring sites, irrespective of BAP certification status, unless a documented disease risk assessment determines that there is a low risk of disease transmission among facilities.

Implementation

Prevention and protection are the two general approaches to control disease pathogens and their spread. The goal of prevention is to manage the rearing environment, primarily through husbandry Best Management Practices, to minimize stress on farmed aquatic animals, thereby reducing susceptibility to disease. Maintaining water quality within the tolerance limits of the aquatic animals, using high-quality feeds that meet nutritional needs, and stocking at a density that will not cause stress are the key approaches. The goal of protection (biosecurity) is to limit the pathogen from entering the farm. Using disease-free juveniles or post-larvae for stocking, disease monitoring, using water that is free of pathogens, hygienic practices (e.g. disinfection), all-in, all-out stocking and harvesting, and control of vectors are some options to prevent pathogen entry.

Animal Health Management Plan

The Animal Health Management Plan is the practical guide to the activities and practices that are implemented to maintain aquatic animals in good health and thus realize their productive potential. The Animal Health Management Plan should link to the biosecurity and welfare plans. A farm-specific written Animal Health Management Plan shall include, at minimum, the following elements:

- Protocols for water quality management to maintain water quality within the tolerance limits of aquatic animals – aeration, water exchange, liming, fertilization, etc.
- Protocols for feeding. How the farm will meet the nutritional requirements of aquatic animals for each life stage.
- Routine disease surveillance and characterization of the health status of the farm. Regular health monitoring is a fundamental part of the health and welfare management of aquatic animals. It provides an early warning detection system that allows rapid response to disease outbreaks. Protocols for regular observation of the behavior and welfare of aquatic animals should be described. Operational disease

surveillance shall be demonstrated by a health-monitoring record-keeping program. The plan should describe the diagnostic capacity (on-farm and contracted labs) available to support infectious disease surveillance.

- Disease diagnosis techniques that will be used to evaluate prevalence of expected diseases.
- Disease control procedures that will be followed in the event of disease outbreaks. The procedures should consider a broad range of options, including vaccination, quarantine, therapeutic treatments and treatment types (e.g. medicated feed, baths or dips, etc.) and humane slaughter (euthanasia). The steps followed shall include reporting to the Competent Authority if the disease is listed by the OIE or is required by local regulations. Procedures should also consider responses in the event of a disease emergency with potential to cause mass mortality.
- Provisions for incoming stock to be vaccinated against diseases for which effective vaccines are available.

To demonstrate that the Animal Health Management Plan is operational and fit-for-purpose, the farm shall maintain or have access to regularly updated records of water quality monitoring, feeding, aquatic animal health and behavior, water quality monitoring, daily mortalities, disease outbreaks, and use of veterinary drugs, therapeutic chemicals or disinfectants.

The Animal Health Management Plan should be evaluated once per year to assess compliance with the plan, effectiveness in meeting goals of improved health and greater survival, and whether documentation and record-keeping have been sufficient.

The Animal Health Management Plan should designate a member of the farm staff as health plan manager that will be responsible for implementing health plan elements, maintaining the recordkeeping system and training staff. The health plan manager should be a professional aquatic animal veterinarian or other trained specialist. The veterinary professional should guide the health monitoring program, conduct health checks and prescribe treatments.

Biosecurity Plan

Biosecurity in aquaculture consists of all practices, activities and policies that minimize the risks from the introduction and spread of aquatic animal diseases. Biosecurity in aquaculture spans multiple levels of governance from international (e.g. OIE guidelines on introductions and transfers), to national (legislative controls) and down to the farm level. Each farm is responsible for biosecurity within the farm.

Proper biosecurity controls will minimize the risk associated with the introduction or spread of disease agents within a farm. The Biosecurity Plan should link to the overall farm aquatic animal health and welfare plan. A farm-specific written Biosecurity Plan shall include, at minimum, the following elements.

- Identification of the likely infectious disease risks for the culture species within the region around the farm.
- Identification of entry and exit points and establishment of critical control points such as movement of aquatic animals and equipment, and farm access by visitors.
- Active control measures to prevent disease introduction in spread by movement of aquatic animals. This includes new introductions, regular stockings and internal movements of aquatic animals. Stock health inspections and certificates should be used to demonstrate the disease freedom of batches of introduced aquatic animals.
- Active control measures to prevent disease introduction and spread by movement of people and equipment. The plan should establish protocols that allow tracing of equipment and people movements, such as through visitor and delivery logs.
- Hygiene and sanitization protocols and standards for equipment and personnel.
- If slaughtering is conducted at the farm, procedures that will be followed to contain or treat blood water and other effluents generated through processing so they do not contaminate the environment or present a biosecurity risk.

To demonstrate that the Biosecurity Plan is operational and fit-for-purpose, the farm shall maintain regularly updated records that trace aquatic animal movements from hatchery to processing plant (see Traceability section). Stock health inspections and certificates should be retained and compiled. Personnel, equipment and vehicle movement logs shall be maintained. Logs of sanitization and disinfection events should be maintained.

The Biosecurity Plan should be evaluated once per year to assess compliance with the plan, effectiveness in meeting goals of improved biosecurity, and whether documentation and record-keeping have been sufficient.

The Biosecurity Plan should designate a member of the farm staff as biosecurity plan manager that will be responsible for implementing biosecurity measures, maintaining the recordkeeping system and training staff and making visitors aware of their roles and responsibilities in implementing biosecurity measures.

Training

The biosecurity plan manager will be responsible for training farm workers in 1) aquatic animal husbandry practices that provide a low-stress environment conducive to good growth and survival, 2) identification of abnormal behavior and external clinical signs of diseases likely to be encountered on the farm, 3) disease reporting and notification procedures, 4) worker responsibilities in the event of disease outbreaks, and 5) role of worker movements in transmitting diseases. Training logs should be maintained by the biosecurity plan manager and will be reviewed during the audit.

Area Management

Although most BAP standards address farm-level impacts, they do not often address the cumulative impact of multiple farms. Cumulative impacts are especially critical with respect to disease transmission among neighboring farms, irrespective of certification status. Aquaculture zones or areas should be disease-free. To achieve area management of disease risks, qualifying farms are required to make a good-faith effort to initiate or participate in an Area Management Plan to coordinate disease surveillance and control and other biosecurity activities within one year of an audit. An exception is provided where farms can demonstrate, through a formal disease risk assessment by qualified and independent experts in aquatic animal diseases, that concludes that there is a low risk of disease transmission among farms.

Additional Information

SRAC 4707: Biosecurity in Aquaculture, Part 1: An Overview (Roy P. E. Yanong and Claire Erlacher-Reid)
https://srac.tamu.edu/fact-sheets

Finfish Biosecurity Measures Plan, Centre for Environment, Fisheries & Aquaculture Science (Cefas)
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/278581/Finfish_biosecurity_measures_plan.pdf

B. Welfare - All Production Systems

Audit Clauses

4.6: Mortalities; body condition factor; lesions, abrasions or fin damage; and gill damage or condition shall be measured in each production unit as individual-based welfare indicators of physical health.

4.7: Water quality shall be measured in each production unit as group-based welfare indicators of environmental quality and maintained within the tolerance limits established for the species and life-stage farmed.

4.8: Feeding response and swimming behavior shall be measured in each production unit as group-based welfare indicators of behavior.

4.9: The farm shall have Standard Operating Procedures for aquatic animal handling operations, including crowding, transfer among production units, grading, vaccination and chemical treatment, that limit the stress experienced by farmed aquatic animals during these operations.

4.10: Farm workers shall be trained in their roles and responsibilities in maintaining the welfare of farmed aquatic animals.

4.11: The welfare of harvested animals that are transported live to processing facilities shall be assessed by documentation of mortality rates during transport.

4.12: If aquatic animals are slaughtered on-farm, the farm shall identify the humane slaughter method used, appropriate for the species.

Implementation

For aquatic animals in aquaculture, welfare can be defined simply as an animal that is healthy and whose needs are met by the farmer. Fundamentally, good welfare will lead to good health, i.e. freedom from disease. Selecting sites and managing facilities to maximize fish welfare can improve production potential by providing conditions conducive to good growth and high survival. Attention to aquatic animal welfare is a characteristic of responsible aquaculture.

Aquatic animals experience numerous stressors that can affect welfare. These include handling, transport, crowding, grading, vaccination, chemical or therapeutic treatments, stocking density (space), water quality, water velocity, light, feed (access, distribution, quality), social interactions, predator control, and parasites and diseases, among others. The welfare requirements of different species and different life stages vary and so practices and considerations to provide good welfare also vary. Each farm should develop its own program to ensure good welfare of their aquatic animals. In general, culture conditions should be managed to avoid situations that could lead to stress, injury or disease. Farms should apply a maximum biomass limit based on standard best management practices and operational welfare indicators. Feeding should be managed to avoid stress caused by under- or over-feeding. For intensive production systems where there is a high risk to animal welfare in the event of a power failure, farms should have in place back-up or fail-safe systems (e.g. standby power generators, pure oxygen systems, tractor-powered paddlewheel aerators, emergency alert systems) to ensure maintenance of good water quality to support aquatic animal welfare.

Welfare Indicators

Best management practices to maintain good culture conditions and routine surveillance as part of health and welfare monitoring program are the keys to promoting good fish welfare. Operational welfare indicators can be measured by farm workers trained to recognize normal and abnormal physical health, water quality and behavior. Regular inspections of the culture facility, water quality analysis, and assessment of the behavior and condition of crustaceans or fish should be conducted regularly.

Individual – Physical Health

The farm shall maintain a recordkeeping system for individual-based welfare indicators of physical health. Mortality is one of the most basic indicators of aquatic animal welfare. Ideally floating dead fish would be removed and recorded as they appear at the water surface, but regular daily removal is best practice. Mortality is much easier to perceive and measure with finfish than with crustaceans. Finfish body condition factor (L/W) shall be measured regularly, preferably weekly. Various physical abnormalities associated with external physical health shall be recorded, including lesions, abrasions or fin damage and gill damage or condition. Crustaceans will have a different set of indicators of physical health. A scoring system can be used to assess all indicators of physical health. Sub-sampling for physical abnormalities can be done during normal biometric sampling, preferably weekly.

Group – Water Quality

The farm shall maintain a recordkeeping system for group-based welfare indicators of environmental quality. Although farms are required to measure the water quality of effluents, regular measurement of water quality to demonstrate that conditions are suitable for good production performance is also required. These are the same water quality variables that are normally measured as part of good husbandry practices. In each production unit, temperature, salinity, dissolved oxygen concentration, pH, ammonia and nitrite concentrations,

and some index of solids concentration – transparency, turbidity or total suspended solids concentration – shall be measured regularly, as determined by culture system type and production system intensity (i.e. stocking density). For finfish and crustacean species grown in flowing, tidal or turbulent water, current speed should be measured and not exceed limits defined by species and life stage. Fish should never be forced to the downstream end of the culture unit by water flow during the grow-out period. Farms should have contingency plans and/or alarms in place in the event of system failure, including having staff on-call to respond to water quality emergencies.

Group – Behavior

The farm shall maintain a recordkeeping system for group-based welfare indicators of behavior. Trained farm workers shall regularly inspect each production unit, noting the behavior of aquatic animals in each unit. Through training and experience, farm workers learn and can assess normal behavior. Often, a loss of appetite is the first sign of disease. Thus, regular assessment of feeding response is a component of health management that can permit rapid response, if necessary. Assessing feeding response can also indicate if fish are being underfed. Swimming behavior is a good indicator of group welfare in a production unit. Abnormal swimming behavior such as vertical orientation, lethargy, whirling, flashing, rubbing and piping are indicators of disease. For both behavior measures, farms may develop custom indices that may be qualitative or semi-quantitative (e.g. percentage range of group exhibiting a certain behavior).

Handling Operations

Aquatic animals that are concentrated during handling operations experience stress. Thus, handling operations should be conducted to minimize stress, including limiting crowding time and time out of water. Procedures for routine handling operations (crowding, transfer, grading, vaccination, chemical treatment, etc.) used on the farm should be described in a Standard Operating Procedure document. Equipment used for handling operations should be maintained in good working order and should be maintained and used in ways that minimize the potential for animal injuries.

Training

Farm workers shall be trained in their roles and responsibilities in maintaining the welfare of farmed aquatic animals. Farm managers are responsible for providing training to workers about 1) evaluation of welfare indicators, including normal and abnormal behavior, signs of poor welfare and expected diseases, 2) water quality management and aquatic animal husbandry, 3) aquatic animal handling procedures (crowding, disease treatment, transfers, loading for transport), and 4) humane euthanasia methods. Training logs should be maintained by the farm to indicate worker training activities.

Live Transport

Chapter 7.2 of the OIE Aquatic Animal Health Code provides detailed guidance on welfare of aquatic animals (especially finfish) during transport, including planning for transport, vehicles and transport containers, procedures for maintaining water quality, preparation for transport, loading, transport and unloading. All transport operations should be done with due consideration to aquatic animal welfare, biosecurity and potential disease transmission, and minimizing physical injuries to preserve product quality. Transport containers and vehicles should be washed and disinfected before and after use. Aquatic animals should be loaded at densities suitable for the species and for distance travelled to other production units or processing facilities. If aquatic animals are transported from one production unit to another, animals should be acclimated to new conditions prior to unloading. A transport logbook shall be maintained that includes information about the group of aquatic animals loaded to allow traceability to farm and production unit, and mortalities that occur during transport.

On-farm Processing

Chapter 7.3 of the OIE Aquatic Animal Health Code provides detailed guidance on welfare aspects of stunning and killing of farmed fish for human consumption. If aquatic animals are processed on-farm, the choice of

stunning and killing method should be appropriate for the species and life stage. Stunning should be sufficient to render fish unconscious rapidly, as indicated by lack of opercular movement or other indicators. The following methods are considered humane: percussive or mechanical stunning, including spiking or pithing, and electrical stunning and killing in water. The following methods are not allowed for killing fish: carbon dioxide (CO_2) in holding water, chilling with ice and CO_2 in holding water, salt or ammonia baths, asphyxiation by removal from water (anoxia) and exsanguination without stunning. Rapid chilling in an ice bath, i.e. thermal shock, is considered sub-optimal but is permissible for on-farm chill-kill of crustaceans and tropical fish species. Technology for the stunning of certain fish types, such as flat fish, is not widely available, so the use of thermal shock is still permissible in specific cases. Note however that the BAP requirements limiting the use of thermal shock will be revised within the three years following the release of this issue (3.0).

Additional Information

OIE Aquatic Animal Health Code (2019), Section 7 – Welfare of Farmed Fish
https://www.oie.int/international-standard-setting/aquatic-code

Noble, C., Gismervik, K., Iversen, M.H., Kolarevic, J., Nilsson, J., Stien, L.H. & Turnbull, J.F. (eds.) (2018)
Welfare Indicators for farmed Atlantic salmon: tools for assessing fish welfare
https://nofima.no/wp-content/uploads/2018/11/FISHWELL-Welfare-indicators-for-farmed-Atlantic-salmon-November-2018.pdf

AVMA Guidelines for the Euthanasia of Animals: 2020 Edition
https://www.avma.org/resources-tools/avma-policies/avma-guidelines-euthanasia-animals

Traceability - All Production Systems

Audit Clauses

T1: The farm shall operate an effective record-keeping system that provides timely, organized, accurate entries, performed and overseen by a designated trained person or team responsible for collecting the data, ensuring it is complete and accurate.

T2: The farm shall have an online traceability system or an in-house database consisting of paper records, documents, forms, notebooks, files, or any combination thereof, and all records shall be available for verification during an audit.

T3: The farm shall keep complete and accurate records for each culture unit and production cycle, including the culture unit identification number, unit area and volume.

T4: As per Clause 3.44, the farm shall keep complete and accurate records of the sources (including BAP certification status of hatchery) and numbers of seed (e.g. post-larvae, juveniles, fingerlings) stocked, stocking dates, species stocked and, if applicable, species characteristic specifications such as non-native, specific pathogen-free, specific pathogen-resistant, hybrid, triploid, sex-reversed, genetically modified (GM) or bioengineered (BE).

T5: Farms that purchase stocking materials from both BAP and non-BAP certified hatcheries shall identify and record all sources and have adequate systems in place to prevent mixing/comingling of stocking materials. All product harvested from use of stocking material from non-BAP certified hatcheries shall not claim the hatchery-associated BAP star status.

T6: Farms that purchase stocking materials from non-BAP certified nurseries and/or other intermediaries shall identify and record all sources and have adequate systems in place to prevent mixing/comingling of the stocking materials. All product harvested from use of such stocking materials shall not claim the hatchery-associated BAP star status. (Note: This does not apply to nurseries within the farm and/or in close

proximity to the farm that are part of the certification and that undergo audits during the farm annual audit).

T7: The farm shall keep complete and accurate records regarding feed manufacturer (including BAP certification status of feed manufacturer), lot numbers and quantities of each feed used in each production unit in each production/crop cycle.

T8: The farm shall keep complete and accurate records concerning any antibiotic or other therapeutic drug use at both the hatchery and the farm, including dosage and dates of treatment initiation and completion.

T9: The farm shall keep complete and accurate records concerning any therapeutic chemical or water quality amendment (fungicides, parasiticides, herbicides, algicides, pesticides, oxidants, probiotics) at the farm, including dosage and dates of treatment.

T10: For production of shrimp and other crustaceans, the farm shall keep complete and accurate records on the use of sulfites (e.g. sodium metabisulfite) or other approved food-processing aids/additives used to control melanosis at harvest.

T11: The farm shall keep complete and accurate records regarding the harvest date, harvest quantity, movement document number (if applicable) and processing plant(s) or purchaser(s). If product lots are destined for more than one processing plant or purchaser, each sub-lot shall be separately identified.

T12: The farm shall provide to all processing plants or purchasers the following information, as applicable, concerning the harvested products:

- Farm name
- Farm government registration number(s)
- BAP farm certification number
- Production method (pond, cages, reservoir, etc.)
- Production unit identification number (i.e., individual pond/cage ID number)
- Sources of post larvae/stocking material, including relevant stock characteristics such as BAP Star status, native/non-native, specific pathogen-free, specific pathogen-resistant, hybrid, triploid, all-male or all-female, sex reversed, genetically modified (GM) or bioengineered (BE)]
- Date of deliveries and lot numbers (defined as deliveries from a single pond or culture unit harvested on a single day)
- Estimated average size and number of harvested animals, total net weight and unit of measure (e.g. kg, mt) for mass balance
- Movement document number (if relevant)
- Feed use (BAP Star Status, commercial brand names, type and lot numbers)
- Reports of chemical treatments
- Testing data for the presence of microbes, antibiotics and chemicals in product (if any such testing was done by the farm itself)

T13: The farm shall keep records of any buyer complaints related to its products' compliance with the BAP standards and records of investigations of such complaints and actions taken to address/correct them.

T14: Farms shall record and provide documentation that demonstrates the farm's relationship with any BAP-certified facilities to which the farm is linked for purposes of star status claims, including:

- The names of all supplying facilities (feed mills and hatcheries/nurseries)
- The names of all product receiving facilities (processing plants), and
- The corresponding annual volume of BAP-certified product exchanged between the named BAP-certified facilities in metric tons/year in the case of feed and harvested products, and the number of live aquatic animals in the case of hatcheries/nurseries.

Note: Auditors must verify this volume/mass balance data and include summary data in the audit report.

T15: The farm, regardless of the star status claims being made for harvested products, shall provide data for the auditor to perform at a minimum two trace-back exercises, one to feed and one to stocking materials, and one trace-forward exercise to a processing plant. Results of these exercises shall be in line with expectations. Note: at the discretion of the auditor, more trace exercises may be conducted.

Implementation

Farms may utilize any traceability system that meets the BAP requirements. This can be an online system; the farm's own in-house database, paper records, files and documents; or a combination thereof. Farms are encouraged to consider implementation of an electronic supply chain traceability system such as blockchain. Where paper records, documents or notebooks are used, if possible, the information should also be transferred to computer database files to allow preparation of data summaries and facilitate electronic transmission. Transition to internal and/or third-party electronic traceability systems is encouraged, e.g. using GDST data recommendations for interoperability. Original files or paper records shall be kept for five years to allow verification of the electronic data.

The record-keeping process requires a high degree of care and organization. On large farms, managers could collect initial data for those aquacultured products for which they are responsible. A single clerk or team could then be given the task of collecting the data from managers and transferring it to a computer database. Farm management shall review the effort at intervals to verify that it satisfies BAP requirements.

The farm shall keep complete and accurate records of the following:

- Sources of seed (eggs, post-larvae and fingerlings)
- Feed sources, types and quantities, feed mill owner/business identification, location
- Therapeutic treatments, with dose, treatment duration, and treatment completion date
- Chemicals (disinfectants, fungicides, parasiticides, herbicides, algicides and other pesticides/chemicals).

Records must be kept in relation to each production unit for each production cycle. Production unit-related records can be captured on the sample Product Traceability Form (Appendix E). Each form corresponds to the harvest on a particular day from a particular culture unit.

Product Identity Preservation

To ensure the integrity of the Best Aquaculture Practices "star" system, traceability controls must be in place that allow verification of all facilities that contribute to the claim of multiple-star BAP-certified status.

To ensure the proper separation and traceability of all farm inputs and outputs, the following components must be in place:

- Farms that purchase all of their shrimp postlarvae, fish fry or fingerlings, and feed from BAP-certified sources shall maintain records of the sources of stocking material and feeds used.
- Farms that purchase stocking material and feed from both BAP- and non-BAP-certified sources shall identify all sources and have adequate systems in place to prevent mixing of BAP and non-BAP production lots.
- To enable mass balance verification of multiple-star products, certified farms shall maintain a list, including harvest dates and volumes, of the processors to which they sell or deliver products.

The farm shall have adequate systems in place to prevent unintended mixing/co-mingling of stocks and feeds from BAP-certified and non-BAP-certified sources. The BAP hatchery-related star cannot be claimed for harvested products from culture units in which more than 20% of the total number of animals were sourced from non-BAP certified hatcheries. The BAP feed-related star cannot be claimed for harvested products from culture units in which more than 20% by weight of the feed volume used was sourced from non-BAP certified feed mills.

The results of trace-forward and trace-back exercises and their mass balance shall be recorded for each eligible star designation. The auditor shall record the traceability and mass balance data in the audit report.

BAP Logo Use

Use of the Best Aquaculture Practices logo, a registered trademark of the Global Seafood Alliance, for any purpose shall be approved by BAP in advance and used in compliance with the BAP trademark usage agreement.

Customer Complaints

The farm must prepare and implement an effective system for the management of complaints and complaint data to control and correct shortcomings related to its products' compliance with the BAP standards.

Appendix A – All Production Systems

This section describes procedures to estimate effluent volume that will be used to calculate a water use index (volume of water used divided by annual fish or shrimp production). Estimations of water use and effluent volume, along with information about effluent water quality and production system time, will be used to calculate nitrogen and phosphorus loads to the environment, expressed as mass per year and mass per fish or shrimp production. This information shall be collected and reported by farms to auditors. The production system scenarios identified below are not intended to be comprehensive, but rather cover the majority of production systems used by BAP-certified farms. Other methods of calculating effluent volume and nutrient mass loading may be suitable for systems not identified below. Those methods can be presented to the BAP Program Integrity team for review and approval. Through analysis of effluent water quality data submitted in BAP audit reports, provisional targets for load indices have been set at: 15kg/mt for total ammonia nitrogen; 1kg/mt for soluble phosphorus; 200 kg/mt for BOD_5.

Calculation of Annual Effluent Volume

An estimation of annual effluent volume shall be determined using one of the following equations.

Embankment Ponds – Pump Discharge Method

Farm discharge (m^3/yr) = Pump discharge (m^3/min) x Average time of pump operation (hr/day) x 60 min/hr x 365 days/yr

Embankment Ponds – Water Exchange Method

Farm discharge (m^3/yr) = [Volume of ponds (m^3) x Number of crops/yr] + [Volume of ponds (m^3) x Average daily water exchange rate as fraction of pond volume x Crop duration in days x Number of crops/yr]

Watershed Ponds – Filled Only by Overland Flow (Runoff)

Effluent volume (m^3/yr) = Annual rainfall (m) x (Watershed area (m^2) x 0.2)

Watershed Ponds – Filled by Inflow from a First-Order (Small) Stream

Effluent volume (m^3/yr) = Annual rainfall (m) x (Watershed area (m^2) x 0.4)

Raceways

Effluent volume (m^3/yr) = Velocity of flow in raceway (m/sec) x Raceway width (m) x Raceway depth (m) x Annual time of operation (days/yr) x 86,400 sec/day

Tanks

Effluent volume (m^3/yr) = Tank volume (m^3) x Number of tank water exchanges per day x Annual time of operation (days/yr)

Recirculating Aquaculture Systems

Effluent volume (m^3/yr) = System volume (m^3) x Fraction (0-1) of system volume replaced with new water per day x Annual time of operation (days/yr)

Other appropriate methods can be used.

Water Use Index

Although not recommended, it is possible to comply with numerical water quality criteria by increasing the amount of water passing through a farm to dilute the concentrations of tested variables. Compliance with the water use index assures that farms meet water quality criteria through good management rather than diluting effluents before they are released into natural waters. A water use index shall be estimated using the following equation.

Water use index (m^3/kg fish or shrimp) = Annual effluent volume (m^3) ÷ Annual fish or shrimp production (kg)

Calculation of Annual Effluent Loads

Loads of water quality variables are more indicative of the pollution potential of farm effluents than separate measurements of concentrations of these variables and effluent volume. Annual loads for total phosphorus and total nitrogen shall be calculated as indicated for each production system type.

Information indicated by a line must be provided by the applicant and recorded on audit reports.

Fish or shrimp produced per year (kg) _____
Feed used per year (kg) _____
Feed protein in grow-out feed (%) _____
Feed N content (%) = Feed protein (%) x 0.16 = _____
Feed P content (%) = _____ (1% is the default P content, unless value is provided by feed supplier)
Harvested fish or shrimp N content (%) = 2.5 (fish) or 3.0 (shrimp)
Harvested fish or shrimp P content (%) = 0.7 (fish) or 0.3 (shrimp)

Nutrient load indices shall be estimated using the following equations, depending on production system.

Cages/net pens and flow-through systems (e.g. raceways, circular tanks) with no solids capture, irrespective of salinity

Nitrogen load (kg/yr) = [Total feed (kg) x Nitrogen (% in feed) ÷ 100] – [Harvested aquatic animals (kg) x Nitrogen (% in fish) ÷ 100]
Nitrogen load index (kg/mt) = Nitrogen load (kg/yr) ÷ Annual production (mt/yr)

Phosphorus load (kg/crop) = [Total feed (kg) x Phosphorus (% in feed) ÷ 100] – [Harvested aquatic animals (kg) x Phosphorus (% in fish) ÷ 100]
Phosphorus load index (kg/mt) = Phosphorus load (kg/yr) x Crops/yr ÷ Annual production (mt/yr)

Flow-through systems with solids capture in quiescent zones or settling basins

Nitrogen load (kg/yr) = [Total feed (kg) x Nitrogen (% in feed) ÷ 100] – [Harvested aquatic animals (kg) x Nitrogen (% in fish) ÷ 100] x 0.80
Nitrogen load index (kg/mt) = Nitrogen load (kg/yr) ÷ Annual production (mt/yr)

Phosphorus load (kg/yr) = [Total feed (kg) x Phosphorus (% in feed) ÷ 100] – [Harvested aquatic animals (kg) x Phosphorus (% in fish) ÷ 100] x 0.50
Phosphorus load index (kg/mt) = Phosphorus load (kg/yr) ÷ Annual production (mt/yr)

Ponds

For ponds with no intentional discharge over multiple production cycles:
Nitrogen load (kg/crop) = [Total feed (kg) x Nitrogen (% in feed) ÷ 100] – [Harvested aquatic animals (kg) x Nitrogen (% in fish) ÷ 100] x 0.30
Nitrogen load index (kg/mt) = Nitrogen load (kg) ÷ Annual production (mt/yr)

Phosphorus load (kg/yr) = [Total feed (kg) x Phosphorus (% in feed) ÷ 100] – [Harvested aquatic animals (kg) x Phosphorus (% in fish) ÷ 100] x 0.15
Phosphorus load index (kg/mt) = Phosphorus load (kg/yr) ÷ Annual production (mt/yr)

For ponds managed with water exchange:
Load of total nitrogen or total phosphorous (kg/yr) = Effluent volume (m^3/yr) x [Mean total nitrogen or total phosphorus concentration in effluent – mean total nitrogen or total phosphorus concentration in source water (mg/L, same as g/m^3)] ÷ 1000 g/kg

Alternatively, in the absence of measurements of variable concentration in source water or where groundwater is used as a water source, the calculation shall be:
Nitrogen load (kg/yr) = Effluent volume (m^3/yr) x 5 mg/L (same as g/m^3)] ÷ 1000 g/kg
Nitrogen load index (kg/mt) = Nitrogen load (kg/yr) ÷ Annual production (mt/yr)

Phosphorus load (kg/yr) = Effluent volume (m^3/yr) x 0.3 mg/L (same as g/m^3)] ÷ 1000 g/kg
Phosphorus load index (kg/mt) = Phosphorus load (kg/yr) ÷ Annual production (mt/yr)

For intensive ponds (>20 t/ha per yr) with water exchange and with solids capture/sedimentation:
Nitrogen load (kg/yr) = [Total feed (kg) x Nitrogen (% in feed) ÷ 100] – [Harvested aquatic animals (kg) x Nitrogen (% in fish) ÷ 100] x 0.25
Nitrogen load index (kg/mt) = Nitrogen load (kg/yr) ÷ Annual production (mt/yr)

Phosphorus load (kg/yr) = [Total feed (kg) x Phosphorus (% in feed) ÷ 100] – [Harvested aquatic animals (kg) x Phosphorus (% in fish) ÷ 100] x 0.50
Phosphorus load index (kg/mt) = Phosphorus load (kg/yr) ÷ Annual production (mt/yr)

Recirculating Aquaculture Systems
Nitrogen load (kg/yr) = Effluent volume (m^3/yr) x NO_3-N concentration (mg/L) ÷ 1000 g/kg
Nitrogen load index (kg/mt) = Nitrogen load (kg/yr) ÷ Annual production (mt/yr)

Phosphorus load (kg/yr) = Effluent volume (m^3/yr) x Total P concentration (mg/L) ÷ 1000 g/kg
Phosphorus load index (kg/mt) = Phosphorus load (kg/yr) ÷ Annual production (mt/yr)

Calculation Examples

Example 1: Water Use, Load Indices For Annual Effluent Estimated By Pond Volume-Water Exchange Method
A farm has 100 ha of ponds that average 1 m deep, with average water exchange of 2.5% pond volume/day. There are 2.3 crops/year, and the average length of each crop is 120 days. The source water of the farm contains an average of, 0.03 mg/L soluble phosphorus (S.P.), 0.15 mg/L total ammonia nitrogen (TAN) and 1.5 mg/L biochemical oxygen demand (BOD).

The farm effluent contains an average of 0.19 mg/L S.P., 0.87 mg/L TAN and 9.6 mg/L BOD. Shrimp/ fish production for the past year was 230,000 kg (230 mt).

Calculations
Pond volume = 100 ha x 10,000 m^2/ha x 1 m = 1,000,000 m^3

Annual effluent volume = [1,000,000 m^3/crop x 2.3 crops/yr] + [1,000,000 m^3 x 0.025 pond volume/day x 120 days/crop x 2.3 crops/yr] = 9,200,000 m^3/yr

Water use index = (9,2000,000 m^3/yr) / (230,000 kg shrimp or fish/yr) = 40 m^3/kg shrimp or fish

S.P. load = (0.19 – 0.03 g/m^3)(9,200,000 m^3/yr)10^{-3} = 1,472 kg/yr
TAN load = (0.87 – 0.15 g/m^3)(9,200,000 m^3/yr)10^{-3} = 6,624 kg/yr
BOD load = (9.6 – 1.5 g/m^3)(9,200,000 m^3/yr)10^{-3} = 74,520 kg/yr

S.P. index = (1,472 kg/yr) / (230 mt shrimp or fish) = 6.4 kg S.P./mt shrimp or fish
TAN index = (6,624 kg/yr) / (230 mt shrimp or fish) = 28.8 kg TAN/mt shrimp or fish
BOD index = (74,520 kg/yr) / (230 mt shrimp or fish)= 324 kg BOD/mt shrimp or fish

Example 2: Water Use, Load Indices For Annual Effluent Estimated By Pump Operation Method
A farm has two pumps that discharge a combined volume of 136 m^3/min. The pumps operate an average of 8 hr/day. The source water of the farm contains an average 0.03 mg/L soluble phosphorus (S.P.), 0.15 mg/L total ammonia nitrogen (TAN) and 1.5 mg/L biochemical oxygen demand (BOD). The farm effluent contains 91 mg/L total suspended solids, 0.23 mg/L soluble phosphorus, 1.20 mg/L total ammonia nitrogen and 12.7 mg/L biochemical oxygen demand. Fish production during the past year was 378,000 kg (378 mt).

Calculations
Annual effluent volume = 136 m^3/min x 60 min/hr x 8 hr/day x 365 days/yr = 23,827,200 m^3/yr
Water use index = (23,827.200 m^3/yr) / (378,000 kg shrimp or fish/yr) = 63.0 m^3/kg shrimp or fish

S.P. load = (23,827,200 m^3/yr)(0.23 – 0.03 g/m^3)10^{-3} = 4,765 kg/yr
TAN load = (23,827,200 m^3/yr)(1.20 – 0.15 g/m^3)10^{-3} = 25,018 kg/yr
BOD load = (23,827,200 m^3/yr)(12.7 – 1.5 g/m^3)10^{-3} = 266,865 kg/yr

S.P. index = (4,765 kg/yr) / (378 mt shrimp or fish) = 12.6 kg S.P./mt shrimp or fish
TAN index = (25,018 kg/yr) / (378 mt shrimp or fish) = 66.2 kg TAN/mt shrimp or fish
BOD index = (266,865 kg/yr) / (378 mt shrimp or fish) = 706 kg BOD/mt shrimp or fish

Appendix B – Ponds, Non-Coastal Flow-through Systems and Recirculating Aquaculture Systems

BAP Effluent Water Quality Criteria

Variable (units)	Ponds and Raceways	RAS*	Minimum Collection Frequency
pH (standard pH units)	6.0-9.5	6.0-9.5	Monthly
Total suspended solids (mg/L)	Less than 50	Less than 25	Quarterly
Soluble phosphorus (mg/L)	Less than 0.5	---	Monthly
Total phosphorus (mg/L)	---	Less than 10	Quarterly
Total ammonia nitrogen (mg/L)	Less than 5	Less than 5	Monthly
Nitrate-N (mg/L)	---	Less than 50	Quarterly
5-day biochemical oxygen demand (mg/L)	Less than 50	Less than 25	Quarterly
Dissolved oxygen	More than 5 mg/L or ≥70% saturation	More than 5 mg/L or ≥70% saturation	Monthly
Chloride (mg/L)	No discharge above 800 mg/L chloride into freshwater**	No discharge above 800 mg/L chloride into freshwater**	Monthly

*Here RAS are defined as systems 1) with a recirculating flow that is >90% of total water flow and 2) with greater than 1% new water per day of total system volume. Recirculating systems with less than 1% new water per day of total system volume are exempt from effluent monitoring.

** Water with less than 1 ppt salinity, specific conductance below 1,500 mmhos/cm or chloride less than 550 mg/L is considered fresh.

Sampling

- Samples shall be collected just prior to locations where effluents enter natural water bodies or exit the farm property. Samples should be collected so that mixing of effluent and water from the receiving body is prevented.
- For farms with multiple effluent outfalls, all or several outfalls shall be sampled to prepare a composite sample for analysis. Where there are more than four outfalls, three outfalls shall be selected as sampling locations.
- Water shall be collected directly from the discharge stream of pipes or dipped from the surface of ditches or canals with a clean plastic bottle. The sample will be placed on ice in a closed, insulated container to prevent exposure to sunlight.
- Samples or direct measurements for dissolved oxygen and pH shall be obtained between 0500 and 0700 hours, and 1300 and 1500 hours on the same day. The average of the two measurements of each variable will be used for verification of compliance.
- Samples for other variables shall be collected between 0500 and 0700 hours.
- The number of ponds or grow-out units being drained for harvest at the time of sampling shall be recorded.
- Samples of source water shall be collected quarterly directly in front of the pump station or from the pump discharge outlet but before pumped water mixes with water in the internal supply canal. Comparing water quality between source and effluent can be used to calculate annual loads and justify an exemption for water quality monitoring of variables that demonstrate no deterioration between source and effluent (3.3.3).

Analysis

- Water samples should be processed and measurements made promptly. Test kits for field or on-farm laboratory can be used for analysis of total ammonia nitrogen, soluble phosphorus, nitrate and chloride. Samples should be diluted with deionized or distilled water to bring test samples into the test kit concentration range for individual variables as needed. Total suspended solids, total phosphorus and 5-d biochemical oxygen demand should be measured by laboratories with technical capacity to conduct those tests.
- Measurements for dissolved oxygen and pH shall be taken in situ with portable meters. pH of water samples collected for dissolved nutrients can also be measured in on-farm water quality laboratories. Auditors shall verify the correct application of dissolved oxygen and pH meter calibration procedures.

Auditing

- A map of the farm layout indicating pumping stations, effluent outfalls and receiving water monitoring points shall be provided to auditors. These areas should be visited and viewed for obvious signs of impaired water quality near outfalls.
- Auditors will inspect and evaluate operation of the on-farm water quality laboratory, the water sampling program and the effluent monitoring recordkeeping system. Auditors can reject analytical results if sampling, in situ measurements or water quality laboratory protocols and analytical procedures are deficient.

Appendix C – Ponds, Non-Coastal Flow-through Systems and Recirculating Aquaculture Systems

Sample Effluent Monitoring Form – pH and Dissolved Oxygen

Date (day/month/ year)	pH (standard units) Morning	Evening	Average	Dissolved Oxygen (mg/L) Morning	Evening	Average	No. Units Harvested
____/01/____							
____/02/____							
____/03/____							
____/04/____							
____/05/____							
____/06/____							
____/07/____							
____/08/____							
____/09/____							
____/10/____							
____/11/____							
____/12/____							
Annual Average							

Sample Effluent Monitoring Form – Soluble Phosphorus, Total Ammonia Nitrogen, Chloride

Date (day/month/year)	Soluble Phosphorus (mg/L)	Total Ammonia Nitrogen (mg/L)	Chloride (mg/L)	Number of Units Harvested
____/01/____				
____/02/____				
____/03/____				
____/04/____				
____/05/____				
____/06/____				
____/07/____				
____/08/____				
____/09/____				
____/10/____				
____/11/____				
____/12/____				
Annual Average				

Sample Effluent Monitoring Form – Total Suspended Solids, 5-Day Biochemical Oxygen Demand

Quarter	Date (day/month/ year)	Total Suspended Solids (mg/L)	5-Day Biochemical Oxygen Demand (mg/L)	Number of Units Harvested
1				
2				
3				
4				
Annual Average				

Appendix D – Cages and Net Pens in Lakes and Reservoirs

BAP Water Quality Monitoring

Variable (units)	Sample Depth	Collection Frequency (minimum)
Secchi disk visibility (cm)	---	Every two weeks
Dissolved oxygen (mg/L)	At 50 cm depth	Every month
Chlorophyll a (µg/L)	At 50 cm depth	Every two months
Total phosphorus (µg/L)	At 50 cm depth	Every two months
Phytoplankton abundance and species (% blue-green algae)	At 50 cm depth	Every two months

Sampling

- A minimum of two sampling stations shall be established. One shall be at the approximate center of the cage farm or net pen area. The other station must be from 50 to 100 m away from the cages, in the prevailing downcurrent direction. It is recommended that these sampling stations be geolocated with fixed buoys or geographic positioning systems (GPS).
- The auditor must approve locations of the stations, which shall be set following a study on prevailing surface currents. For methods, refer to: Estimating Surface Currents Using Dyes and Drogues, U.S. Army Corps of Engineers – http://chl.erdc.usace.army.mil/library/publications/chetn/pdf/chetn-vi-37.pdf.
- Secchi disk visibility shall be measured on a clear day, around midday, with the sun behind the viewer but not in shadow. The recorded value should be the average of the depth of disappearance and the depth of reappearance of the disk.
- Direct measurements of dissolved oxygen concentration a shall be made between 0600 and 0900 hours.
- Water for measurement of total phosphorus and chlorophyll *a* concentration should be collected at each sampling station with a Kemmerer or van Dorn water sampler, or by use of a weighted bottle from which the stopper can be removed by yanking on a calibrated line. Samples should be transferred to clean plastic bottles and placed in ice in a closed, insulated container to avoid exposure to sunlight.
- Water samples from the two sampling stations shall be blended (1:1) to create a composite sample for analysis of total phosphorus and chlorophyll *a* concentration.

Analysis

- Water samples shall be processed, delivered to a water quality laboratory and measurements made promptly. Analysis of the samples shall be done by a private or government laboratory following standard methods as published by the American Public Health Association, American Water Works Association and Water Environment Federation – www.standardmethods.org.
- Measurements for dissolved oxygen concentration shall be taken *in situ* with a portable meter. Auditors shall verify the correct application of dissolved oxygen meter calibration procedures.

Auditing

- A map of the water body with the farm layout indicating location of cages or net pens, water body inlets and outlets, and water quality monitoring sampling stations shall be provided to auditors. Water quality should be visually assessed by auditors for obvious qualitative signs of impairment.
- Auditors will evaluate the qualifications of the selected water quality laboratory and the sufficiency of the water sampling program and the water body monitoring recordkeeping system. Auditors can reject analytical results if sampling, in situ measurements or water quality laboratory protocols and analytical procedures are deficient.

Appendix E - All Production Systems

Sample Product Traceability Form

Farm Name	Pond or Cage Number Pond Area (ha)
POSTLARVAE OR FINGERLINGS Stocking Date	**FEED** Feed Type
Stocking Quantity Species	Manufacturer
Any Species Specifications (e.g., triploid, G.M.)	Lot Number(s)
Hatchery BAP No.	
Confirmation: No Use of Proactively Prohibited Chemicals Yes No	Confirmation: No Use of Proactively Prohibited Chemicals Yes No
THERAPEUTIC DRUG USE Compound 1	**PESTICIDE USE** Compound 1
Disease Treated	Condition Treated
Application Rate	Application Rate
Application Period	Application Period
Compound 2	Compound 2
Disease Treated	Condition Treated
Application Rate	Application Rate
Application Period	Application Period
HARVEST Harvest Date	Harvest Purchaser Name/ Address
Harvest Quantity (kg)	

A1.3 Appendix C – Resumes for Senior Personnel

WADE SKINNER

Port Hawkesbury, NS · [redacted]
[redacted]

More than 15 years of experience as captain/manager and team leader in various sectors of the aquaculture industry. Responsible, punctual, self-motivated, organized and efficient. Extremely dependable and a hard-working individual. Works great alone or as a team member.

EXPERIENCE

MARCH 2023 – PRESENT
MANAGER OF AQUACULTURE OPERATIONS, WE'KOMA'Q FIRST NATION
In charge of farming operations, from egg to plate. Reports to the CEO.

MARCH 2020 – FEBRUARY 2023
REGIONAL OPERATIONS MANAGER NL, AKVAGROUP NA
In charge of various company projects in Atlantic Canada. Reported to the Senior Project manager in Norway daily. As operations manager, my role involved coordinating schedules, meeting deadlines, organizing subcontractors, budgeting, and sales.

JANUARY 2008 – MARCH 2020
HARVEST CAPTAIN, COOKE AQUACULTURE INC.
In charge of all daily operations of the harvest vessel including but not limited to, payroll, scheduling, training crew, maintenance, dry docking and adhering to operational SOP's. Ensure all staff avail of safety equipment and all equipment is inspected and validated appropriately. Ensure vessel budget is within the expected operational cost including, ordering of supplies, fuel, food, etc. Always ensuring top quality Atlantic salmon is delivered to the production plant by the harvest vessel within appropriate temperature, quality, quantity and time.

DECEMBER 2006 – DECEMBER 2007
BRIDGE WATCHMEN & BOSUN, MCKEIL MARINE
Responsible for carrying out the daily duties assigned by the officer of the watch.

MAY 2004-NOVEMBER 2006
CAPTAIN/OPERATOR, SELF EMPLOYED
In charge of all the daily operations of the fishing vessel, ensuring safe working conditions on vessel, complete maintenance of boat, preventative maintenance onshore, fished several species including Cod, Scallop, Halibut, Herring, and Snow Crab.

APRIL 2000 – APRIL 2004
MATE, SELF EMPLOYED
Preparing ship to sail (Fuel, ice, food, etc.), being team leader on deck, responsible for all fishing gear, and general supervision of crew.

JUNE 1990 – MARCH 2000
DECKHAND, SELF EMPLOYED
Fished on various fishing vessels. Included Ground Fishery and Scallop Fishery.

EDUCATION

DECEMBER 2016
SECOND CLASS FISHING MASTERS, TRANSPORT CANADA

JUNE 2015
SEN2, MARINE INSTITUTE

FEBRUARY 2007
BRIDGE WATCH CERTIFICATE, TRANSPORT CANADA

JULY 2006-SEPTEMBER 2006
MARINE EMERGENCY DUTIES (A1, MFA, B1, B2, C), MARINE INSTITUTE

JANUARY 2003-APRIL 2003
ASTRO-NAVIGATION, SEXTANT TRAINING, ROC-MC, MARINE INSTITUTE

OCTOBER 2002- NOVEMBER 2002
SEN1, MARINE INSTITUTE

JUNE 1990
HIGH SCHOOL DIPLOMA, KING ACADEMY

Cooke Aquaculture Leadership Development program certificate, Introduction to Microsoft Office certificate

ACTIVITIES

Volunteer volleyball coach, recreational golfer, enjoy various outdoor activities including camping and boating and winter sports.

Anthony Phillips

We'koqma'q First Nation E-mail: [redacted]

Education

High School Diploma - Whycocomagh Education Center
Whycocomagh, NS 2006

Experience

- **Farm Manager – We'koqma'q First Nation WFN Fish Farm Limited Partnership**

We'koqma'q First Nation 2022 - Current

- **Assistant Farm Manager – We'koqma'q First Nation WFN Fish Farm Limited Partnership**

We'koqma'q First Nation 2021- 2022

- **Harvest Supervisor – We'koqma'q First Nation WFN Fish Farm Limited Partnership**

We'koqma'q First Nation 2019-2021

- **Band Councilor – We'koqma'q First Nation**

We'koqma'q First Nation 1996-2019

- **Heavy Equipment Operator – Georgia Pacific**

Milford, NS 2000-2016

Community Service

- Fire Fighter
- First Responder

Trissa Dunham



EXPERIENCE

Big Falls Fish Growers O/B WHI General Partner Inc, Wolfville NS — *Hatchery Manager*

January 2020 - PRESENT

Hatch and raise Rainbow trout in a freshwater flowthrough hatchery system. Continue with day to day technician and assistant manager duties.

Work closely with all parts of the WFN Fish Farm organization (grow out, processing, sales) to produce a sustainable product and a sustainable operation.

Plan and project inputs and outputs for annual production plans. Coordinate all farming activities and operations such as grading, vaccinating, and shipping.

All administrative duties such as scheduling, payroll, invoice approvals, procuring quotes, and acquiring and scheduling required services and products.

Community involvement such as participating in the Black River Lake Association, giving presentations at local elementary schools, and providing hatchery tours.

Big Falls Fish Growers O/B WHI General Partner Inc, Wolfville NS — *Assistant Hatchery Manager*

January 2018 - December 2019

Hatched and raised Rainbow trout in a freshwater flowthrough hatchery system. Continued day to day technician duties.

Managed personnel and trained new employees.

Performed data collection and analysis.

Created procedures and documentation for safety, biosecurity, and training purposes.

SKILLS

Standard First Aid CPR/AED Level C

Valid Class 5 Nova Scotia Driver License

Basic skills in carpentry, plumbing, and electrical

Advanced skills in Microsoft Excel, Word

Tractor and forklift operations

AWARDS

Mt Allison CIS Academic All-Canadian 2009-2013

Purdy Crawford Award 2010

Women's Soccer Award 2010

Dean's List 2009-2010

Big Falls Fish Growers Ltd, Wolfville NS — *Hatchery Technician*

September 2013 - December 2017

Hatched and raised Atlantic salmon in a freshwater flowthrough hatchery system.

Carried out tasks related to all aspects of animal husbandry from monitoring tank conditions, to feeding, to vaccination.

General site and equipment maintenance and repair.

EDUCATION

Mt Allison University, Sackville NB — *Bachelor of Science*

September 2009 - May 2013

Biology major, Biochemistry minor.

Wayne Fowlie

[redacted]

Qualifications

- Bachelor of Science Degree- Major Biology Chemistry.
- More than ten years' experience in management of processing and manufacturing plants.
- Strong communication skills and interpersonal skills.
- Ability to disseminate, analyze, assess and utilize data in an effective and efficient manner.
- Well-travelled and comfortable in multi-cultural environments.
- Ability to work well under pressure and aggressive schedules and deadlines.
- I am self-motivated, well organized and possess strong leadership traits.
- Extensive experience working with quality control systems.
- Have worked closely with CFIA, FDA in HACCP/QMP Plants both installing and adhering to guidelines.

Employment

Plant Manager
Waycobah Aberdeen Trout Processing Plant April 2020-Present

- Recruitment/selection of maintenance, quality assurance, production and sanitation staff.
- Member of HACCP team and participate in customer audits as they occur throughout the year
- Ensure all employees receive appropriate safety training pertinent for both on and off the job.
- Tasked with ensuring plant fulfills all requirements to become BAP(Best Aquaculture Practices) certified.
- Process flow improvement

Plant Manager April 2015-April 2020
Premium Seafoods Ltd. Arichat, NS

- Responsible for recruitment/selection of maintenance, quality assurance, production and sanitation staff
- Accountable for annual budget maintenance; oversee all operations and modifications
- Mandated to improve production processes to ensure that maximum yield is achieved
- Actively utilize CMMS Maintenance program to track repairs to equipment; Lean Manufacturing principles followed
- Responsible for all production planning and scheduling
- Member of HACCP team and participate in customer audits as they occur throughout the year (BRC, M&S and Sedex audited facility)
- Ensure all employees receive appropriate safety training pertinent for both on and off the job.

Shift Supervisor Mar 2008-April 2015
DSM (Ocean Nutrition Canada) Mulgrave,

- Ensure that GMP standards are followed throughout the plant which produces fish oil concentrates via vacuum distillation vessels resulting in commercial products such as fuel oil, Omega 3, EPA & DHA health food supplement.
- Oversee the operation of the production shift from a managerial perspective.
- Supervise staff providing direction and guidance in daily activities.
- Train staff re proper procedures and use of equipment for safe and efficient performance.
- Conduct annual employee performance reviews.
- Participate in writing of SOP's and maintain MPR's used in various processes.
- Enforce and monitor safety regulations and foster work place safety consciousness.
- Coach and motivate workers including leading by example.

Plant Manager **Oct** 2005-Mar 2008
Marr Pelagics, USA New Bedford, Mass. New Bedford Mass.

- Develop and implement an HACCP plan for Marr Pelagics USA.
- While employed in USA had to liaise with all pertinent government bodies such as FDA, Mass. Health Authority, Public Utilities and Port Authorities to ensure company compliance.
- Hire and maintain personnel as well as train new staff.
- Develop and maintain company sanitation program.
- Coordinate all raw materials landings and oversee proper harvest vessel records to insure quality of raw materials.
- Oversee quality control from raw material to finished product.
- Implement machinery/equipment changes, production systems and work methods.

Quality Control Analyst Ocean Nutrition Canada Jan 2002- Oct 2005
Ocean Nutrition Canada Mulgrave, Nova Scotia

- Perform quality control analysis on all-in process and FP samples entering the lab.
- Conducted chemical analysis based on titrations and use of HPLC and GC.
- Qualifying samples brought to lab and performing analysis based on priorities.
- Inspect all raw materials, packaging and finished products ensuring company standards met.
- Provide input toward the development of MPR's and audit as required.
- Ensure that GMP standards are being met throughout the plants.
- Inspect lab equipment to ensure proper calibrations.

Plant Manager May 1995- Jan 2002
ACS Trading Mulgrave, Nova Scotia

- Provided ongoing reports to company president.
- Managed all plant operations including 150 employees.
- Responsible for ensuring maximum profit on owner's investment.
- Sought out new equipment to increase profit through higher efficiency.
- Promoted company throughout North America and Europe at various trade shows.
- Collaborated with outside contractors in building design (new and existing structures).

Education

Bachelor of Science Degree 1979-1982
Dalhousie University Halifax, NS

Skills

- National Seafood Sector Council & NS School of Fisheries QMPR Program.
- Completion of FDA approved Seafood HACCP Alliance.
- Certified WHMIS instructor.
- GMP certified training.
- Permit preparation training.
- St John's Ambulance first aid.
- Confined Space Certified training.
- Fall Arrest & Scaffolding training.
- "Safe Start" training (train the trainer in house safety training)
- October of 2015 received BRC Food Safety Version 7 training
- Trained in use of SAP
- Completed SQF Quality Code & SQF Ed.8 changes overview.

Stephen A French

CONTACT: [redacted]

Education

- **Canadian Institute of Traffic and Transportation** (CITT) **September 1990 – June 1992**

- **B. Business Administration. Major in Economics** **September 1982 — September 1986**
University of New Brunswick – Fredericton, NB

- **High School Diploma / A-Levels** **September 1977 — June 1982**
Fundy High School- St. George, NB

Experience

- **VP Sales – Waycobah Trout Farms**
Cape Breton, NS May 2021 - Current

- **VP Sales – MOWI Canada East / Marine Harvest**
St. George, New Brunswick. July 2018 — May 2020

- **VP Sales & Marketing – Northern Harvest Sea Farms**
St. George, New Brunswick. April 2007 — July 2018

- **Retail Sales Manager (North America) – Marine Harvest**
Pompano, Florida. April 2005— April 2007

- **Retails Sales Manager (North America) – Stolt Sea Farms**
St. George, New Brunswick. - August 2000 – April 2005

- **Sales/Logistics Manager – Ocean Horizons**
St. George, New Brunswick. September 1993 – August 2000

- **Sales/Freight Manager – Connors Brothers Ltd**
Blacks Harbour, New Brunswick. September 1988 – August 1993

Professional Interests:

- **Member of the Minister's Round Table on Fisheries –** created in order for the Minister of Agriculture, Aquaculture, Aquaculture and Fisheries to receive advice from the fishing and seafood processing industry on a regular basis

Personal Interests:

- Active member of the community including coaching basketball

A1.4 Appendix D – Algar et al. Carrying Capacity Study

Appendix D: MEOPAR- Funded Sediment Modelling for Whycocomagh Bay

The below was extracted from the proposal by C. Algar et al., with permission:

Objective 1: Modelling and Field studies: The goal of this phase of the proposal is to develop and parameterize a numerical diagenetic model that can capture carbon, oxygen, and sulfur dynamics in the sediments of Whycocomagh Bay, both with and without the influence of fish cages. The model will be used to assess the impact of aquaculture upon the biogeochemical processes of the Whycocomagh Bay benthic ecosystem and investigate how changes in fish-rearing practices, such as increased stocking levels, may alter this biogeochemistry.

The model will be based on a previous model that was developed by an undergraduate honours student (A. Chan) in my research group. It is a multicomponent diagenetic reactive-transport model (*10–12*). The model describes the entire suit of metabolic processes observed in the sediment redox cascade (*13*) (aerobic metabolism, nitrate reduction, iron and manganese oxide reduction, sulfate reduction and methanogenesis), along with the corresponding secondary metabolisms (e.g. nitrification, sulfide oxidation, methane oxidation), abiotic reactions such as sulfide mineral formation, and key transport processes (sedimentation, diffusion, bioturbation, and bioirrigation).

To parameterize and ground-truth the model, a 2 year field study will be carried out aimed at quantifying porewater chemistry and fluxes across the sediment-water interface. To do this, sediment cores will be collected seasonally (minimum of three times per year), from immediately after ice break up in the spring (~April) until freeze up in the fall (~December/January). Sediment cores will be collected immediately under fish cages, and at similar water depths in a "pristine" sediment far from the influence of the aquaculture cage (the location of the pristine site will be based on the guidelines outlined Nova Scotia's aquaculture EMP (*14*)), and at the deepest depth (~48 m) in the anoxic zone in the center of the Bay. At each location six sediment cores will be collected. Three will be used to conduct flux incubations to determine oxygen (when O_2 is present in the bottom water), sulfide, and nutrient fluxes across the sediment water interface. The overlying water in each core will be spiked with bromide to determine bioirrigation rates. The remaining three cores will be used to determine porewater and solid phase chemistry (CHN and organic mater content). Porewaters will be extracted using Rhizon samplers and analysis for nutrients (NO_3^-, NH_4^+, and PO_4^{2-}) and free sulfide. Microprofiling (UNISENSE microsensors) for O_2, pH, and H_2S will be conducted to determine their concentration across the sediment water interphase at sub-millimeter resolution.

Results from the field campaign and diagenetic modeling will be combined with data collected by collaborator Hatcher, and partners NS-DFA and CMAR who have been monitoring physical (T,S, current velocities) and chemical (O_2, nutrients) conditions in the waters of Whycocomagh Bay, to produce carrying capacity estimates for the bay that predict what level of fish farming it can sustainably support. Carrying capacity estimates will be developed with collaborator Filgueira, who has used this approach for shellfish aquaculture sites (*15–17*).

April 2024 Update: Since the original lease applications in 2019, a Master's thesis was completed regarding the topics described above:

Vandeplas, S. 2023. *Effects of an Aquaculture Fish Farm on the Sediment Geochemistry of a Naturally Anoxic Basin*. [Master of Science thesis, Dalhousie University]. https://dalspace.library.dal.ca/bitstream/handle/10222/82749/StormyVandeplas2023.pdf?sequence=4

A1.5 Appendix E – Atlantic Canada Conservation Data Centre Reports

DATA REPORT 6336: Whycocomagh Bay, NS

Prepared 14 February 2019
by J. Churchill, Data Manager

CONTENTS OF REPORT

1.0 Preface
- 1.1 Data List
- 1.2 Restrictions
- 1.3 Additional Information
- Map 1: Buffered Study Area

2.0 Rare and Endangered Species
- 2.1 Flora
- 2.2 Fauna
- Map 2: Flora and Fauna

3.0 Special Areas
- 3.1 Managed Areas
- 3.2 Significant Areas
- Map 3: Special Areas

4.0 Rare Species Lists
- 4.1 Fauna
- 4.2 Flora
- 4.3 Location Sensitive Species
- 4.4 Source Bibliography

5.0 Rare Species within 100 km
- 5.1 Source Bibliography



Map 1. A 100 km buffer around the study area

1.0 PREFACE

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

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

1.1 DATA LIST

Included datasets:

Filename	Contents
WhycocomaghBNS_6336ob.xls	All Rare and legally protected *Flora and Fauna* in your study area
WhycocomaghBNS_6336ob100km.xls	A list of Rare and legally protected *Flora and Fauna* within 100 km of your study area
WhycocomaghBNS_6336ma.xls	All *Managed Areas* in your study area
WhycocomaghBNS_6336sa.xls	All *Significant Natural Areas* in your study area
WhycocomaghBNS_6336ff.xls	Rare and common *Freshwater Fish* in your study area (DFO database)

1.2 RESTRICTIONS

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

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

1.3 ADDITIONAL INFORMATION

The accompanying Data Dictionary provides metadata for the data provided.

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

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

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

Plant Communities
Sarah Robinson, Community Ecologist
Tel: (506) 364-2664
sarah.robinson@accdc.ca

Data Management, GIS
James Churchill, Data Manager
Tel: (902) 679-6146
james.churchill@accdc.ca

Billing
Jean Breau
Tel: (506) 364-2657
jean.breau@accdc.ca

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

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

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

Western: Duncan Bayne
(902) 648-3536
Duncan.Bayne@novascotia.ca

Western: Sarah Spencer
(902) 634-7555
Sarah.Spencer@novascotia.ca

Central: Shavonne Meyer
(902) 893-6350
Shavonne.Meyer@novascotia.ca

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

Eastern: Lisa Doucette
(902) 863-4513
Lisa.Doucette@novascotia.ca

Eastern: Terry Power
(902) 563-3370
Terrance.Power@novascotia.ca

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

2.0 RARE AND ENDANGERED SPECIES

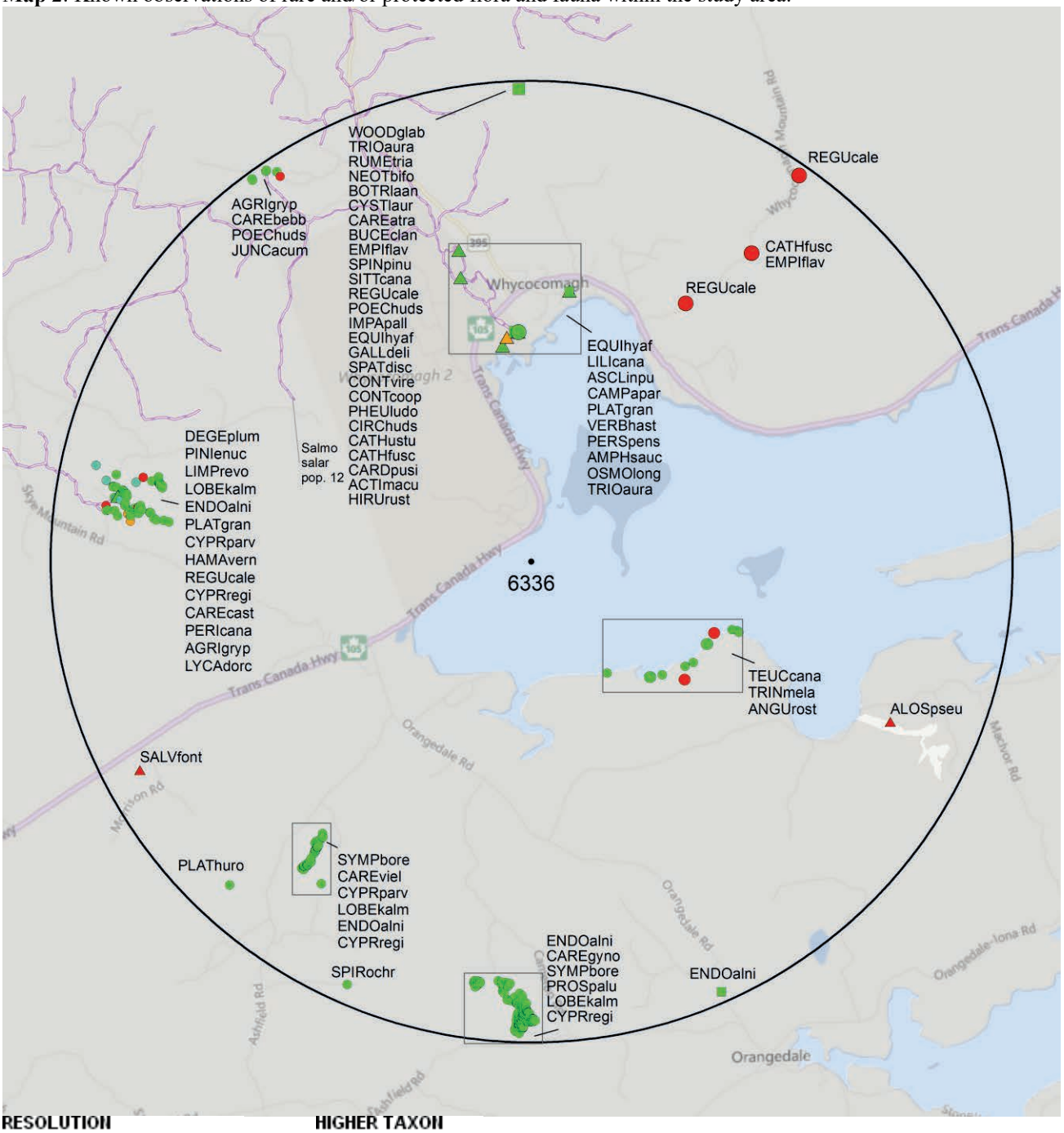
2.1 FLORA

The study area contains 257 records of 31 vascular, 6 records of 3 nonvascular flora (Map 2 and attached: *ob.xls).

2.2 FAUNA

The study area contains 39 records of 23 vertebrate, 3 records of 2 invertebrate fauna (Map 2 and attached data files - see 1.1 Data List). Please see section 4.3 to determine if 'location-sensitive' species occur near your study site.

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



RESOLUTION
- 4.7 within 50s of kilometers
- 4.0 within 10s of kilometers
- 3.7 within 5s of kilometers
- 3.0 within kilometers
- 2.7 within 500s of meters
- 2.0 within 100s of meters
- 1.7 within 10s of meters

HIGHER TAXON
- vertebrate fauna
- invertebrate fauna
- vascular flora
- nonvascular flora

3.0 SPECIAL AREAS

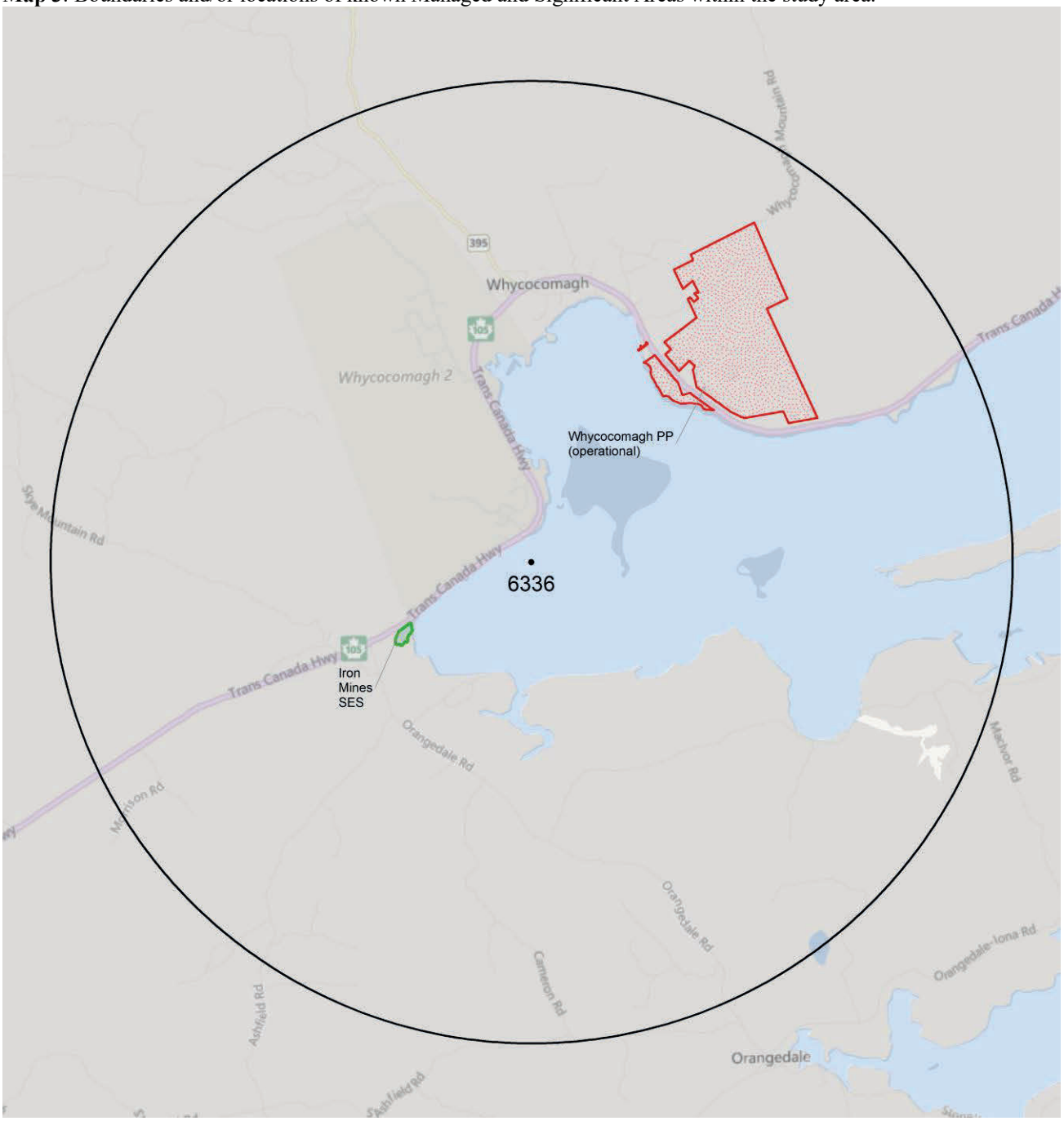
3.1 MANAGED AREAS

The GIS scan identified 1 managed area in the vicinity of the study area (Map 3 and attached file: *ma*.xls).

3.2 SIGNIFICANT AREAS

The GIS scan identified 2 biologically significant sites in the vicinity of the study area (Map 3 and attached file: *sa*.xls).

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



4.0 RARE SPECIES LISTS

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

4.1 FLORA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
N	*Degelia plumbea*	Blue Felt Lichen	Special Concern	Special Concern	Vulnerable	S3	4 Secure	2	4.6 ± 0.0
N	*Hamatocaulis vernicosus*	a Moss				S1S2	3 Sensitive	1	4.4 ± 0.0
N	*Limprichtia revolvens*	a Moss				S2S3	3 Sensitive	3	4.2 ± 0.0
P	*Carex gynocrates*	Northern Bog Sedge				S1	2 May Be At Risk	2	4.4 ± 0.0
P	*Carex viridula var. elatior*	Greenish Sedge				S1	2 May Be At Risk	12	3.6 ± 0.0
P	*Platanthera huronensis*	Fragrant Green Orchid				S1S2	5 Undetermined	1	4.6 ± 0.0
P	*Osmorhiza longistylis*	Smooth Sweet Cicely				S2	2 May Be At Risk	1	2.4 ± 10.0
P	*Impatiens pallida*	Pale Jewelweed				S2	3 Sensitive	2	4.9 ± 7.0
P	*Lobelia kalmii*	Brook Lobelia				S2	2 May Be At Risk	26	3.7 ± 0.0
P	*Rumex triangulivalvis*	Triangular-valve Dock				S2	3 Sensitive	1	4.9 ± 7.0
P	*Carex bebbii*	Bebb's Sedge				S2	3 Sensitive	1	4.9 ± 0.0
P	*Carex castanea*	Chestnut Sedge				S2	2 May Be At Risk	6	3.9 ± 0.0
P	*Carex atratiformis*	Scabrous Black Sedge				S2	3 Sensitive	1	4.9 ± 7.0
P	*Lilium canadense*	Canada Lily				S2	2 May Be At Risk	1	3.0 ± 1.0
P	*Cypripedium reginae*	Showy Lady's-Slipper				S2	2 May Be At Risk	54	3.6 ± 0.0
P	*Cystopteris laurentiana*	Laurentian Bladder Fern				S2	2 May Be At Risk	1	4.9 ± 10.0
P	*Woodsia glabella*	Smooth Cliff Fern				S2	3 Sensitive	1	4.9 ± 7.0
P	*Symphyotrichum boreale*	Boreal Aster				S2?	3 Sensitive	15	3.7 ± 0.0
P	*Triosteum aurantiacum*	Orange-fruited Tinker's Weed				S2S3	3 Sensitive	2	2.3 ± 1.0
P	*Cypripedium parviflorum*	Yellow Lady's-slipper				S2S3	3 Sensitive	5	3.8 ± 0.0
P	*Botrychium lanceolatum ssp. angustisegmentum*	Narrow Triangle Moonwort				S2S3	3 Sensitive	1	4.9 ± 7.0
P	*Campanula aparinoides*	Marsh Bellflower				S3	3 Sensitive	1	2.8 ± 5.0
P	*Proserpinaca palustris*	Marsh Mermaidweed				S3	4 Secure	1	4.4 ± 0.0
P	*Teucrium canadense*	Canada Germander				S3	3 Sensitive	9	1.4 ± 0.0
P	*Persicaria pensylvanica*	Pennsylvania Smartweed				S3	4 Secure	1	2.4 ± 3.0
P	*Endotropis alnifolia*	alder-leaved buckthorn				S3	4 Secure	97	3.6 ± 0.0
P	*Agrimonia gryposepala*	Hooked Agrimony				S3	4 Secure	3	3.8 ± 0.0
P	*Verbena hastata*	Blue Vervain				S3	4 Secure	1	2.4 ± 0.0
P	*Neottia bifolia*	Southern Twayblade				S3	4 Secure	1	4.9 ± 7.0
P	*Platanthera grandiflora*	Large Purple Fringed Orchid				S3	4 Secure	3	2.8 ± 5.0
P	*Spiranthes ochroleuca*	Yellow Ladies'-tresses				S3	4 Secure	1	4.8 ± 0.0
P	*Asclepias incarnata ssp. pulchra*	Swamp Milkweed				S3?	5 Undetermined	2	2.8 ± 1.0
P	*Juncus acuminatus*	Sharp-Fruit Rush				S3S4	4 Secure	2	4.9 ± 0.0
P	*Equisetum hyemale ssp. affine*	common scouring-rush				S3S4	4 Secure	2	3.3 ± 3.0

4.2 FAUNA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
A	*Anguilla rostrata*	American Eel	Threatened			S2	4 Secure	1	2.0 ± 0.0
A	*Hirundo rustica*	Barn Swallow	Threatened	Threatened	Endangered	S2S3B	1 At Risk	1	4.9 ± 7.0
A	*Contopus cooperi*	Olive-sided Flycatcher	Special Concern	Threatened	Threatened	S2B	1 At Risk	2	4.9 ± 7.0
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern	Special Concern	Vulnerable	S3S4B	3 Sensitive	3	4.9 ± 7.0
A	*Circus hudsonius*	Northern Harrier	Not At Risk			S3S4B	4 Secure	1	4.9 ± 7.0
A	*Bucephala clangula*	Common Goldeneye				S2B,S5N	4 Secure	1	4.9 ± 7.0
A	*Spinus pinus*	Pine Siskin				S2S3	3 Sensitive	2	4.9 ± 7.0

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
A	*Pheucticus ludovicianus*	Rose-breasted Grosbeak				S2S3B	3 Sensitive	2	4.9 ± 7.0
A	*Pinicola enucleator*	Pine Grosbeak				S2S3B,S5N	2 May Be At Risk	1	4.1 ± 0.0
A	*Perisoreus canadensis*	Canada Jay				S3	3 Sensitive	1	4.1 ± 0.0
A	*Poecile hudsonicus*	Boreal Chickadee				S3	3 Sensitive	2	4.8 ± 0.0
A	*Sitta canadensis*	Red-breasted Nuthatch				S3	4 Secure	1	4.9 ± 7.0
A	*Alosa pseudoharengus*	Alewife				S3	3 Sensitive	1	4.1 ± 0.0
A	*Salvelinus fontinalis*	Brook Trout				S3	3 Sensitive	1	4.6 ± 0.0
A	*Gallinago delicata*	Wilson's Snipe				S3B	3 Sensitive	3	4.9 ± 7.0
A	*Cardellina pusilla*	Wilson's Warbler				S3B	3 Sensitive	1	4.9 ± 7.0
A	*Tringa melanoleuca*	Greater Yellowlegs				S3B,S3S4M	3 Sensitive	1	2.0 ± 0.0
A	*Spatula discors*	Blue-winged Teal				S3S4B	2 May Be At Risk	2	4.9 ± 7.0
A	*Actitis macularius*	Spotted Sandpiper				S3S4B	3 Sensitive	2	4.9 ± 7.0
A	*Empidonax flaviventris*	Yellow-bellied Flycatcher				S3S4B	3 Sensitive	2	3.9 ± 0.0
A	*Regulus calendula*	Ruby-crowned Kinglet				S3S4B	3 Sensitive	5	3.1 ± 0.0
A	*Catharus fuscescens*	Veery				S3S4B	4 Secure	2	3.9 ± 0.0
A	*Catharus ustulatus*	Swainson's Thrush				S3S4B	4 Secure	1	4.9 ± 7.0
I	*Lycaena dorcas*	Dorcas Copper				S1?	6 Not Assessed	2	4.2 ± 0.0
I	*Amphiagrion saucium*	Eastern Red Damsel				S3	4 Secure	1	2.3 ± 1.0

4.3 LOCATION SENSITIVE SPECIES

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

ova Scotia

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

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

4.4 SOURCE BIBLIOGRAPHY

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

# recs	CITATION
130	Blaney, C.S.; Mazerolle, D.M.; Belliveau, A.B. 2014. Atlantic Canada Conservation Data Centre Fieldwork 2014. Atlantic Canada Conservation Data Centre, # recs.
67	Blaney, C.S.; Mazerolle, D.M.; Belliveau, A.B. 2015. Atlantic Canada Conservation Data Centre Fieldwork 2015. Atlantic Canada Conservation Data Centre, # recs.
37	Mazerolle, D.M. 2016. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
26	Lepage, D. 2014. Maritime Breeding Bird Atlas Database. Bird Studies Canada, Sackville NB, 407,838 recs.
9	Pronych, G. & Wilson, A. 1993. Atlas of Rare Vascular Plants in Nova Scotia. Nova Scotia Museum, Halifax NS, I:1-168, II:169-331. 1446 recs.
6	Benjamin, L.K. 2011. NSDNR fieldwork & consultant reports 1997, 2009-10. Nova Scotia Dept Natural Resources, 85 recs.
6	Newell, R.E. 2000. E.C. Smith Herbarium Database. Acadia University, Wolfville NS, 7139 recs.
5	Benjamin, L.K. (compiler). 2007. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 8439 recs.
5	Erskine, A.J. 1992. Maritime Breeding Bird Atlas Database. NS Museum & Nimbus Publ., Halifax, 82,125 recs.
5	Neily, T.H. 2017. Maritmes Lichen and Bryophyte records. Atlantic Canada Conservation Data Centre.
2	Benjamin, L.K. (compiler) 2012. Significant Habitat & Species Database. NS Dept of Natural Resources.

# recs	CITATION
2	Gillis, J. 2007. Botanical observations from bog on Skye Mountain, NS. Pers. comm., 8 recs.
2	Munro, Marian K. Nova Scotia Provincial Museum of Natural History Herbarium Database. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia. 2013.
2	Roland, A.E. & Smith, E.C. 1969. The Flora of Nova Scotia, 1st Ed. Nova Scotia Museum, Halifax, 743pp.
1	Brunelle, P.-M. (compiler). 2009. ADIP/MDDS Odonata Database: data to 2006 inclusive. Atlantic Dragonfly Inventory Program (ADIP), 24200 recs.
1	Neily, T.H. 2017. Nova Scotia lichen records. Mersey Tobeatic Research Institute.
1	Newell, R.E. 2005. E.C. Smith Digital Herbarium. E.C. Smith Herbarium, Irving Biodiversity Collection, Acadia University, Web site: http://luxor.acadiau.ca/library/Herbarium/project/. 582 recs.
1	Staff, DNR 2007. Restricted & Limited Use Land Database (RLUL).
1	Zinck, M. & Roland, A.E. 1998. Roland's Flora of Nova Scotia. Nova Scotia Museum, 3rd ed., rev. M. Zinck; 2 Vol., 1297 pp.

5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 17742 records of 133 vertebrate and 472 records of 48 invertebrate fauna; 6212 records of 278 vascular, 1170 records of 99 nonvascular flora (attached: *ob100km.xls).

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

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	*Myotis lucifugus*	Little Brown Myotis	Endangered	Endangered	Endangered	S1	1 At Risk	36	21.4 ± 0.0	NS
A	*Myotis septentrionalis*	Northern Long-eared Myotis	Endangered	Endangered	Endangered	S1	1 At Risk	7	90.5 ± 0.0	PE
A	*Charadrius melodus melodus*	Piping Plover melodus ssp	Endangered	Endangered	Endangered	S1B	1 At Risk	632	26.2 ± 0.0	NS
A	*Sterna dougallii*	Roseate Tern	Endangered	Endangered	Endangered	S1B	1 At Risk	36	75.8 ± 7.0	NS
A	*Calidris canutus rufa*	Red Knot rufa ssp	Endangered	Endangered	Endangered	S2M	1 At Risk	135	40.9 ± 0.0	NS
A	*Rangifer tarandus pop. 2*	Woodland Caribou (Atlantic-Gasp├⌐sie pop.)	Endangered	Endangered	Extirpated	SX	0.1 Extirpated	1	96.5 ± 0.0	NS
A	*Antrostomus vociferus*	Eastern Whip-Poor-Will	Threatened	Threatened	Threatened	S1?B	1 At Risk	3	32.8 ± 0.0	NS
A	*Catharus bicknelli*	Bicknell's Thrush	Threatened	Special Concern	Endangered	S1S2B	1 At Risk	211	30.3 ± 7.0	NS
A	*Glyptemys insculpta*	Wood Turtle	Threatened	Threatened	Threatened	S2	3 Sensitive	70	2.5 ± 0.0	NS
A	*Acipenser oxyrinchus*	Atlantic Sturgeon	Threatened			S2	2 May Be At Risk	1	64.8 ± 0.0	NS
A	*Anguilla rostrata*	American Eel	Threatened			S2	4 Secure	2	2.0 ± 0.0	NS
A	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Endangered	S2B,S1M	1 At Risk	68	24.9 ± 0.0	NS
A	*Riparia riparia*	Bank Swallow	Threatened	Threatened	Endangered	S2S3B	2 May Be At Risk	236	11.0 ± 7.0	NS
A	*Hirundo rustica*	Barn Swallow	Threatened	Threatened	Endangered	S2S3B	1 At Risk	414	4.9 ± 7.0	NS
A	*Cardellina canadensis*	Canada Warbler	Threatened	Threatened	Endangered	S3B	1 At Risk	253	10.0 ± 0.0	NS
A	*Dolichonyx oryzivorus*	Bobolink	Threatened	Threatened	Vulnerable	S3S4B	3 Sensitive	218	11.0 ± 7.0	NS
A	*Sturnella magna*	Eastern Meadowlark	Threatened	Threatened		SHB	3 Sensitive	2	75.8 ± 7.0	NS
A	*Hylocichla mustelina*	Wood Thrush	Threatened	Threatened		SUB	5 Undetermined	7	68.2 ± 7.0	NS
A	*Falco peregrinus pop. 1*	Peregrine Falcon - anatum/tundrius	Special Concern	Special Concern	Vulnerable	S1B,SNAM	3 Sensitive	2	40.4 ± 7.0	NS
A	*Bucephala islandica (Eastern pop.)*	Barrow's Goldeneye - Eastern pop.	Special Concern	Special Concern		S1N	1 At Risk	1	77.9 ± 16.0	NS
A	*Asio flammeus*	Short-eared Owl	Special Concern	Special Concern		S1S2B	2 May Be At Risk	6	32.2 ± 0.0	NS
A	*Euphagus carolinus*	Rusty Blackbird	Special Concern	Special Concern	Endangered	S2B	2 May Be At Risk	171	11.1 ± 7.0	NS
A	*Chordeiles minor*	Common Nighthawk	Special Concern	Threatened	Threatened	S2B	1 At Risk	89	5.1 ± 7.0	NS
A	*Contopus cooperi*	Olive-sided Flycatcher	Special Concern	Threatened	Threatened	S2B	1 At Risk	561	4.9 ± 7.0	NS
A	*Histrionicus histrionicus pop. 1*	Harlequin Duck - Eastern pop.	Special Concern	Special Concern	Endangered	S2N	1 At Risk	10	55.8 ± 7.0	NS
A	*Phalaropus lobatus*	Red-necked Phalarope	Special Concern			S2S3M	3 Sensitive	1	97.8 ± 0.0	NS
A	*Morone saxatilis pop. 1*	Striped Bass- Southern Gulf of St Lawrence pop.	Special Concern			S2S3N	2 May Be At Risk	1	70.8 ± 1.0	NS
A	*Chelydra serpentina*	Snapping Turtle	Special Concern	Special Concern	Vulnerable	S3	3 Sensitive	8	50.1 ± 10.0	NS
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern	Special Concern	Vulnerable	S3S4B	3 Sensitive	185	4.9 ± 7.0	NS
A	*Coccothraustes vespertinus*	Evening Grosbeak	Special Concern		Vulnerable	S3S4B,S3N	4 Secure	212	8.3 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	*Chrysemys picta picta*	Eastern Painted Turtle	Special Concern			S4S5	4 Secure	1	88.8 ± 1.0	NS
A	*Lynx canadensis*	Canadian Lynx	Not At Risk		Endangered	S1	1 At Risk	139	15.0 ± 1.0	NS
A	*Accipiter cooperii*	Cooper's Hawk	Not At Risk			S1?B	5 Undetermined	1	71.4 ± 7.0	NS
A	*Fulica americana*	American Coot	Not At Risk			S1B	5 Undetermined	2	88.9 ± 0.0	PE
A	*Sorex dispar*	Long-tailed Shrew	Not At Risk	Special Concern		S2	3 Sensitive	17	10.1 ± 0.0	NS
A	*Aegolius funereus*	Boreal Owl	Not At Risk			S2?B	5 Undetermined	11	38.9 ± 7.0	NS
A	*Globicephala melas*	Long-finned Pilot Whale	Not At Risk			S2S3		6	76.5 ± 1.0	NS
A	*Hemidactylium scutatum*	Four-toed Salamander	Not At Risk			S3	4 Secure	18	24.8 ± 0.0	NS
A	*Sterna hirundo*	Common Tern	Not At Risk			S3B	3 Sensitive	411	5.1 ± 7.0	NS
A	*Sialia sialis*	Eastern Bluebird	Not At Risk			S3B	3 Sensitive	12	33.5 ± 7.0	NS
A	*Buteo lagopus*	Rough-legged Hawk	Not At Risk			S3N	4 Secure	2	64.5 ± 4.0	NS
A	*Accipiter gentilis*	Northern Goshawk	Not At Risk			S3S4	4 Secure	75	11.0 ± 0.0	NS
A	*Circus hudsonius*	Northern Harrier	Not At Risk			S3S4B	4 Secure	229	4.9 ± 7.0	NS
A	*Ammospiza nelsoni*	Nelson's Sparrow	Not At Risk			S3S4B	4 Secure	82	11.0 ± 7.0	NS
A	*Morone saxatilis*	Striped Bass	E,E,SC			S2S3	2 May Be At Risk	4	54.6 ± 0.0	NS
A	*Martes americana*	American Marten			Endangered	S1	1 At Risk	28	13.5 ± 1.0	NS
A	*Alces americanus*	Moose			Endangered	S1	1 At Risk	13	26.3 ± 0.0	NS
A	*Salmo salar*	Atlantic Salmon				S1	2 May Be At Risk	91	7.0 ± 0.0	NS
A	*Picoides dorsalis*	American Three-toed Woodpecker				S1?	5 Undetermined	7	10.7 ± 0.0	NS
A	*Passerina cyanea*	Indigo Bunting				S1?B	5 Undetermined	3	60.3 ± 7.0	NS
A	*Uria aalge*	Common Murre				S1?B,S5N	4 Secure	3	75.5 ± 0.0	NS
A	*Nycticorax nycticorax*	Black-crowned Night-heron				S1B	2 May Be At Risk	1	65.2 ± 7.0	NS
A	*Anas acuta*	Northern Pintail				S1B	2 May Be At Risk	7	68.5 ± 1.0	NS
A	*Oxyura jamaicensis*	Ruddy Duck				S1B	4 Secure	2	80.5 ± 0.0	NS
A	*Haematopus palliatus*	American Oystercatcher				S1B	5 Undetermined	7	65.8 ± 7.0	NS
A	*Mimus polyglottos*	Northern Mockingbird				S1B	4 Secure	18	25.1 ± 7.0	NS
A	*Toxostoma rufum*	Brown Thrasher				S1B	5 Undetermined	3	59.6 ± 0.0	NS
A	*Vireo gilvus*	Warbling Vireo				S1B	5 Undetermined	7	27.1 ± 7.0	NS
A	*Calidris minutilla*	Least Sandpiper				S1B,S3M	4 Secure	209	40.9 ± 0.0	NS
A	*Charadrius semipalmatus*	Semipalmated Plover				S1B,S3S4M	4 Secure	321	34.7 ± 0.0	NS
A	*Pluvialis dominica*	American Golden-Plover				S1S2M	3 Sensitive	79	53.8 ± 0.0	NS
A	*Limosa haemastica*	Hudsonian Godwit				S1S2M	3 Sensitive	95	53.8 ± 0.0	NS
A	*Microtus chrotorrhinus*	Rock Vole				S2	4 Secure	20	10.1 ± 0.0	NS
A	*Vireo philadelphicus*	Philadelphia Vireo				S2?B	5 Undetermined	9	52.1 ± 7.0	NS
A	*Spatula clypeata*	Northern Shoveler				S2B	2 May Be At Risk	5	74.7 ± 0.0	NS
A	*Mareca strepera*	Gadwall				S2B	2 May Be At Risk	7	61.2 ± 7.0	NS
A	*Empidonax traillii*	Willow Flycatcher				S2B	3 Sensitive	5	65.6 ± 0.0	NS
A	*Setophaga tigrina*	Cape May Warbler				S2B	3 Sensitive	62	17.6 ± 0.0	NS
A	*Piranga olivacea*	Scarlet Tanager				S2B	5 Undetermined	7	11.1 ± 7.0	NS
A	*Pooecetes gramineus*	Vesper Sparrow				S2B	2 May Be At Risk	11	27.1 ± 7.0	NS
A	*Molothrus ater*	Brown-headed Cowbird				S2B	4 Secure	30	32.0 ± 7.0	NS
A	*Alca torda*	Razorbill				S2B,S4N	3 Sensitive	43	46.3 ± 7.0	NS
A	*Bucephala clangula*	Common Goldeneye				S2B,S5N	4 Secure	99	4.9 ± 7.0	NS
A	*Branta bernicla*	Brant				S2M	3 Sensitive	1	64.3 ± 16.0	NS
A	*Phalacrocorax carbo*	Great Cormorant				S2S3	3 Sensitive	286	30.5 ± 7.0	NS
A	*Asio otus*	Long-eared Owl				S2S3	2 May Be At Risk	21	38.9 ± 7.0	NS
A	*Spinus pinus*	Pine Siskin				S2S3	3 Sensitive	263	4.9 ± 7.0	NS
A	*Cathartes aura*	Turkey Vulture				S2S3B	3 Sensitive	2	89.1 ± 7.0	PE
A	*Rallus limicola*	Virginia Rail				S2S3B	5 Undetermined	6	44.9 ± 7.0	NS
A	*Tringa semipalmata*	Willet				S2S3B	2 May Be At Risk	509	11.1 ± 7.0	NS
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S2S3B	2 May Be At Risk	115	5.1 ± 7.0	NS
A	*Pheucticus ludovicianus*	Rose-breasted Grosbeak				S2S3B	3 Sensitive	147	4.9 ± 7.0	NS
A	*Icterus galbula*	Baltimore Oriole				S2S3B	2 May Be At Risk	6	40.4 ± 7.0	NS
A	*Pinicola enucleator*	Pine Grosbeak				S2S3B,S5N	2 May Be At Risk	161	4.1 ± 0.0	NS
A	*Numenius phaeopus hudsonicus*	Hudsonian Whimbrel				S2S3M	3 Sensitive	92	34.7 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	*Calidris melanotos*	Pectoral Sandpiper				S2S3M	4 Secure	73	53.8 ± 0.0	NS
A	*Phalaropus fulicarius*	Red Phalarope				S2S3M	3 Sensitive	1	77.6 ± 0.0	NS
A	*Perisoreus canadensis*	Canada Jay				S3	3 Sensitive	337	4.1 ± 0.0	NS
A	*Poecile hudsonicus*	Boreal Chickadee				S3	3 Sensitive	679	4.8 ± 0.0	NS
A	*Sitta canadensis*	Red-breasted Nuthatch				S3	4 Secure	499	4.9 ± 7.0	NS
A	*Alosa pseudoharengus*	Alewife				S3	3 Sensitive	43	4.1 ± 0.0	NS
A	*Salvelinus fontinalis*	Brook Trout				S3	3 Sensitive	60	4.6 ± 0.0	NS
A	*Synaptomys cooperi*	Southern Bog Lemming				S3	4 Secure	10	10.1 ± 0.0	NS
A	*Pekania pennanti*	Fisher				S3	3 Sensitive	1	39.6 ± 0.0	NS
A	*Calidris maritima*	Purple Sandpiper				S3?N	3 Sensitive	25	41.5 ± 10.0	NS
A	*Falco sparverius*	American Kestrel				S3B	4 Secure	232	5.1 ± 7.0	NS
A	*Charadrius vociferus*	Killdeer				S3B	3 Sensitive	176	5.1 ± 7.0	NS
A	*Gallinago delicata*	Wilson's Snipe				S3B	3 Sensitive	368	4.9 ± 7.0	NS
A	*Sterna paradisaea*	Arctic Tern				S3B	2 May Be At Risk	101	23.9 ± 0.0	NS
A	*Coccyzus erythropthalmus*	Black-billed Cuckoo				S3B	2 May Be At Risk	21	11.3 ± 7.0	NS
A	*Tyrannus tyrannus*	Eastern Kingbird				S3B	3 Sensitive	71	11.0 ± 7.0	NS
A	*Dumetella carolinensis*	Gray Catbird				S3B	2 May Be At Risk	130	11.0 ± 7.0	NS
A	*Cardellina pusilla*	Wilson's Warbler				S3B	3 Sensitive	87	4.9 ± 7.0	NS
A	*Tringa melanoleuca*	Greater Yellowlegs				S3B,S3S4M	3 Sensitive	462	2.0 ± 0.0	NS
A	*Rissa tridactyla*	Black-legged Kittiwake				S3B,S5N	3 Sensitive	49	72.1 ± 7.0	NS
A	*Fratercula arctica*	Atlantic Puffin				S3B,S5N	3 Sensitive	34	72.3 ± 0.0	NS
A	*Pluvialis squatarola*	Black-bellied Plover				S3M	4 Secure	344	34.7 ± 0.0	NS
A	*Tringa flavipes*	Lesser Yellowlegs				S3M	4 Secure	232	51.2 ± 0.0	NS
A	*Arenaria interpres*	Ruddy Turnstone				S3M	4 Secure	153	40.9 ± 0.0	NS
A	*Calidris pusilla*	Semipalmated Sandpiper				S3M	3 Sensitive	272	34.7 ± 0.0	NS
A	*Calidris fuscicollis*	White-rumped Sandpiper				S3M	4 Secure	157	40.9 ± 0.0	NS
A	*Limnodromus griseus*	Short-billed Dowitcher				S3M	4 Secure	162	53.8 ± 0.0	NS
A	*Calidris alba*	Sanderling				S3M,S2N	4 Secure	175	40.9 ± 0.0	NS
A	*Somateria mollissima*	Common Eider				S3S4	4 Secure	267	36.4 ± 7.0	NS
A	*Picoides arcticus*	Black-backed Woodpecker				S3S4	3 Sensitive	66	20.7 ± 7.0	NS
A	*Loxia curvirostra*	Red Crossbill				S3S4	4 Secure	29	31.0 ± 0.0	NS
A	*Sorex palustris*	American Water Shrew				S3S4	4 Secure	3	81.0 ± 1.0	NS
A	*Botaurus lentiginosus*	American Bittern				S3S4B	3 Sensitive	111	18.2 ± 7.0	NS
A	*Spatula discors*	Blue-winged Teal				S3S4B	2 May Be At Risk	96	4.9 ± 7.0	NS
A	*Actitis macularius*	Spotted Sandpiper				S3S4B	3 Sensitive	605	4.9 ± 7.0	NS
A	*Empidonax flaviventris*	Yellow-bellied Flycatcher				S3S4B	3 Sensitive	600	3.9 ± 0.0	NS
A	*Regulus calendula*	Ruby-crowned Kinglet				S3S4B	3 Sensitive	1484	3.1 ± 0.0	NS
A	*Catharus fuscescens*	Veery				S3S4B	4 Secure	171	3.9 ± 0.0	NS
A	*Catharus ustulatus*	Swainson's Thrush				S3S4B	4 Secure	992	4.9 ± 7.0	NS
A	*Oreothlypis peregrina*	Tennessee Warbler				S3S4B	3 Sensitive	144	8.3 ± 0.0	NS
A	*Setophaga castanea*	Bay-breasted Warbler				S3S4B	3 Sensitive	189	11.3 ± 7.0	NS
A	*Setophaga striata*	Blackpoll Warbler				S3S4B	3 Sensitive	185	11.3 ± 7.0	NS
A	*Passerella iliaca*	Fox Sparrow				S3S4B	4 Secure	261	11.3 ± 7.0	NS
A	*Mergus serrator*	Red-breasted Merganser				S3S4B,S5N	4 Secure	138	11.1 ± 7.0	NS
A	*Bucephala albeola*	Bufflehead				S3S4N	4 Secure	19	59.3 ± 11.0	NS
A	*Eremophila alpestris*	Horned Lark				SHB,S4S5N	4 Secure	2	83.7 ± 7.0	NS
A	*Morus bassanus*	Northern Gannet				SHB,S5M	4 Secure	35	31.1 ± 0.0	NS
A	*Aythya americana*	Redhead				SHB,SNAM	4 Secure	1	95.9 ± 15.0	NS
I	*Danaus plexippus*	Monarch	Endangered	Special Concern	Endangered	S2B	3 Sensitive	17	14.2 ± 0.0	NS
I	*Lampsilis cariosa*	Yellow Lampmussel	Special Concern	Special Concern	Threatened	S1	1 At Risk	37	64.1 ± 0.0	NS
I	*Alasmidonta varicosa*	Brook Floater	Special Concern		Threatened	S1S2	3 Sensitive	4	71.4 ± 0.0	NS
I	*Bombus terricola*	Yellow-banded Bumblebee	Special Concern		Vulnerable	S3	3 Sensitive	3	44.5 ± 0.0	NS
I	*Quedius spelaeus*	Spelean Rove Beetle				S1		1	68.7 ± 1.0	NS
I	*Papilio brevicauda bretonensis*	Short-tailed Swallowtail				S1	1 At Risk	15	33.7 ± 1.0	NS
I	*Somatochlora albicincta*	Ringed Emerald				S1	2 May Be At Risk	7	70.4 ± 0.0	NS
I	*Leucorrhinia patricia*	Canada Whiteface				S1	2 May Be At Risk	1	73.7 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
I	*Coenagrion interrogatum*	Subarctic Bluet				S1	2 May Be At Risk	2	51.1 ± 0.0	NS
I	*Leptodea ochracea*	Tidewater Mucket				S1	3 Sensitive	17	62.8 ± 1.0	NS
I	*Lycaena dorcas*	Dorcas Copper				S1?	6 Not Assessed	24	4.2 ± 0.0	NS
I	*Polygonia satyrus*	Satyr Comma				S1?	3 Sensitive	1	76.4 ± 1.0	NS
I	*Strymon melinus*	Grey Hairstreak				S1S2	4 Secure	1	37.7 ± 0.0	NS
I	*Nymphalis l-album*	Compton Tortoiseshell				S1S2	4 Secure	1	37.6 ± 1.0	NS
I	*Coenagrion resolutum*	Taiga Bluet				S1S2	2 May Be At Risk	1	97.2 ± 1.0	PE
I	*Haematopota rara*	Shy Cleg				S1S3	5 Undetermined	2	51.9 ± 0.0	NS
I	*Lycaena dospassosi*	Salt Marsh Copper				S2	1 At Risk	1	25.8 ± 0.0	NS
I	*Boloria chariclea grandis*	Purple Lesser Fritillary				S2	3 Sensitive	4	38.8 ± 0.0	NS
I	*Aglais milberti milberti*	Milbert's Tortoise Shell				S2	4 Secure	1	33.7 ± 1.0	NS
I	*Somatochlora septentrionalis*	Muskeg Emerald				S2	3 Sensitive	21	32.7 ± 0.0	NS
I	*Somatochlora williamsoni*	Williamson's Emerald				S2	2 May Be At Risk	10	36.5 ± 0.0	NS
I	*Margaritifera margaritifera*	Eastern Pearlshell				S2	3 Sensitive	98	12.4 ± 0.0	NS
I	*Pantala hymenaea*	Spot-Winged Glider				S2?B	3 Sensitive	2	37.9 ± 0.0	NS
I	*Thorybes pylades*	Northern Cloudywing				S2S3	3 Sensitive	6	27.8 ± 0.0	NS
I	*Euphydryas phaeton*	Baltimore Checkerspot				S2S3	4 Secure	9	25.5 ± 1.0	NS
I	*Gomphus descriptus*	Harpoon Clubtail				S2S3	3 Sensitive	16	7.0 ± 0.0	NS
I	*Ophiogomphus aspersus*	Brook Snaketail				S2S3	2 May Be At Risk	5	13.6 ± 0.0	NS
I	*Ophiogomphus mainensis*	Maine Snaketail				S2S3	2 May Be At Risk	1	89.6 ± 0.0	NS
I	*Somatochlora forcipata*	Forcipate Emerald				S2S3	2 May Be At Risk	7	26.0 ± 1.0	NS
I	*Alasmidonta undulata*	Triangle Floater				S2S3	4 Secure	5	47.5 ± 0.0	NS
I	*Iphthiminus opacus*	a Darkling Beetle				S3		1	6.6 ± 0.0	NS
I	*Callophrys henrici*	Henry's Elfin				S3	4 Secure	1	98.2 ± 0.0	NS
I	*Speyeria aphrodite*	Aphrodite Fritillary				S3	4 Secure	2	66.1 ± 1.0	NS
I	*Polygonia faunus*	Green Comma				S3	4 Secure	13	13.2 ± 0.0	NS
I	*Oeneis jutta*	Jutta Arctic				S3	2 May Be At Risk	10	12.3 ± 0.0	NS
I	*Aeshna clepsydra*	Mottled Darner				S3	4 Secure	1	36.3 ± 0.0	NS
I	*Boyeria grafiana*	Ocellated Darner				S3	3 Sensitive	1	75.6 ± 1.0	NS
I	*Gomphaeschna furcillata*	Harlequin Darner				S3	3 Sensitive	3	7.0 ± 0.0	NS
I	*Somatochlora tenebrosa*	Clamp-Tipped Emerald				S3	4 Secure	2	46.7 ± 0.0	NS
I	*Nannothemis bella*	Elfin Skimmer				S3	4 Secure	3	28.5 ± 0.0	NS
I	*Sympetrum danae*	Black Meadowhawk				S3	3 Sensitive	16	25.4 ± 1.0	NS
I	*Enallagma vernale*	Vernal Bluet				S3	5 Undetermined	8	7.0 ± 0.0	NS
I	*Amphiagrion saucium*	Eastern Red Damsel				S3	4 Secure	20	2.3 ± 1.0	NS
I	*Polygonia interrogationis*	Question Mark				S3B	4 Secure	17	33.7 ± 1.0	NS
I	*Erynnis juvenalis*	Juvenal's Duskywing				S3S4	4 Secure	1	75.7 ± 1.0	NS
I	*Polygonia progne*	Grey Comma				S3S4	4 Secure	16	26.0 ± 0.0	NS
I	*Lanthus parvulus*	Northern Pygmy Clubtail				S3S4	4 Secure	22	26.0 ± 1.0	NS
I	*Lampsilis radiata*	Eastern Lampmussel				S3S4	3 Sensitive	15	20.1 ± 0.0	NS
N	*Erioderma pedicellatum (Atlantic pop.)*	Boreal Felt Lichen - Atlantic pop.	Endangered	Endangered	Endangered	S1	1 At Risk	280	10.7 ± 0.0	NS
N	*Pannaria lurida*	Wrinkled Shingle Lichen	Threatened		Threatened	S1S2	2 May Be At Risk	1	46.7 ± 0.0	NS
N	*Sclerophora peronella (Nova Scotia pop.)*	Frosted Glass-whiskers Lichen - Nova Scotia pop.	Special Concern	Special Concern		S1?		5	53.2 ± 0.0	NS
N	*Degelia plumbea*	Blue Felt Lichen	Special Concern	Special Concern	Vulnerable	S3	4 Secure	74	4.6 ± 0.0	NS
N	*Pseudevernia cladonia*	Ghost Antler Lichen	Not At Risk			S2S3	3 Sensitive	1	100.0 ± 0.0	NS
N	*Cladonia brevis*	Short Peg Lichen				S1		1	52.9 ± 0.0	NS
N	*Peltigera lepidophora*	Scaly Pelt Lichen				S1	2 May Be At Risk	2	20.4 ± 0.0	NS
N	*Gowardia nigricans*	Gray Witch's Beard Lichen				S1	6 Not Assessed	1	88.5 ± 1.0	NS
N	*Metacalypogeia schusterana*	Schuster's Pouchwort				S1?	5 Undetermined	1	40.0 ± 0.0	NS
N	*Moerckia hibernica*	Irish Ruffwort				S1?		1	40.0 ± 0.0	NS
N	*Brachythecium erythrorrhizon*	Taiga Ragged Moss				S1?		2	39.8 ± 0.0	NS
N	*Calliergon richardsonii*	Richardson's Spear Moss				S1?		1	92.5 ± 0.0	NS
N	*Conardia compacta*	Coast Creeping Moss				S1?	3 Sensitive	2	20.3 ± 2.0	NS
N	*Entodon concinnus*	Lime Entodon Moss				S1?	3 Sensitive	2	87.2 ± 0.0	NS
N	*Grimmia laevigata*	a Moss				S1?	3 Sensitive	2	81.7 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
N	*Grimmia pilifera*	a Moss				S1?	3 Sensitive	2	87.2 ± 0.0	NS
N	*Hygrohypnum smithii*	Smith's Brook Moss				S1?	3 Sensitive	1	87.4 ± 0.0	NS
N	*Orthothecium strictum*	Shiny Erect-capsule Moss				S1?	3 Sensitive	2	87.2 ± 0.0	NS
N	*Paludella squarrosa*	Tufted Fen Moss				S1?	3 Sensitive	1	33.3 ± 5.0	NS
N	*Timmia norvegica*	a moss				S1?	3 Sensitive	1	95.1 ± 50.0	NS
N	*Syntrichia ruralis*	a Moss				S1?	3 Sensitive	1	62.3 ± 1.0	NS
N	*Ulota curvifolia*	a Moss				S1?	3 Sensitive	1	81.7 ± 0.0	NS
N	*Plagiomnium ellipticum*	Marsh Leafy Moss				S1?	2 May Be At Risk	1	87.0 ± 2.0	NS
N	*Flavocetraria nivalis*	Crinkled Snow Lichen				S1?	3 Sensitive	1	70.0 ± 0.0	NS
N	*Parmeliella parvula*	Poor-man's Shingles Lichen				S1?	2 May Be At Risk	6	55.1 ± 0.0	NS
N	*Buxbaumia minakatae*	Hump-Backed Elves				S1S2	3 Sensitive	1	38.0 ± 100.0	NS
N	*Ctenidium molluscum*	Mollusc Ctenidium moss				S1S2		1	79.8 ± 1.0	NS
N	*Dicranodontium denudatum*	Beaked Bow Moss				S1S2	3 Sensitive	2	87.2 ± 0.0	NS
N	*Dicranoweisia crispula*	Mountain Thatch Moss				S1S2	3 Sensitive	1	78.3 ± 0.0	NS
N	*Didymodon ferrugineus*	a moss				S1S2	3 Sensitive	1	99.7 ± 0.0	NS
N	*Mnium thomsonii*	Thomson's Leafy Moss				S1S2	3 Sensitive	2	99.7 ± 0.0	NS
N	*Plagiobryum zieri*	a Moss				S1S2	3 Sensitive	6	87.2 ± 0.0	NS
N	*Platydictya confervoides*	a Moss				S1S2	3 Sensitive	1	64.2 ± 3.0	NS
N	*Seligeria calcarea*	Chalk Brittle Moss				S1S2	3 Sensitive	2	99.7 ± 0.0	NS
N	*Sphagnum platyphyllum*	Flat-leaved Peat Moss				S1S2		2	14.4 ± 0.0	NS
N	*Hamatocaulis vernicosus*	a Moss				S1S2	3 Sensitive	2	4.4 ± 0.0	NS
N	*Schistidium trichodon*	a Moss				S1S2	3 Sensitive	1	99.7 ± 0.0	NS
N	*Anomodon viticulosus*	a Moss				S2?	3 Sensitive	4	99.7 ± 0.0	NS
N	*Atrichum angustatum*	Lesser Smoothcap Moss				S2?	3 Sensitive	3	43.7 ± 30.0	NS
N	*Campylium polygamum*	a Moss				S2?	5 Undetermined	1	98.2 ± 2.0	NS
N	*Campylium radicale*	Long-stalked Fine Wet Moss				S2?	5 Undetermined	1	8.8 ± 0.0	NS
N	*Dicranum condensatum*	Condensed Broom Moss				S2?	5 Undetermined	1	90.4 ± 0.0	PE
N	*Fontinalis hypnoides*	a moss				S2?	5 Undetermined	2	88.9 ± 1.0	NS
N	*Fontinalis sullivantii*	a Moss				S2?	3 Sensitive	1	38.0 ± 100.0	NS
N	*Grimmia anomala*	Mountain Forest Grimmia				S2?	3 Sensitive	3	55.6 ± 0.0	NS
N	*Orthotrichum anomalum*	Anomalous Bristle Moss				S2?	3 Sensitive	1	81.7 ± 0.0	NS
N	*Philonotis marchica*	a Moss				S2?	5 Undetermined	1	99.9 ± 5.0	NS
N	*Platydictya jungermannioides*	False Willow Moss				S2?	3 Sensitive	2	23.2 ± 0.0	NS
N	*Pseudoleskea patens*	Patent Leskea Moss				S2?	3 Sensitive	2	96.5 ± 0.0	NS
N	*Pseudoleskea stenophylla*	Narrow-leaved Leskea Moss				S2?	3 Sensitive	2	96.6 ± 1.0	NS
N	*Rhytidium rugosum*	Wrinkle-leaved Moss				S2?	3 Sensitive	4	86.2 ± 0.0	NS
N	*Scorpidium scorpioides*	Hooked Scorpion Moss				S2?	3 Sensitive	9	8.9 ± 0.0	NS
N	*Seligeria donniana*	Donian Beardless Moss				S2?	3 Sensitive	3	98.2 ± 2.0	NS
N	*Sematophyllum marylandicum*	a Moss				S2?	3 Sensitive	4	87.0 ± 0.0	NS
N	*Tetraplodon angustatus*	Toothed-leaved Nitrogen Moss				S2?	3 Sensitive	2	91.8 ± 0.0	NS
N	*Tortella fragilis*	Fragile Twisted Moss				S2?	3 Sensitive	6	39.6 ± 0.0	NS
N	*Anomobryum filiforme*	a moss				S2?		5	86.2 ± 0.0	NS
N	*Cyrtomnium hymenophylloides*	Short-pointed Lantern Moss				S2?	3 Sensitive	6	39.2 ± 0.0	NS
N	*Platylomella lescurii*	a Moss				S2?	3 Sensitive	1	87.0 ± 1.0	NS
N	*Nephroma arcticum*	Arctic Kidney Lichen				S2?	2 May Be At Risk	1	38.5 ± 0.0	NS
N	*Peltigera collina*	Tree Pelt Lichen				S2?	3 Sensitive	17	14.5 ± 0.0	NS
N	*Platydictya subtilis*	Bark Willow Moss				S2S3	3 Sensitive	1	96.5 ± 0.0	NS
N	*Tetraplodon mnioides*	Entire-leaved Nitrogen Moss				S2S3	4 Secure	9	87.0 ± 0.0	NS
N	*Limprichtia revolvens*	a Moss				S2S3	3 Sensitive	6	4.2 ± 0.0	NS
N	*Cetraria muricata*	Spiny Heath Lichen				S2S3	5 Undetermined	2	88.5 ± 1.0	NS
N	*Fuscopannaria leucosticta*	Rimmed Shingles Lichen				S2S3	2 May Be At Risk	1	60.7 ± 0.0	NS
N	*Leptogium tenuissimum*	Birdnest Jellyskin Lichen				S2S3	6 Not Assessed	2	20.4 ± 0.0	NS
N	*Racodium rupestre*	Rockhair Lichen				S2S3	5 Undetermined	1	96.0 ± 0.0	NS
N	*Usnea mutabilis*	Bloody Beard Lichen				S2S3	3 Sensitive	1	11.1 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
N	*Collema tenax*	Soil Tarpaper Lichen				S3		2	20.3 ± 0.0	NS
N	*Sticta fuliginosa*	Peppered Moon Lichen				S3	3 Sensitive	3	50.7 ± 0.0	NS
N	*Fuscopannaria ahlneri*	Corrugated Shingles Lichen				S3	4 Secure	36	15.2 ± 0.0	NS
N	*Heterodermia speciosa*	Powdered Fringe Lichen				S3	4 Secure	1	56.8 ± 0.0	NS
N	*Leptogium corticola*	Blistered Jellyskin Lichen				S3	3 Sensitive	1	54.9 ± 0.0	NS
N	*Leptogium lichenoides*	Tattered Jellyskin Lichen				S3	2 May Be At Risk	2	20.4 ± 0.0	NS
N	*Nephroma bellum*	Naked Kidney Lichen				S3	3 Sensitive	1	38.5 ± 0.0	NS
N	*Platismatia norvegica*	Oldgrowth Rag Lichen				S3	4 Secure	128	49.8 ± 0.0	NS
N	*Moelleropsis nebulosa*	Blue-gray Moss Shingle Lichen				S3	4 Secure	10	46.9 ± 0.0	NS
N	*Calliergon giganteum*	Giant Spear Moss				S3?	3 Sensitive	1	14.7 ± 0.0	NS
N	*Drummondia prorepens*	a Moss				S3?	3 Sensitive	5	77.4 ± 2.0	NS
N	*Anomodon tristis*	a Moss				S3?	3 Sensitive	2	77.7 ± 0.0	NS
N	*Mnium stellare*	Star Leafy Moss				S3?	5 Undetermined	2	39.8 ± 0.0	NS
N	*Anomodon rugelii*	Rugel's Anomodon Moss				S3S4	3 Sensitive	1	99.6 ± 0.0	NS
N	*Dicranella varia*	a Moss				S3S4	5 Undetermined	2	15.7 ± 0.0	NS
N	*Dicranum leioneuron*	a Dicranum Moss				S3S4	4 Secure	7	87.0 ± 0.0	NS
N	*Encalypta procera*	Slender Extinguisher Moss				S3S4	4 Secure	5	37.9 ± 0.0	NS
N	*Myurella julacea*	Small Mouse-tail Moss				S3S4	3 Sensitive	2	87.2 ± 0.0	NS
N	*Sphagnum lindbergii*	Lindberg's Peat Moss				S3S4	4 Secure	1	97.7 ± 0.0	NS
N	*Splachnum ampullaceum*	Cruet Dung Moss				S3S4	4 Secure	2	91.8 ± 0.0	NS
N	*Thamnobryum alleghaniense*	a Moss				S3S4	3 Sensitive	3	79.8 ± 1.0	NS
N	*Schistidium agassizii*	Elf Bloom Moss				S3S4	4 Secure	4	78.3 ± 0.0	NS
N	*Hylocomiastrum pyrenaicum*	a Feather Moss				S3S4	3 Sensitive	1	25.7 ± 3.0	NS
N	*Arctoparmelia incurva*	Finger Ring Lichen				S3S4	4 Secure	3	88.5 ± 1.0	NS
N	*Hypogymnia vittata*	Slender Monk's Hood Lichen				S3S4	4 Secure	92	49.1 ± 0.0	NS
N	*Cladonia floerkeana*	Gritty British Soldiers Lichen				S3S4	5 Undetermined	3	56.6 ± 0.0	NS
N	*Leptogium acadiense*	Acadian Jellyskin Lichen				S3S4		1	52.3 ± 0.0	NS
N	*Coccocarpia palmicola*	Salted Shell Lichen				S3S4	4 Secure	316	38.4 ± 0.0	NS
N	*Anaptychia palmulata*	Shaggy Fringed Lichen				S3S4	4 Secure	5	79.6 ± 0.0	NS
N	*Heterodermia neglecta*	Fringe Lichen				S3S4	4 Secure	8	13.7 ± 2.0	NS
P	*Juncus caesariensis*	New Jersey Rush	Special Concern	Special Concern	Vulnerable	S2	3 Sensitive	239	49.5 ± 5.0	NS
P	*Isoetes prototypus*	Prototype Quillwort	Special Concern	Special Concern	Vulnerable	S2	3 Sensitive	13	67.7 ± 0.0	NS
P	*Floerkea proserpinacoides*	False Mermaidweed	Not At Risk			S2	3 Sensitive	21	18.7 ± 1.0	NS
P	*Salix candida*	Sage Willow			Endangered	S1	2 May Be At Risk	42	24.6 ± 0.0	NS
P	*Thuja occidentalis*	Eastern White Cedar			Vulnerable	S1	1 At Risk	5	78.4 ± 7.0	NS
P	*Acer saccharinum*	Silver Maple				S1	5 Undetermined	1	73.3 ± 0.0	NS
P	*Sanicula odorata*	Clustered Sanicle				S1	2 May Be At Risk	6	20.8 ± 3.0	NS
P	*Zizia aurea*	Golden Alexanders				S1	2 May Be At Risk	7	68.7 ± 1.0	NS
P	*Arnica lonchophylla*	Northern Arnica				S1	2 May Be At Risk	10	36.4 ± 7.0	NS
P	*Bidens hyperborea*	Estuary Beggarticks				S1	2 May Be At Risk	3	44.9 ± 7.0	NS
P	*Nabalus racemosus*	Glaucous Rattlesnakeroot				S1	2 May Be At Risk	1	77.1 ± 3.0	NS
P	*Ageratina altissima*	White Snakeroot				S1	2 May Be At Risk	2	67.8 ± 1.0	NS
P	*Betula glandulosa*	Glandular Birch				S1	2 May Be At Risk	5	84.9 ± 7.0	NS
P	*Cardamine dentata*	Toothed Bittercress				S1	2 May Be At Risk	5	12.1 ± 0.0	NS
P	*Cochlearia tridactylites*	Limestone Scurvy-grass				S1	2 May Be At Risk	4	80.5 ± 0.0	NS
P	*Draba glabella*	Rock Whitlow-Grass				S1	2 May Be At Risk	3	81.7 ± 0.0	NS
P	*Draba norvegica*	Norwegian Whitlow-Grass				S1	2 May Be At Risk	7	55.3 ± 2.0	NS
P	*Stellaria crassifolia*	Fleshy Stitchwort				S1	2 May Be At Risk	2	5.7 ± 2.0	NS
P	*Hudsonia tomentosa*	Woolly Beach-heath				S1	2 May Be At Risk	7	62.7 ± 1.0	NS
P	*Diapensia lapponica*	Diapensia				S1	2 May Be At Risk	1	79.8 ± 0.0	NS
P	*Pinguicula vulgaris*	Common Butterwort				S1	2 May Be At Risk	6	79.8 ± 0.0	NS
P	*Utricularia ochroleuca*	Yellowish-white Bladderwort				S1	5 Undetermined	1	64.5 ± 1.0	NS
P	*Oxyria digyna*	Mountain Sorrel				S1	2 May Be At Risk	8	96.8 ± 0.0	NS
P	*Bistorta vivipara*	Alpine Bistort				S1	2 May Be At Risk	1	37.9 ± 1.0	NS
P	*Montia fontana*	Water Blinks				S1	2 May Be At Risk	2	41.2 ± 1.0	NS
P	*Anemone multifida*	Cut-leaved Anemone				S1	2 May Be At Risk	4	80.9 ± 1.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	*Potentilla litoralis*	Coastal Cinquefoil				S1	0.1 Extirpated	4	86.0 ± 1.0	NS
P	*Salix vestita*	Hairy Willow				S1	2 May Be At Risk	1	87.4 ± 0.0	NS
P	*Saxifraga aizoides*	Yellow Mountain Saxifrage				S1	2 May Be At Risk	8	87.4 ± 0.0	NS
P	*Saxifraga oppositifolia*	Purple Mountain Saxifrage				S1	2 May Be At Risk	2	86.7 ± 1.0	NS
P	*Agalinis purpurea var. parviflora*	Small-flowered Purple False Foxglove				S1		1	9.0 ± 0.0	NS
P	*Scrophularia lanceolata*	Lance-leaved Figwort				S1	5 Undetermined	2	38.7 ± 1.0	NS
P	*Carex alopecoidea*	Foxtail Sedge				S1	2 May Be At Risk	2	61.8 ± 0.0	NS
P	*Carex granularis*	Limestone Meadow Sedge				S1	2 May Be At Risk	21	8.6 ± 0.0	NS
P	*Carex gynocrates*	Northern Bog Sedge				S1	2 May Be At Risk	16	4.4 ± 0.0	NS
P	*Carex haydenii*	Hayden's Sedge				S1	2 May Be At Risk	3	7.7 ± 0.0	NS
P	*Carex rariflora*	Loose-flowered Alpine Sedge				S1	2 May Be At Risk	1	89.9 ± 5.0	NS
P	*Carex tenuiflora*	Sparse-Flowered Sedge				S1	2 May Be At Risk	3	51.3 ± 0.0	NS
P	*Carex tincta*	Tinged Sedge				S1	2 May Be At Risk	1	61.8 ± 1.0	NS
P	*Carex viridula var. elatior*	Greenish Sedge				S1	2 May Be At Risk	54	3.6 ± 0.0	NS
P	*Carex grisea*	Inflated Narrow-leaved Sedge				S1	2 May Be At Risk	6	72.3 ± 0.0	NS
P	*Carex saxatilis*	Russet Sedge				S1	2 May Be At Risk	1	98.5 ± 7.0	NS
P	*Cyperus lupulinus*	Hop Flatsedge				S1	2 May Be At Risk	5	62.0 ± 0.0	NS
P	*Cyperus lupulinus ssp. macilentus*	Hop Flatsedge				S1	2 May Be At Risk	8	62.7 ± 1.0	NS
P	*Eleocharis erythropoda*	Red-stemmed Spikerush				S1	2 May Be At Risk	6	7.3 ± 0.0	NS
P	*Rhynchospora capillacea*	Slender Beakrush				S1	2 May Be At Risk	8	11.1 ± 10.0	NS
P	*Blysmopsis rufa*	Red Bulrush				S1	2 May Be At Risk	1	73.0 ± 1.0	NS
P	*Iris prismatica*	Slender Blue Flag				S1	2 May Be At Risk	2	28.7 ± 0.0	NS
P	*Triantha glutinosa*	Sticky False-Asphodel				S1	2 May Be At Risk	15	24.5 ± 0.0	NS
P	*Malaxis monophyllos*	White Adder's-mouth				S1	2 May Be At Risk	1	54.2 ± 7.0	NS
P	*Bromus latiglumis*	Broad-Glumed Brome				S1	2 May Be At Risk	11	27.7 ± 0.0	NS
P	*Elymus wiegandii*	Wiegand's Wild Rye				S1	2 May Be At Risk	9	28.0 ± 0.0	NS
P	*Elymus hystrix*	Spreading Wild Rye				S1	2 May Be At Risk	1	96.4 ± 4.0	NS
P	*Hordeum brachyantherum*	Meadow Barley				S1	2 May Be At Risk	1	61.9 ± 0.0	NS
P	*Phleum alpinum*	Alpine Timothy				S1	2 May Be At Risk	7	60.3 ± 0.0	NS
P	*Torreyochloa pallida var. pallida*	Pale False Manna Grass				S1	0.1 Extirpated	2	74.0 ± 1.0	NS
P	*Graphephorum melicoides*	Purple False Oats				S1	2 May Be At Risk	4	49.1 ± 0.0	NS
P	*Sparganium androcladum*	Branching Bur-Reed				S1	2 May Be At Risk	2	22.5 ± 0.0	NS
P	*Equisetum palustre*	Marsh Horsetail				S1	2 May Be At Risk	8	26.3 ± 0.0	NS
P	*Botrychium lunaria*	Common Moonwort				S1	2 May Be At Risk	2	65.7 ± 1.0	NS
P	*Epilobium lactiflorum*	White-flowered Willowherb				S1?	2 May Be At Risk	1	96.0 ± 5.0	NS
P	*Bolboschoenus robustus*	Sturdy Bulrush				S1?	5 Undetermined	2	33.1 ± 5.0	NS
P	*Dichanthelium lindheimeri*	Lindheimer's Panicgrass				S1?	5 Undetermined	1	97.4 ± 1.0	NS
P	*Huperzia selago*	Northern Firmoss				S1?	2 May Be At Risk	1	72.0 ± 2.0	NS
P	*Fraxinus nigra*	Black Ash			Threatened	S1S2	1 At Risk	95	2.4 ± 0.0	NS
P	*Rudbeckia laciniata*	Cut-Leaved Coneflower				S1S2	2 May Be At Risk	1	69.6 ± 7.0	NS
P	*Arabis pycnocarpa*	Cream-flowered Rockcress				S1S2	2 May Be At Risk	7	65.7 ± 4.0	NS
P	*Cornus suecica*	Swedish Bunchberry				S1S2	3 Sensitive	21	70.3 ± 6.0	NS
P	*Anemone virginiana var. alba*	Virginia Anemone				S1S2	3 Sensitive	8	14.2 ± 1.0	NS
P	*Ranunculus sceleratus*	Cursed Buttercup				S1S2	2 May Be At Risk	3	34.9 ± 7.0	NS
P	*Parnassia parviflora*	Small-flowered Grass-of-Parnassus				S1S2	2 May Be At Risk	16	29.9 ± 1.0	NS
P	*Carex livida*	Livid Sedge				S1S2	2 May Be At Risk	27	42.3 ± 5.0	NS
P	*Juncus greenei*	Greene's Rush				S1S2	2 May Be At Risk	1	62.7 ± 1.0	NS
P	*Juncus alpinoarticulatus ssp. Rariflorus*					S1S2	2 May Be At Risk	13	13.3 ± 5.0	NS
P	*Juncus bulbosus*	Bulbous Rush				S1S2	5 Undetermined	12	82.5 ± 0.0	NS
P	*Platanthera huronensis*	Fragrant Green Orchid				S1S2	5 Undetermined	5	4.6 ± 0.0	NS
P	*Calamagrostis stricta ssp.*	Slim-stemmed Reed Grass				S1S2	3 Sensitive	2	33.5 ± 1.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
	stricta									
P	*Cinna arundinacea*	Sweet Wood Reed Grass				S1S2	2 May Be At Risk	24	25.7 ± 0.0	NS
P	*Festuca prolifera*	Proliferous Fescue				S1S2	3 Sensitive	6	78.3 ± 1.0	NS
P	*Sparganium hyperboreum*	Northern Burreed				S1S2	3 Sensitive	13	24.7 ± 1.0	NS
P	*Cryptogramma stelleri*	Steller's Rockbrake				S1S2	2 May Be At Risk	17	5.6 ± 0.0	NS
P	*Woodsia alpina*	Alpine Cliff Fern				S1S2	2 May Be At Risk	8	67.3 ± 2.0	NS
P	*Selaginella selaginoides*	Low Spikemoss				S1S2	2 May Be At Risk	5	45.8 ± 0.0	NS
P	*Carex vacillans*	Estuarine Sedge				S1S3	5 Undetermined	2	61.8 ± 0.0	NS
P	*Conioselinum chinense*	Chinese Hemlock-parsley				S2	3 Sensitive	2	87.0 ± 0.0	NS
P	*Osmorhiza longistylis*	Smooth Sweet Cicely				S2	2 May Be At Risk	21	2.4 ± 10.0	NS
P	*Erigeron philadelphicus*	Philadelphia Fleabane				S2	3 Sensitive	8	11.1 ± 7.0	NS
P	*Solidago multiradiata*	Multi-rayed Goldenrod				S2	2 May Be At Risk	10	70.9 ± 2.0	NS
P	*Symphyotrichum ciliolatum*	Fringed Blue Aster				S2	3 Sensitive	2	55.8 ± 7.0	NS
P	*Impatiens pallida*	Pale Jewelweed				S2	3 Sensitive	10	4.9 ± 7.0	NS
P	*Caulophyllum thalictroides*	Blue Cohosh				S2	2 May Be At Risk	19	12.8 ± 0.0	NS
P	*Boechera stricta*	Drummond's Rockcress				S2	3 Sensitive	6	57.2 ± 0.0	NS
P	*Cardamine parviflora*	Small-flowered Bittercress				S2	3 Sensitive	9	67.0 ± 1.0	NS
P	*Draba arabisans*	Rock Whitlow-Grass				S2	3 Sensitive	14	10.2 ± 1.0	NS
P	*Lobelia kalmii*	Brook Lobelia				S2	2 May Be At Risk	95	3.7 ± 0.0	NS
P	*Stellaria humifusa*	Saltmarsh Starwort				S2	3 Sensitive	4	88.9 ± 1.0	PE
P	*Stellaria longifolia*	Long-leaved Starwort				S2	3 Sensitive	1	27.7 ± 0.0	NS
P	*Oxybasis rubra*	Red Goosefoot				S2	2 May Be At Risk	3	48.6 ± 2.0	NS
P	*Hudsonia ericoides*	Pinebarren Golden Heather				S2	3 Sensitive	11	87.2 ± 0.0	PE
P	*Hypericum majus*	Large St John's-wort				S2	3 Sensitive	2	21.5 ± 1.0	NS
P	*Crassula aquatica*	Water Pygmyweed				S2	3 Sensitive	6	40.3 ± 7.0	NS
P	*Oxytropis campestris var. johannensis*	Field Locoweed				S2	2 May Be At Risk	5	81.7 ± 0.0	NS
P	*Myriophyllum farwellii*	Farwell's Water Milfoil				S2	3 Sensitive	2	46.2 ± 7.0	NS
P	*Myriophyllum verticillatum*	Whorled Water Milfoil				S2	3 Sensitive	6	13.9 ± 0.0	NS
P	*Utricularia resupinata*	Inverted Bladderwort				S2	3 Sensitive	1	49.8 ± 0.0	NS
P	*Oenothera fruticosa ssp. tetragona*	Narrow-leaved Evening Primrose				S2	5 Undetermined	1	28.8 ± 1.0	NS
P	*Rumex triangulivalvis*	Triangular-valve Dock				S2	3 Sensitive	10	4.9 ± 7.0	NS
P	*Primula mistassinica*	Mistassini Primrose				S2	3 Sensitive	10	78.2 ± 1.0	NS
P	*Anemonastrum canadense*	Canada Anemone				S2	2 May Be At Risk	10	43.2 ± 3.0	NS
P	*Anemone quinquefolia*	Wood Anemone				S2	3 Sensitive	4	28.9 ± 1.0	NS
P	*Anemone virginiana*	Virginia Anemone				S2	3 Sensitive	23	19.0 ± 0.0	NS
P	*Caltha palustris*	Yellow Marsh Marigold				S2	3 Sensitive	33	27.4 ± 0.0	NS
P	*Galium labradoricum*	Labrador Bedstraw				S2	3 Sensitive	93	6.0 ± 0.0	NS
P	*Salix pedicellaris*	Bog Willow				S2	3 Sensitive	12	10.0 ± 0.0	NS
P	*Comandra umbellata*	Bastard's Toadflax				S2	2 May Be At Risk	28	20.5 ± 7.0	NS
P	*Saxifraga paniculata ssp. Laestadii*	Laestadius' Saxifrage				S2	3 Sensitive	16	11.3 ± 7.0	NS
P	*Viola nephrophylla*	Northern Bog Violet				S2	3 Sensitive	11	7.9 ± 0.0	NS
P	*Carex bebbii*	Bebb's Sedge				S2	3 Sensitive	30	4.9 ± 0.0	NS
P	*Carex capillaris*	Hairlike Sedge				S2	3 Sensitive	14	79.6 ± 1.0	NS
P	*Carex castanea*	Chestnut Sedge				S2	2 May Be At Risk	24	3.9 ± 0.0	NS
P	*Carex comosa*	Bearded Sedge				S2	3 Sensitive	1	37.1 ± 1.0	NS
P	*Carex hystericina*	Porcupine Sedge				S2	2 May Be At Risk	37	11.3 ± 5.0	NS
P	*Carex scirpoidea*	Scirpuslike Sedge				S2	3 Sensitive	13	57.8 ± 4.0	NS
P	*Carex tenera*	Tender Sedge				S2	3 Sensitive	3	47.9 ± 1.0	NS
P	*Carex tuckermanii*	Tuckerman's Sedge				S2	3 Sensitive	2	36.7 ± 0.0	NS
P	*Carex atratiformis*	Scabrous Black Sedge				S2	3 Sensitive	18	4.9 ± 7.0	NS
P	*Eleocharis quinqueflora*	Few-flowered Spikerush				S2	3 Sensitive	30	7.7 ± 0.0	NS
P	*Vallisneria americana*	Wild Celery				S2	2 May Be At Risk	2	63.7 ± 10.0	NS
P	*Juncus stygius ssp. americanus*	Moor Rush				S2	3 Sensitive	35	36.4 ± 7.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	*Allium schoenoprasum*	Wild Chives				S2	2 May Be At Risk	1	73.5 ± 0.0	NS
P	*Allium schoenoprasum var. sibiricum*	Wild Chives				S2	2 May Be At Risk	8	46.1 ± 7.0	NS
P	*Lilium canadense*	Canada Lily				S2	2 May Be At Risk	21	3.0 ± 1.0	NS
P	*Cypripedium parviflorum var. pubescens*	Yellow Lady's-slipper				S2	3 Sensitive	11	8.1 ± 0.0	NS
P	*Cypripedium parviflorum var. makasin*	Small Yellow Lady's-Slipper				S2	3 Sensitive	18	13.3 ± 0.0	NS
P	*Cypripedium reginae*	Showy Lady's-Slipper				S2	2 May Be At Risk	360	3.6 ± 0.0	NS
P	*Spiranthes lucida*	Shining Ladies'-Tresses				S2	2 May Be At Risk	26	18.9 ± 0.0	NS
P	*Calamagrostis stricta*	Slim-stemmed Reed Grass				S2	3 Sensitive	5	88.7 ± 0.0	PE
P	*Piptatheropsis canadensis*	Canada Ricegrass				S2	3 Sensitive	1	73.7 ± 0.0	NS
P	*Piptatheropsis pungens*	Slender Ricegrass				S2	3 Sensitive	1	90.2 ± 10.0	NS
P	*Potamogeton friesii*	Fries' Pondweed				S2	2 May Be At Risk	8	25.1 ± 7.0	NS
P	*Potamogeton richardsonii*	Richardson's Pondweed				S2	2 May Be At Risk	9	11.5 ± 0.0	NS
P	*Cystopteris laurentiana*	Laurentian Bladder Fern				S2	2 May Be At Risk	23	4.9 ± 10.0	NS
P	*Dryopteris fragrans*	Fragrant Wood Fern				S2	3 Sensitive	11	49.4 ± 7.0	NS
P	*Polystichum lonchitis*	Northern Holly Fern				S2	3 Sensitive	16	6.2 ± 1.0	NS
P	*Woodsia glabella*	Smooth Cliff Fern				S2	3 Sensitive	20	4.9 ± 7.0	NS
P	*Symphyotrichum boreale*	Boreal Aster				S2?	3 Sensitive	59	3.7 ± 0.0	NS
P	*Cuscuta cephalanthi*	Buttonbush Dodder				S2?	5 Undetermined	3	61.2 ± 7.0	NS
P	*Epilobium coloratum*	Purple-veined Willowherb				S2?	3 Sensitive	2	68.2 ± 0.0	NS
P	*Rumex persicarioides*	Peach-leaved Dock				S2?	2 May Be At Risk	1	22.5 ± 0.0	NS
P	*Crataegus submollis*	Quebec Hawthorn				S2?	5 Undetermined	2	87.5 ± 7.0	NS
P	*Eleocharis ovata*	Ovate Spikerush				S2?	3 Sensitive	2	71.2 ± 0.0	NS
P	*Scirpus pedicellatus*	Stalked Bulrush				S2?	3 Sensitive	4	27.1 ± 0.0	NS
P	*Hieracium robinsonii*	Robinson's Hawkweed				S2S3	3 Sensitive	38	54.5 ± 1.0	NS
P	*Iva frutescens*	Big-leaved Marsh-elder				S2S3	3 Sensitive	1	95.8 ± 4.0	NS
P	*Senecio pseudoarnica*	Seabeach Ragwort				S2S3	3 Sensitive	14	39.4 ± 0.0	NS
P	*Betula michauxii*	Michaux's Dwarf Birch				S2S3	3 Sensitive	3	92.0 ± 0.0	NS
P	*Sagina nodosa*	Knotted Pearlwort				S2S3	4 Secure	1	68.8 ± 5.0	NS
P	*Sagina nodosa ssp. borealis*	Knotted Pearlwort				S2S3	4 Secure	1	89.1 ± 5.0	PE
P	*Hypericum x dissimulatum*	Disguised St. John's-wort				S2S3	3 Sensitive	2	53.9 ± 2.0	NS
P	*Triosteum aurantiacum*	Orange-fruited Tinker's Weed				S2S3	3 Sensitive	123	2.3 ± 1.0	NS
P	*Shepherdia canadensis*	Soapberry				S2S3	3 Sensitive	139	26.8 ± 0.0	NS
P	*Empetrum atropurpureum*	Purple Crowberry				S2S3	3 Sensitive	7	69.0 ± 3.0	NS
P	*Euphorbia polygonifolia*	Seaside Spurge				S2S3	3 Sensitive	13	24.7 ± 1.0	NS
P	*Halenia deflexa*	Spurred Gentian				S2S3	3 Sensitive	38	12.1 ± 0.0	NS
P	*Hedeoma pulegioides*	American False Pennyroyal				S2S3	3 Sensitive	2	73.5 ± 1.0	NS
P	*Polygonum aviculare ssp. buxiforme*	Box Knotweed				S2S3	5 Undetermined	1	54.9 ± 7.0	NS
P	*Polygonum oxyspermum ssp. raii*	Ray's Knotweed				S2S3	5 Undetermined	16	11.4 ± 5.0	NS
P	*Amelanchier fernaldii*	Fernald's Serviceberry				S2S3	5 Undetermined	7	29.2 ± 1.0	NS
P	*Potentilla canadensis*	Canada Cinquefoil				S2S3	3 Sensitive	1	46.1 ± 2.0	NS
P	*Galium aparine*	Common Bedstraw				S2S3	3 Sensitive	1	72.4 ± 0.0	NS
P	*Salix pellita*	Satiny Willow				S2S3	3 Sensitive	5	19.6 ± 2.0	NS
P	*Carex adusta*	Lesser Brown Sedge				S2S3	3 Sensitive	1	98.5 ± 7.0	NS
P	*Carex hirtifolia*	Pubescent Sedge				S2S3	3 Sensitive	9	23.6 ± 0.0	NS
P	*Eleocharis flavescens*	Pale Spikerush				S2S3	3 Sensitive	3	76.1 ± 5.0	NS
P	*Eriophorum gracile*	Slender Cottongrass				S2S3	3 Sensitive	8	9.7 ± 0.0	NS
P	*Oreojuncus trifidus*	Highland Rush				S2S3	3 Sensitive	16	15.2 ± 0.0	NS
P	*Coeloglossum viride*	Long-bracted Frog Orchid				S2S3	2 May Be At Risk	6	96.8 ± 1.0	NS
P	*Cypripedium parviflorum*	Yellow Lady's-slipper				S2S3	3 Sensitive	97	3.8 ± 0.0	NS
P	*Poa glauca*	Glaucous Blue Grass				S2S3	3 Sensitive	19	5.6 ± 0.0	NS
P	*Stuckenia filiformis*	Thread-leaved Pondweed				S2S3	3 Sensitive	46	11.0 ± 7.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	*Botrychium lanceolatum ssp. angustisegmentum*	Narrow Triangle Moonwort				S2S3	3 Sensitive	9	4.9 ± 7.0	NS
P	*Botrychium simplex*	Least Moonwort				S2S3	3 Sensitive	6	16.9 ± 5.0	NS
P	*Ophioglossum pusillum*	Northern Adder's-tongue				S2S3	3 Sensitive	1	60.9 ± 5.0	NS
P	*Angelica atropurpurea*	Purple-stemmed Angelica				S3	4 Secure	29	25.4 ± 0.0	NS
P	*Erigeron hyssopifolius*	Hyssop-leaved Fleabane				S3	3 Sensitive	95	13.3 ± 0.0	NS
P	*Bidens beckii*	Water Beggarticks				S3	4 Secure	9	19.8 ± 0.0	NS
P	*Packera paupercula*	Balsam Groundsel				S3	4 Secure	142	13.3 ± 0.0	NS
P	*Betula pumila var. pumila*	Bog Birch				S3	3 Sensitive	12	18.0 ± 7.0	NS
P	*Betula pumila*	Bog Birch				S3	3 Sensitive	25	9.4 ± 0.0	NS
P	*Campanula aparinoides*	Marsh Bellflower				S3	3 Sensitive	4	2.8 ± 5.0	NS
P	*Mononeuria groenlandica*	Greenland Stitchwort				S3	3 Sensitive	1	86.9 ± 0.0	NS
P	*Viburnum edule*	Squashberry				S3	3 Sensitive	59	55.8 ± 7.0	NS
P	*Empetrum eamesii*	Pink Crowberry				S3	3 Sensitive	16	46.6 ± 0.0	NS
P	*Vaccinium boreale*	Northern Blueberry				S3	3 Sensitive	44	11.3 ± 7.0	NS
P	*Vaccinium cespitosum*	dwarf bilberry				S3	4 Secure	28	45.9 ± 7.0	NS
P	*Vaccinium uliginosum*	Alpine Bilberry				S3	3 Sensitive	16	67.4 ± 0.0	NS
P	*Bartonia virginica*	Yellow Bartonia				S3	4 Secure	1	37.4 ± 0.0	NS
P	*Proserpinaca palustris*	Marsh Mermaidweed				S3	4 Secure	49	4.4 ± 0.0	NS
P	*Teucrium canadense*	Canada Germander				S3	3 Sensitive	55	1.4 ± 0.0	NS
P	*Decodon verticillatus*	Swamp Loosestrife				S3	4 Secure	4	14.9 ± 7.0	NS
P	*Epilobium hornemannii*	Hornemann's Willowherb				S3	4 Secure	24	37.5 ± 2.0	NS
P	*Epilobium strictum*	Downy Willowherb				S3	3 Sensitive	20	6.0 ± 0.0	NS
P	*Polygala sanguinea*	Blood Milkwort				S3	3 Sensitive	1	67.9 ± 7.0	NS
P	*Persicaria pensylvanica*	Pennsylvania Smartweed				S3	4 Secure	10	2.4 ± 3.0	NS
P	*Fallopia scandens*	Climbing False Buckwheat				S3	3 Sensitive	12	26.3 ± 0.0	NS
P	*Plantago rugelii*	Rugel's Plantain				S3	4 Secure	1	8.4 ± 0.0	NS
P	*Primula laurentiana*	Laurentian Primrose				S3	4 Secure	1	49.1 ± 7.0	NS
P	*Samolus parviflorus*	Seaside Brookweed				S3	3 Sensitive	16	11.4 ± 0.0	NS
P	*Pyrola asarifolia*	Pink Pyrola				S3	4 Secure	28	11.0 ± 0.0	NS
P	*Pyrola minor*	Lesser Pyrola				S3	3 Sensitive	18	6.0 ± 2.0	NS
P	*Ranunculus gmelinii*	Gmelin's Water Buttercup				S3	4 Secure	96	6.1 ± 0.0	NS
P	*Endotropis alnifolia*	alder-leaved buckthorn				S3	4 Secure	459	3.6 ± 0.0	NS
P	*Agrimonia gryposepala*	Hooked Agrimony				S3	4 Secure	220	3.8 ± 0.0	NS
P	*Amelanchier spicata*	Running Serviceberry				S3	4 Secure	6	44.3 ± 0.0	NS
P	*Galium kamtschaticum*	Northern Wild Licorice				S3	4 Secure	46	10.8 ± 1.0	NS
P	*Geocaulon lividum*	Northern Comandra				S3	4 Secure	18	44.7 ± 2.0	NS
P	*Limosella australis*	Southern Mudwort				S3	4 Secure	9	46.9 ± 5.0	NS
P	*Lindernia dubia*	Yellow-seeded False Pimperel				S3	4 Secure	2	28.0 ± 0.0	NS
P	*Laportea canadensis*	Canada Wood Nettle				S3	3 Sensitive	17	20.9 ± 2.0	NS
P	*Verbena hastata*	Blue Vervain				S3	4 Secure	20	2.4 ± 0.0	NS
P	*Carex cryptolepis*	Hidden-scaled Sedge				S3	4 Secure	17	10.0 ± 5.0	NS
P	*Carex eburnea*	Bristle-leaved Sedge				S3	3 Sensitive	164	12.7 ± 0.0	NS
P	*Carex lupulina*	Hop Sedge				S3	4 Secure	7	68.2 ± 0.0	NS
P	*Carex rosea*	Rosy Sedge				S3	4 Secure	4	28.7 ± 2.0	NS
P	*Carex tribuloides*	Blunt Broom Sedge				S3	4 Secure	9	25.2 ± 0.0	NS
P	*Carex wiegandii*	Wiegand's Sedge				S3	3 Sensitive	47	11.6 ± 0.0	NS
P	*Carex foenea*	Fernald's Hay Sedge				S3	4 Secure	4	93.3 ± 0.0	NS
P	*Elodea canadensis*	Canada Waterweed				S3	4 Secure	8	24.2 ± 0.0	NS
P	*Juncus subcaudatus*	Woods-Rush				S3	3 Sensitive	9	50.0 ± 0.0	NS
P	*Juncus dudleyi*	Dudley's Rush				S3	4 Secure	63	7.9 ± 0.0	NS
P	*Goodyera oblongifolia*	Menzies' Rattlesnake-plantain				S3	3 Sensitive	24	34.9 ± 7.0	NS
P	*Goodyera repens*	Lesser Rattlesnake-plantain				S3	3 Sensitive	32	8.7 ± 0.0	NS
P	*Neottia bifolia*	Southern Twayblade				S3	4 Secure	51	4.9 ± 7.0	NS
P	*Platanthera grandiflora*	Large Purple Fringed Orchid				S3	4 Secure	23	2.8 ± 5.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	*Platanthera hookeri*	Hooker's Orchid				S3	4 Secure	3	7.8 ± 0.0	NS
P	*Platanthera orbiculata*	Small Round-leaved Orchid				S3	4 Secure	14	12.4 ± 0.0	NS
P	*Spiranthes ochroleuca*	Yellow Ladies'-tresses				S3	4 Secure	6	4.8 ± 0.0	NS
P	*Alopecurus aequalis*	Short-awned Foxtail				S3	4 Secure	19	26.3 ± 0.0	NS
P	*Potamogeton obtusifolius*	Blunt-leaved Pondweed				S3	4 Secure	23	12.3 ± 1.0	NS
P	*Potamogeton praelongus*	White-stemmed Pondweed				S3	3 Sensitive	17	14.2 ± 0.0	NS
P	*Potamogeton zosteriformis*	Flat-stemmed Pondweed				S3	3 Sensitive	12	14.9 ± 7.0	NS
P	*Sparganium natans*	Small Burreed				S3	4 Secure	18	6.0 ± 0.0	NS
P	*Asplenium trichomanes*	Maidenhair Spleenwort				S3	4 Secure	25	11.0 ± 0.0	NS
P	*Asplenium viride*	Green Spleenwort				S3	3 Sensitive	35	5.6 ± 0.0	NS
P	*Equisetum pratense*	Meadow Horsetail				S3	3 Sensitive	22	13.7 ± 0.0	NS
P	*Equisetum variegatum*	Variegated Horsetail				S3	4 Secure	38	10.0 ± 0.0	NS
P	*Isoetes acadiensis*	Acadian Quillwort				S3	3 Sensitive	9	66.0 ± 1.0	NS
P	*Diphasiastrum sitchense*	Sitka Ground-cedar				S3	4 Secure	10	31.9 ± 5.0	NS
P	*Huperzia appressa*	Mountain Firmoss				S3	3 Sensitive	22	20.2 ± 1.0	NS
P	*Sceptridium dissectum*	Dissected Moonwort				S3	4 Secure	4	60.9 ± 5.0	NS
P	*Polypodium appalachianum*	Appalachian Polypody				S3	5 Undetermined	5	7.4 ± 0.0	NS
P	*Asclepias incarnata ssp. pulchra*	Swamp Milkweed				S3?	5 Undetermined	57	2.8 ± 1.0	NS
P	*Diphasiastrum x sabinifolium*	Savin-leaved Ground-cedar				S3?	4 Secure	10	10.3 ± 1.0	NS
P	*Atriplex glabriuscula var. franktonii*	Frankton's Saltbush				S3S4	4 Secure	9	29.4 ± 2.0	NS
P	*Suaeda calceoliformis*	Horned Sea-blite				S3S4	4 Secure	4	49.2 ± 1.0	NS
P	*Myriophyllum sibiricum*	Siberian Water Milfoil				S3S4	4 Secure	17	14.2 ± 0.0	NS
P	*Sanguinaria canadensis*	Bloodroot				S3S4	4 Secure	148	7.6 ± 0.0	NS
P	*Polygonum fowleri*	Fowler's Knotweed				S3S4	4 Secure	1	69.1 ± 0.0	NS
P	*Rumex fueginus*	Tierra del Fuego Dock				S3S4	4 Secure	2	89.0 ± 0.0	PE
P	*Fragaria vesca ssp. americana*	Woodland Strawberry				S3S4	4 Secure	72	5.6 ± 0.0	NS
P	*Salix petiolaris*	Meadow Willow				S3S4	4 Secure	8	10.0 ± 0.0	NS
P	*Carex argyrantha*	Silvery-flowered Sedge				S3S4	4 Secure	3	23.9 ± 0.0	NS
P	*Eriophorum russeolum*	Russet Cottongrass				S3S4	4 Secure	5	15.2 ± 0.0	NS
P	*Triglochin gaspensis*	Gasp ├⌐ Arrowgrass				S3S4	5 Undetermined	9	24.2 ± 0.0	NS
P	*Juncus acuminatus*	Sharp-Fruit Rush				S3S4	4 Secure	4	4.9 ± 0.0	NS
P	*Luzula parviflora*	Small-flowered Woodrush				S3S4	4 Secure	37	33.0 ± 5.0	NS
P	*Liparis loeselii*	Loesel's Twayblade				S3S4	4 Secure	16	14.4 ± 5.0	NS
P	*Panicum philadelphicum*	Philadelphia Panicgrass				S3S4	4 Secure	1	18.0 ± 0.0	NS
P	*Trisetum spicatum*	Narrow False Oats				S3S4	4 Secure	20	15.3 ± 0.0	NS
P	*Cystopteris bulbifera*	Bulblet Bladder Fern				S3S4	4 Secure	417	5.9 ± 0.0	NS
P	*Equisetum hyemale ssp. affine*	common scouring-rush				S3S4	4 Secure	36	3.3 ± 3.0	NS
P	*Equisetum scirpoides*	Dwarf Scouring-Rush				S3S4	4 Secure	75	12.9 ± 0.0	NS
P	*Diphasiastrum complanatum*	Northern Ground-cedar				S3S4	4 Secure	6	14.9 ± 5.0	NS
P	*Schizaea pusilla*	Little Curlygrass Fern				S3S4	4 Secure	34	25.3 ± 0.0	NS
P	*Viola canadensis*	Canada Violet				SH	0.1 Extirpated	1	19.6 ± 0.0	NS
P	*Poa alpina*	Alpine Blue Grass				SH	0.1 Extirpated	2	72.3 ± 0.0	NS
P	*Botrychium minganense*	Mingan Moonwort				SH	0.1 Extirpated	1	66.9 ± 1.0	NS
P	*Solidago randii*	Rand's Goldenrod				SNA		1	68.7 ± 5.0	NS

5.1 SOURCE BIBLIOGRAPHY (100 km)

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

# recs	CITATION
9937	Lepage, D. 2014. Maritime Breeding Bird Atlas Database. Bird Studies Canada, Sackville NB, 407,838 recs.
3270	Morrison, Guy. 2011. Maritime Shorebird Survey (MSS) database. Canadian Wildlife Service, Ottawa, 15939 surveys. 86171 recs.
2037	Erskine, A.J. 1992. Maritime Breeding Bird Atlas Database. NS Museum & Nimbus Publ., Halifax, 82,125 recs.
998	Blaney, C.S.; Mazerolle, D.M.; Belliveau, A.B. 2014. Atlantic Canada Conservation Data Centre Fieldwork 2014. Atlantic Canada Conservation Data Centre, # recs.
958	Blaney, C.S.; Mazerolle, D.M.; Belliveau, A.B. 2015. Atlantic Canada Conservation Data Centre Fieldwork 2015. Atlantic Canada Conservation Data Centre, # recs.
678	Blaney, C.S.; Mazerolle, D.M. 2010. Fieldwork 2010. Atlantic Canada Conservation Data Centre. Sackville NB, 15508 recs.
527	Newell, R.E. 2000. E.C. Smith Herbarium Database. Acadia University, Wolfville NS, 7139 recs.
509	Benjamin, L.K. (compiler). 2012. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 4965 recs.
498	Benjamin, L.K. (compiler). 2007. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 8439 recs.
461	Blaney, C.S.; Mazerolle, D.M. 2012. Fieldwork 2012. Atlantic Canada Conservation Data Centre, 13,278 recs.
460	Blaney, C.S.; Mazerolle, D.M. 2009. Fieldwork 2009. Atlantic Canada Conservation Data Centre. Sackville NB, 13395 recs.
367	Belliveau, A.G. 2016. Atlantic Canada Conservation Data Centre Fieldwork 2016. Atlantic Canada Conservation Data Centre, 10695 recs.
264	Amirault, D.L. & Stewart, J. 2007. Piping Plover Database 1894-2006. Canadian Wildlife Service, Sackville, 3344 recs, 1228 new.
262	Newell, R.E. 2005. E.C. Smith Digital Herbarium. E.C. Smith Herbarium, Irving Biodiversity Collection, Acadia University, Web site: http://luxor.acadiau.ca/library/Herbarium/project/. 582 recs.
258	Wilhelm, S.I. et al. 2011. Colonial Waterbird Database. Canadian Wildlife Service, Sackville, 2698 sites, 9718 recs (8192 obs).
253	Pronych, G. & Wilson, A. 1993. Atlas of Rare Vascular Plants in Nova Scotia. Nova Scotia Museum, Halifax NS, I:1-168, II:169-331. 1446 recs.
211	Hicks, Andrew. 2009. Coastal Waterfowl Surveys Database, 2000-08. Canadian Wildlife Service, Sackville, 46488 recs (11149 non-zero).
208	Neily, T.H. & Pepper, C.; Toms, B. 2018. Nova Scotia lichen database [as of 2018-03]. Mersey Tobeatic Research Institute.
204	Belliveau, A.G. 2018. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
165	Neily, T.H. & Pepper, C.; Toms, B. 2013. Nova Scotia lichen location database. Mersey Tobeatic Research Institute, 1301 records.
159	Klymko, J.J.D.; Robinson, S.L. 2012. 2012 field data. Atlantic Canada Conservation Data Centre, 447 recs.
149	Neily, T.H. 2017. Nova Scotia lichen records. Mersey Tobeatic Research Institute.
140	Quigley, E.J. & Neily, P.D,. 2012. Botanical Discoveries in Inverness County, NS. Nova Scotia Dept Natural Resources. Pers. comm. to C.S. Blaney, Nov. 29, 141 rec.
127	Cameron, R.P. 2011. Lichen observations, 2011. Nova Scotia Environment & Labour, 731 recs.
122	Blaney, C.S. 2016. Atlantic Canada Conservation Data Centre Fieldwork 2016. Atlantic Canada Conservation Data Centre, 6719 recs.
117	Belland, R.J. Maritimes moss records from various herbarium databases. 2014.
97	Munro, Marian K. Nova Scotia Provincial Museum of Natural History Herbarium Database. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia. 2013.
96	WIlliams, M. Cape Breton University Digital Herbarium. Cape Breton University Digital Herbarium. 2013.
94	Mazerolle, D.M. 2016. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
84	Bridgland, J. 2006. Cape Breton Highlands National Park Digital Database. Parks Canada, 190 recs.
82	Zinck, M. & Roland, A.E. 1998. Roland's Flora of Nova Scotia. Nova Scotia Museum, 3rd ed., rev. M. Zinck; 2 Vol., 1297 pp.
81	Campbell, G. 2017. Maritimes Bicknell's Thrush database 2002-2015. Bird Studies Canada, Sackville NB, 609 recs.
74	Benjamin, L.K. 2009. D. Anderson Odonata Records for Cape Breton, 1997-2004. Nova Scotia Dept Natural Resources, 1316 recs.
68	Benjamin, L.K. 2012. NSDNR fieldwork & consultant reports 2008-2012. Nova Scotia Dept Natural Resources, 196 recs.
60	Benjamin, L.K. (compiler). 2001. Significant Habitat & Species Database. Nova Scotia Dept of Natural Resources, 15 spp, 224 recs.
59	Roland, A.E. & Smith, E.C. 1969. The Flora of Nova Scotia, 1st Ed. Nova Scotia Museum, Halifax, 743pp.
57	Amirault, D.L. & McKnight, J. 2003. Piping Plover Database 1991-2003. Canadian Wildlife Service, Sackville, unpublished data. 7 recs.
57	Mazerolle, D.M. 2017. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
56	Brunelle, P.-M. (compiler). 2009. ADIP/MDDS Odonata Database: data to 2006 inclusive. Atlantic Dragonfly Inventory Program (ADIP), 24200 recs.
54	Canadian Wildlife Service, Dartmouth. 2010. Piping Plover censuses 2007-09, 304 recs.
51	Busby, D.G. 1999. 1997-1999 Bicknell's Thrush data, unpublished files. Canadian Wildlife Service, Sackville, 17 recs.
49	LaPaix, R.W.; Crowell, M.J.; MacDonald, M. 2011. Stantec rare plant records, 2010-11. Stantec Consulting, 334 recs.
47	Klymko, J.J.D. 2014. Maritimes Butterfly Atlas, 2012 submissions. Atlantic Canada Conservation Data Centre, 8552 records.
47	Knapton, R. & Power, T.; Williams, M. 2001. SAR Inventory: Fortress Louisbourg NP. Parks Canada, Atlantic, SARINV01-13. 157 recs.
41	anon. 2001. S.. H.. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 76 recs.
41	Blaney, C.S.; Spicer, C.D. 2001. Fieldwork 2001. Atlantic Canada Conservation Data Centre. Sackville NB, 981 recs.
41	Pulsifer, M.D. 2002. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 369 recs.
38	Parker, G.R., Maxwell, J.W., Morton, L.D. & Smith,G.E.J. 1983. The ecology of Lynx , Lynx canadensis, on Cape Breton Island. Canadian Journal of Zoology, 61:770-786. 51 recs.
38	Scott, F.W. 2002. Nova Scotia Herpetofauna Atlas Database. Acadia University, Wolfville NS, 8856 recs.
37	Layberry, R.A. & Hall, P.W., LaFontaine, J.D. 1998. The Butterflies of Canada. University of Toronto Press. 280 pp+plates.
33	Neily, T.H. 2010. Erioderma Pedicellatum records 2005-09. Mersey Tobiatic Research Institute, 67 recs.
33	Sollows, M.C,. 2008. NBM Science Collections databases: mammals. New Brunswick Museum, Saint John NB, download Jan. 2008, 4983 recs.
30	Blaney, C.S.; Spicer, C.D.; Mazerolle, D.M. 2005. Fieldwork 2005. Atlantic Canada Conservation Data Centre. Sackville NB, 2333 recs.

# recs	CITATION
27	Klymko, J.J.D. 2012. Maritimes Butterfly Atlas, 2010 and 2011 records. Atlantic Canada Conservation Data Centre, 6318 recs.
27	Neily, T.H. 2017. Maritmes Lichen and Bryophyte records. Atlantic Canada Conservation Data Centre.
24	Neily, T.H. 2013. Email communication to Sean Blaney regarding Listera australis observations made from 2007 to 2011 in Nova Scotia. , 50.
22	Benjamin, L.K. 2009. Boreal Felt Lichen, Mountain Avens, Orchid and other recent records. Nova Scotia Dept Natural Resources, 105 recs.
21	Belland, R.J. & W.B. Schofield. 1993. Salix vestita Pursh & Saxifraga oppositifolia L.: arctic-alpine species new to Nova Scotia. Rhodora, 95: 76-78.
21	Hill, N.M. 1994. Status report on the Long's bulrush Scirpus longii in Canada. Committee on the Status of Endangered Wildlife in Canada, 7 recs.
20	Cameron, R.P. 2012. Rob Cameron 2012 vascular plant data. NS Department of Environment, 30 recs.
20	Gillis, J. 2015. Rare plant records from Cape Breton gypsum sites. Pers. comm., 25 rare plant records.
20	Klymko, J.J.D. 2016. 2015 field data. Atlantic Canada Conservation Data Centre.
19	Cameron, R.P. 2013. 2013 rare species field data. Nova Scotia Department of Environment, 71 recs.
19	Catling, P.M., Erskine, D.S. & MacLaren, R.B. 1985. The Plants of Prince Edward Island with new records, nomenclatural changes & corrections & deletions, 1st Ed. Research Branch, Agriculture Canada, Ottawa, Publication 1798. 22pp.
19	Pepper, C. 2013. 2013 rare bird and plant observations in Nova Scotia. , 181 records.
18	Manthorne, A. 2014. MaritimesSwiftwatch Project database 2013-2014. Bird Studies Canada, Sackville NB, 326 recs.
18	Misc. rare species records gathered by NSDNR staff or communicated to NSDNR and forwared to ACCDC
17	Adams, J. & Herman, T.B. 1998. Thesis, Unpublished map of C. insculpta sightings. Acadia University, Wolfville NS, 88 recs.
17	Benjamin, L.K. 2011. NSDNR fieldwork & consultant reports 1997, 2009-10. Nova Scotia Dept Natural Resources, 85 recs.
16	Basquill, S.P. 2012. 2012 rare vascular plant field data. Nova Scotia Department of Natural Resources, 37 recs.
15	Newell, R.E. 2004. Assessment and update status report on the New Jersey Rush (Juncus caesariensis) in Canada. Committee on the Status of Endangered Wildlife in Canada, 15 recs.
14	Basquill, S.P. 2012. 2012 Bryophyte specimen data. Nova Scotia Department of Natural Resources, 37 recs.
14	Blaney, C.S. 2000. Fieldwork 2000. Atlantic Canada Conservation Data Centre. Sackville NB, 1265 recs.
14	Downes, C. 1998-2000. Breeding Bird Survey Data. Canadian Wildlife Service, Ottawa, 111 recs.
14	Whittam, R.M. 2006. Bicknell's Thrush in CBHNP, BSC database. Bird Studies Canada, 21 recs.
13	Burns, L. 2013. Personal communication concerning bat occurrence on PEI. Winter 2013. Pers. comm.
12	Robinson, S.L. 2011. 2011 ND dune survey field data. Atlantic Canada Conservation Data Centre, 2715 recs.
11	Klymko, J.J.D. 2012. Insect fieldwork & submissions, 2011. Atlantic Canada Conservation Data Centre. Sackville NB, 760 recs.
11	Neily, T.H. 2012. 2012 Erioderma pedicellatum records in Nova Scotia.
11	Parks Canada. 2010. Specimens in or near National Parks in Atlantic Canada. Canadian National Museum, 3925 recs.
10	MacDonald, M. 2008. PEI Power Corridor Floral Surveys, 2004-08. Jacques Whitford Ltd, 2238 recs (979 rare).
10	Murphy, S. 2006. Juncus caesariensis data from Yava Technologies In Situ Leach Mining Environmental Assessment. Jacques Whitford Inc., 10 recs.
9	Goltz, J.P. & Bishop, G. 2005. Confidential supplement to Status Report on Prototype Quillwort (Isoetes prototypus). Committee on the Status of Endangered Wildlife in Canada, 111 recs.
8	Oldham, M.J. 2000. Oldham database records from Maritime provinces. Oldham, M.J; ONHIC, 487 recs.
7	Chaput, G. 2002. Atlantic Salmon: Maritime Provinces Overview for 2001. Dept of Fisheries & Oceans, Atlantic Region, Science Stock Status Report D3-14. 39 recs.
7	Robinson, S.L. 2014. 2013 Field Data. Atlantic Canada Conservation Data Centre.
7	Taylor, B.R., and Tam, J.C. 2012. Local distribution of the rare plant Triosteum aurantiacum in northeastern Nova Scotia, Canada. Rhodora, 114(960): 366-382.
6	Blaney, C.S.; Mazerolle, D.M.; Oberndorfer, E. 2007. Fieldwork 2007. Atlantic Canada Conservation Data Centre. Sackville NB, 13770 recs.
6	Cameron, R.P. 2009. Erioderma pedicellatum database, 1979-2008. Dept Environment & Labour, 103 recs.
6	NS DNR. 2017. Black Ash records from NS DNR Permanent Sample Plots (PSPs), 1965-2016. NS Dept of Natural Resources.
6	Olsen, R. Herbarium Specimens. Nova Scotia Agricultural College, Truro. 2003.
6	Whittam, R.M. 1999. Status Report on the Roseate Tern (update) in Canada. Committee on the Status of Endangered Wildlife in Canada, 36 recs.
5	Blaney, C.S.; Mazerolle, D.M.; Klymko, J; Spicer, C.D. 2006. Fieldwork 2006. Atlantic Canada Conservation Data Centre. Sackville NB, 8399 recs.
5	Cameron, R.P. 2009. Cyanolichen database. Nova Scotia Environment & Labour, 1724 recs.
5	Marshall, L. 1998. Atlantic Salmon: Cape Breton SFA 18 (part) & SFA 19. Dept of Fisheries & Oceans, Atlantic Region, Science. Stock Status Report D3-09. 5 recs.
5	Plissner, J.H. & Haig, S.M. 1997. 1996 International piping plover census. US Geological Survey, Corvallis OR, 231 pp.
5	Porter, K. 2013. 2013 rare and non-rare vascular plant field data. St. Mary's University, 57 recs.
5	Scott, F.W. 1988. Status Report on the Gaspé Shrew (Sorex gaspensis) in Canada. Committee on the Status of Endangered Wildlife in Canada, 12 recs.
5	Whittam, R.M. 1997. Status Report on the Roseate Tern (Sterna dougallii) in Canada. Committee on the Status of Endangered Wildlife in Canada, 5 recs.
4	Bagnell, B.A. 2001. New Brunswick Bryophyte Occurrences. B&B Botanical, Sussex, 478 recs.
4	Blaney, C.S.; Mazerolle, D.M. 2008. Fieldwork 2008. Atlantic Canada Conservation Data Centre. Sackville NB, 13343 recs.
4	Blaney, C.S.; Mazerolle, D.M. 2011. Fieldwork 2011. Atlantic Canada Conservation Data Centre. Sackville NB.
4	Clayden, S.R. 2007. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, download Mar. 2007, 6914 recs.
4	Erskine, D. 1960. The plants of Prince Edward Island, 1st Ed. Research Branch, Agriculture Canada, Ottawa., Publication 1088. 1238 recs.
4	Neily, T.H. & Pepper, C.; Toms, B. 2015. Nova Scotia lichen location database [as of 2015-02-15]. Mersey Tobeatic Research Institute, 1691 records.
4	Newell, R.E. 2001. Fortress Louisbourg Species at Risk Survey 2001. Parks Canada, 4 recs.
4	Porter, C.J.M. 2014. Field work data 2007-2014. Nova Scotia Nature Trust, 96 recs.
4	Rousseau, J. 1938. Notes Floristiques sur l'est de la Nouvelle-Ecosse in Contributions de l'Institut Botanique de l'Universite de Montreal. Universite de Montreal, 32, 13-62. 11 recs.
3	Amirault, D.L. 1997-2000. Unpublished files. Canadian Wildlife Service, Sackville, 470 recs.

# recs	CITATION
3	Baechler, Lynn. 2012. Plant observations & photos, 2012. Pers. comm. to S. Blaney, July 2012, 4 recs.
3	Dibblee, R.L. 1999. PEI Cormorant Survey. Prince Edward Island Fisheries, Aquaculture & Environment, 1p. 21 recs.
3	Gilhen, J. 1984. Amphibians & Reptiles of Nova Scotia, 1st Ed. Nova Scotia Museum, 164pp.
3	Popma, T.M. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre. Sackville NB, 113 recs.
2	Benedict, B. Connell Herbarium Specimens (Data) . University New Brunswick, Fredericton. 2003.
2	Blaney, C.S.; Mazerolle, D.M.; Hill, N.M. 2011. Nova Scotia Crown Share Land Legacy Trust Fieldwork. Atlantic Canada Conservation Data Centre, 5022 recs.
2	Blaney, C.S.; Spicer, C.D.; Rothfels, C. 2004. Fieldwork 2004. Atlantic Canada Conservation Data Centre. Sackville NB, 1343 recs.
2	Christie, D.S. 2000. Christmas Bird Count Data, 1997-2000. Nature NB, 54 recs.
2	Clayden, S.R. 1998. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, 19759 recs.
2	Doucet, D.A. 2007. Lepidopteran Records, 1988-2006. Doucet, 700 recs.
2	Edsall, J. 2007. Personal Butterfly Collection: specimens collected in the Canadian Maritimes, 1961-2007. J. Edsall, unpubl. report, 137 recs.
2	Gillis, J. 2007. Botanical observations from bog on Skye Mountain, NS. Pers. comm., 8 recs.
2	Hall, R.A. 2001. S.. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 178 recs.
2	Hill, N. 2003. Floerkea proserpinacoides at Heatherdale, Antigonish Co. 2002. , Pers. comm. to C.S. Blaney. 2 recs.
2	Klymko, J.J.D. 2012. Insect field work & submissions. Atlantic Canada Conservation Data Centre, 852 recs.
2	Layberry, R.A. 2012. Lepidopteran records for the Maritimes, 1974-2008. Layberry Collection, 1060 recs.
2	Lock, A.R., Brown, R.G.B. & Gerriets, S.H. 1994. Gazetteer of Marine Birds in Atlantic Canada. Canadian Wildlife Service, Atlantic Region, 137 pp.
2	Munden, C. 2018. Email communication on Cypripedium parviflorum. Amateur naturalist, 2.
2	Munro, Marian K. Nova Scotia Provincial Museum of Natural History Herbarium Database. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia. 2014.
2	Neily, T.H. & Pepper, C.; Toms, B. 2018. Nova Scotia lichen database Update. Mersey Tobeatic Research Institute.
2	O'Neil, S. 1998. Atlantic Salmon: Northumberland Strait Nova Scotia part of SFA 18. Dept of Fisheries & Oceans, Atlantic Region, Science. Stock Status Report D3-08. 9 recs.
2	Quigley, E.J. 2006. Plant records, Mabou & Port Hood. Pers. comm. to S.P. Basquill, Jun. 12. 4 recs, 4 recs.
2	Selva, S.B. 2002. Status Report on frosted glass-whiskers, Sclerophora peronella. Committee on the Status of Endangered Wildlife in Canada, Draft Revision, May 2002. 2 recs.
2	Sollows, M.C,. 2009. NBM Science Collections databases: molluscs. New Brunswick Museum, Saint John NB, download Jan. 2009, 6951 recs (2957 in Atlantic Canada).
2	Whittam, R.M. et al. 1998. Country Island Tern Restoration Project. Canadian Wildlife Service, Sackville, 2 recs.
1	Anderson, D.G. 2011. New site for showy ladyslipper on Cape Breton. Nova Scotia Department of Natural Resources, pers.comm. to R. Lautenschlager, Jul 5, 2011.
1	Archibald, D.R. 2003. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 213 recs.
1	Basquill, S.P. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre, Sackville NB, 69 recs.
1	Beaulieu-Bouchard, M. 2014. Email to S. Blaney regarding Salix reticulata & vestita in NS. Canadian Museum of Nature, 1 obs.
1	Benjamin, L.K. 2009. NSDNR Fieldwork & Consultants Reports. Nova Scotia Dept Natural Resources, 143 recs.
1	Boyne, A.W. & Grecian, V.D. 1999. Tern Surveys. Canadian Wildlife Service, Sackville, unpublished data. 23 recs.
1	Cameron, R.P. 2009. Nova Scotia nonvascular plant observations, 1995-2007. Nova Scotia Dept Natural Resources, 27 recs.
1	Crowell, M. 2013. email to Sean Blaney regarding Listera australis at Bear Head and Mill Cove Canadian Forces Station. Jacques Whitford Environmental Ltd., 2.
1	Curley, F.R. 2005. PEF&W Collection 2003-04. PEI Fish & Wildlife Div., 716 recs.
1	Doucet, D.A. 2009. Census of Globally Rare, Endemic Butterflies of Nova Scotia Gulf of St Lawrence Salt Marshes. Nova Scotia Dept of Natural Resources, Species at Risk, 155 recs.
1	Gilman, A.; Testo, W. 2015. Use of Gemma Characters to Identify North American Huperzia (Lycopodiaceae). American Fern Journal, 105(3):145-161.
1	Hinds, H.R. 1984. Additions to the flora of Cape Breton Highlands National Park, Nova Scotia. Rhodora, 86:67-72.
1	Kelly, Glen 2004. Botanical records from 2004 PEI Forestry fieldwork. Dept of Environment, Energy & Forestry, 71 recs.
1	Klymko, J.J.D. 2018. 2017 field data. Atlantic Canada Conservation Data Centre.
1	Lautenschlager, R.A. 2010. Miscellaneous observations reported to ACCDC (zoology). Pers. comm. from various persons, 2 recs.
1	McKendry, Karen. 2016. Rare species observations, 2016. Nova Scotia Nature Trust, 19 recs.
1	New York Botanical Garden. 2006. Virtual Plant Herbarium - Vascular Plant Types Catalog. Sylva, S.; Kallunki, J. (ed.) International Plant Science Centre, Web site: http://sciweb.nybg.org/science2/vii2.asp. 4 recs.
1	Newell, R.B.; Sam, D. 2014. 2014 Bloodroot personal communication report, Antigonish, NS. NS Department of Natural Resources.
1	Schori, M. 2003. Hieracium robinsonii locations in Atlantic Canada. Pers. comm. to C.S. Blaney. Gray Herbarium, Harvard University, 1 rec.
1	Spicer, C.D. 2004. Specimens from CWS Herbarium, Mount Allison Herbarium Database. Mount Allison University, 5939 recs.
1	Standley, L.A. 2002. Carex haydenii in Nova Scotia. , Pers. comm. to C.S. Blaney. 4 recs.
1	Whittam, R.M. 2000. Senecio pseudoarnica on Country Island. , Pers. comm. to S. Gerriets. 1 rec.

DATA REPORT 6326: Whycocomagh Bay 1, NS

Prepared 8 February 2019
by J. Churchill, Data Manager

CONTENTS OF REPORT

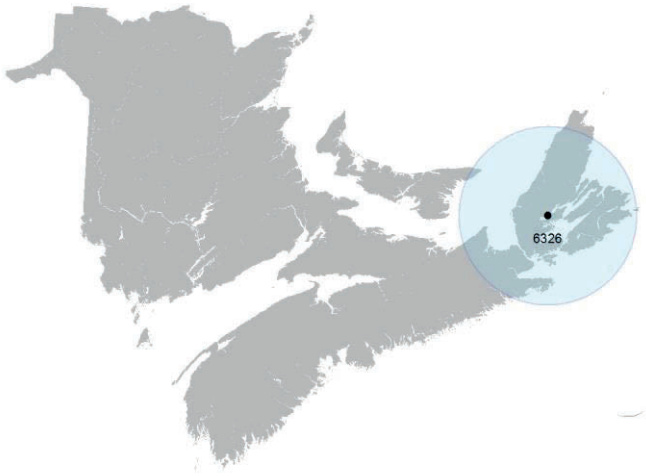
1.0 Preface
- 1.1 Data List
- 1.2 Restrictions
- 1.3 Additional Information
- Map 1: Buffered Study Area

2.0 Rare and Endangered Species
- 2.1 Flora
- 2.2 Fauna
- Map 2: Flora and Fauna

3.0 Special Areas
- 3.1 Managed Areas
- 3.2 Significant Areas
- Map 3: Special Areas

4.0 Rare Species Lists
- 4.1 Fauna
- 4.2 Flora
- 4.3 Location Sensitive Species
- 4.4 Source Bibliography

5.0 Rare Species within 100 km
- 5.1 Source Bibliography



Map 1. A 100 km buffer around the study area

1.0 PREFACE

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

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

1.1 DATA LIST

Included datasets:

Filename	Contents
WhycocomaghBNS_6326ob.xls	All Rare and legally protected *Flora and Fauna* in your study area
WhycocomaghBNS_6326ob100km.xls	A list of Rare and legally protected *Flora and Fauna* within 100 km of your study area
WhycocomaghBNS_6326sa.xls	All *Significant Natural Areas* in your study area
WhycocomaghBNS_6326ff.xls	Rare and common *Freshwater Fish* in your study area (DFO database)

1.2 RESTRICTIONS

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

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

1.3 ADDITIONAL INFORMATION

The accompanying Data Dictionary provides metadata for the data provided.

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

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

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

Plant Communities
Sarah Robinson, Community Ecologist
Tel: (506) 364-2664
sarah.robinson@accdc.ca

Data Management, GIS
James Churchill, Data Manager
Tel: (902) 679-6146
james.churchill@accdc.ca

Billing
Jean Breau
Tel: (506) 364-2657
jean.breau@accdc.ca

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

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

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

Western: Duncan Bayne
(902) 648-3536
Duncan.Bayne@novascotia.ca

Western: Sarah Spencer
(902) 634-7555
Sarah.Spencer@novascotia.ca

Central: Shavonne Meyer
(902) 893-6350
Shavonne.Meyer@novascotia.ca

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

Eastern: Lisa Doucette
(902) 863-4513
Lisa.Doucette@novascotia.ca

Eastern: Terry Power
(902) 563-3370
Terrance.Power@novascotia.ca

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

2.0 RARE AND ENDANGERED SPECIES

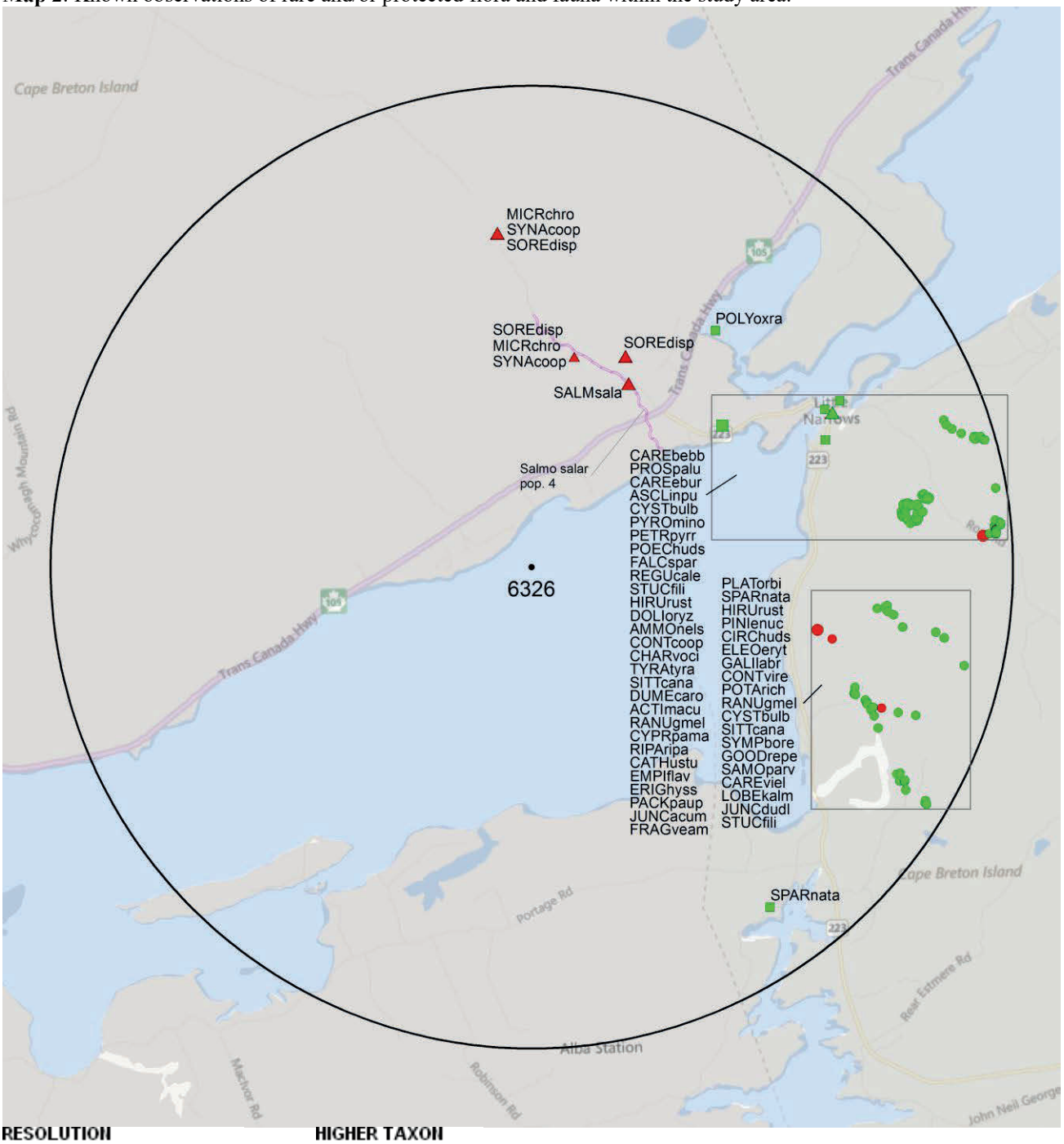
2.1 FLORA

The study area contains 107 records of 25 vascular, no records of nonvascular flora (Map 2 and attached: *ob.xls).

2.2 FAUNA

The study area contains 43 records of 23 vertebrate, no records of invertebrate fauna (Map 2 and attached data files - see 1.1 Data List). Please see section 4.3 to determine if 'location-sensitive' species occur near your study site.

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



RESOLUTION
- 4.7 within 50s of kilometers
- 4.0 within 10s of kilometers
- 3.7 within 5s of kilometers
- 3.0 within kilometers
- 2.7 within 500s of meters
- 2.0 within 100s of meters
- 1.7 within 10s of meters

HIGHER TAXON
- vertebrate fauna
- invertebrate fauna
- vascular flora
- nonvascular flora

3.0 SPECIAL AREAS

3.1 MANAGED AREAS

The GIS scan identified no managed areas in the vicinity of the study area (Map 3).

3.2 SIGNIFICANT AREAS

The GIS scan identified 1 biologically significant site in the vicinity of the study area (Map 3 and attached file: *sa*.xls).

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



4.0 RARE SPECIES LISTS

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

4.1 FLORA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
P	*Carex viridula var. elatior*	Greenish Sedge				S1	2 May Be At Risk	3	4.4 ± 0.0
P	*Eleocharis erythropoda*	Red-stemmed Spikerush				S1	2 May Be At Risk	1	4.6 ± 0.0
P	*Lobelia kalmii*	Brook Lobelia				S2	2 May Be At Risk	2	4.4 ± 0.0
P	*Galium labradoricum*	Labrador Bedstraw				S2	3 Sensitive	4	3.6 ± 0.0
P	*Carex bebbii*	Bebb's Sedge				S2	3 Sensitive	2	4.5 ± 0.0
P	*Cypripedium parviflorum var. makasin*	Small Yellow Lady's-Slipper				S2	3 Sensitive	6	4.8 ± 0.0
P	*Potamogeton richardsonii*	Richardson's Pondweed				S2	2 May Be At Risk	1	3.8 ± 0.0
P	*Symphyotrichum boreale*	Boreal Aster				S2?	3 Sensitive	8	3.6 ± 0.0
P	*Polygonum oxyspermum ssp. raii*	Ray's Knotweed				S2S3	5 Undetermined	1	3.1 ± 5.0
P	*Stuckenia filiformis*	Thread-leaved Pondweed				S2S3	3 Sensitive	3	2.5 ± 7.0
P	*Erigeron hyssopifolius*	Hyssop-leaved Fleabane				S3	3 Sensitive	2	4.8 ± 0.0
P	*Packera paupercula*	Balsam Groundsel				S3	4 Secure	2	4.8 ± 0.0
P	*Proserpinaca palustris*	Marsh Mermaidweed				S3	4 Secure	4	3.5 ± 5.0
P	*Samolus parviflorus*	Seaside Brookweed				S3	3 Sensitive	1	4.0 ± 0.0
P	*Pyrola minor*	Lesser Pyrola				S3	3 Sensitive	1	4.0 ± 0.0
P	*Ranunculus gmelinii*	Gmelin's Water Buttercup				S3	4 Secure	20	3.3 ± 5.0
P	*Carex eburnea*	Bristle-leaved Sedge				S3	3 Sensitive	5	4.1 ± 0.0
P	*Juncus dudleyi*	Dudley's Rush				S3	4 Secure	1	4.5 ± 0.0
P	*Goodyera repens*	Lesser Rattlesnake-plantain				S3	3 Sensitive	1	4.3 ± 0.0
P	*Platanthera orbiculata*	Small Round-leaved Orchid				S3	4 Secure	1	4.3 ± 0.0
P	*Sparganium natans*	Small Burreed				S3	4 Secure	2	4.3 ± 0.0
P	*Asclepias incarnata ssp. pulchra*	Swamp Milkweed				S3?	5 Undetermined	2	3.5 ± 2.0
P	*Fragaria vesca ssp. americana*	Woodland Strawberry				S3S4	4 Secure	8	3.9 ± 0.0
P	*Juncus acuminatus*	Sharp-Fruit Rush				S3S4	4 Secure	1	3.6 ± 4.0
P	*Cystopteris bulbifera*	Bulblet Bladder Fern				S3S4	4 Secure	25	3.9 ± 0.0

4.2 FAUNA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
A	*Riparia riparia*	Bank Swallow	Threatened	Threatened	Endangered	S2S3B	2 May Be At Risk	1	2.5 ± 7.0
A	*Hirundo rustica*	Barn Swallow	Threatened	Threatened	Endangered	S2S3B	1 At Risk	3	2.5 ± 7.0
A	*Dolichonyx oryzivorus*	Bobolink	Threatened	Threatened	Vulnerable	S3S4B	3 Sensitive	1	2.5 ± 7.0
A	*Contopus cooperi*	Olive-sided Flycatcher	Special Concern	Threatened	Threatened	S2B	1 At Risk	1	2.5 ± 7.0
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern	Special Concern	Vulnerable	S3S4B	3 Sensitive	1	3.9 ± 0.0
A	*Sorex dispar*	Long-tailed Shrew	Not At Risk	Special Concern		S2	3 Sensitive	3	2.2 ± 0.0
A	*Circus hudsonius*	Northern Harrier	Not At Risk			S3S4B	4 Secure	1	3.2 ± 0.0
A	*Ammospiza nelsoni*	Nelson's Sparrow	Not At Risk			S3S4B	4 Secure	1	2.5 ± 7.0
A	*Salmo salar*	Atlantic Salmon				S1	2 May Be At Risk	1	2.2 ± 1.0
A	*Microtus chrotorrhinus*	Rock Vole				S2	4 Secure	10	2.2 ± 0.0
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S2S3B	2 May Be At Risk	2	2.5 ± 7.0
A	*Pinicola enucleator*	Pine Grosbeak				S2S3B,S5N	2 May Be At Risk	1	4.3 ± 0.0
A	*Poecile hudsonicus*	Boreal Chickadee				S3	3 Sensitive	1	2.5 ± 7.0
A	*Sitta canadensis*	Red-breasted Nuthatch				S3	4 Secure	2	2.5 ± 7.0
A	*Synaptomys cooperi*	Southern Bog Lemming				S3	4 Secure	4	2.2 ± 0.0
A	*Falco sparverius*	American Kestrel				S3B	4 Secure	1	2.5 ± 7.0

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
A	*Charadrius vociferus*	Killdeer				S3B	3 Sensitive	1	2.5 ± 7.0
A	*Tyrannus tyrannus*	Eastern Kingbird				S3B	3 Sensitive	2	2.5 ± 7.0
A	*Dumetella carolinensis*	Gray Catbird				S3B	2 May Be At Risk	1	2.5 ± 7.0
A	*Actitis macularius*	Spotted Sandpiper				S3S4B	3 Sensitive	1	2.5 ± 7.0
A	*Empidonax flaviventris*	Yellow-bellied Flycatcher				S3S4B	3 Sensitive	1	4.8 ± 0.0
A	*Regulus calendula*	Ruby-crowned Kinglet				S3S4B	3 Sensitive	2	2.5 ± 7.0
A	*Catharus ustulatus*	Swainson's Thrush				S3S4B	4 Secure	1	4.7 ± 0.0

4.3 LOCATION SENSITIVE SPECIES

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

Nova Scotia

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

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

4.4 SOURCE BIBLIOGRAPHY

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

# recs	CITATION
81	Blaney, C.S.; Mazerolle, D.M.; Belliveau, A.B. 2015. Atlantic Canada Conservation Data Centre Fieldwork 2015. Atlantic Canada Conservation Data Centre, # recs.
24	Blaney, C.S.; Mazerolle, D.M.; Belliveau, A.B. 2014. Atlantic Canada Conservation Data Centre Fieldwork 2014. Atlantic Canada Conservation Data Centre, # recs.
17	Lepage, D. 2014. Maritime Breeding Bird Atlas Database. Bird Studies Canada, Sackville NB, 407,838 recs.
8	Benjamin, L.K. (compiler). 2001. Significant Habitat & Species Database. Nova Scotia Dept of Natural Resources, 15 spp, 224 recs.
8	Benjamin, L.K. (compiler). 2012. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 4965 recs.
4	Newell, R.E. 2005. E.C. Smith Digital Herbarium. E.C. Smith Herbarium, Irving Biodiversity Collection, Acadia University, Web site: http://luxor.acadiau.ca/library/Herbarium/project/. 582 recs.
2	Benjamin, L.K. (compiler). 2007. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 8439 recs.
2	Newell, R.E. 2000. E.C. Smith Herbarium Database. Acadia University, Wolfville NS, 7139 recs.
1	Benjamin, L.K. (compiler) 2012. Significant Habitat & Species Database. NS Dept of Natural Resources.
1	Erskine, A.J. 1992. Maritime Breeding Bird Atlas Database. NS Museum & Nimbus Publ., Halifax, 82,125 recs.
1	Munro, Marian K. Nova Scotia Provincial Museum of Natural History Herbarium Database. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia. 2013.
1	Pronych, G. & Wilson, A. 1993. Atlas of Rare Vascular Plants in Nova Scotia. Nova Scotia Museum, Halifax NS, I:1-168, II:169-331. 1446 recs.
1	Roland, A.E. & Smith, E.C. 1969. The Flora of Nova Scotia, 1st Ed. Nova Scotia Museum, Halifax, 743pp.
1	Scott, F.W. 1988. Status Report on the Gaspé Shrew (Sorex gaspensis) in Canada. Committee on the Status of Endangered Wildlife in Canada, 12 recs.

5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 17445 records of 133 vertebrate and 479 records of 47 invertebrate fauna; 6395 records of 282 vascular, 1177 records of 108 nonvascular flora (attached: *ob100km.xls).

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

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	*Myotis lucifugus*	Little Brown Myotis	Endangered	Endangered	Endangered	S1	1 At Risk	36	27.4 ± 0.0	NS
A	*Myotis septentrionalis*	Northern Long-eared Myotis	Endangered	Endangered	Endangered	S1	1 At Risk	5	95.3 ± 0.0	PE
A	*Charadrius melodus melodus*	Piping Plover melodus ssp	Endangered	Endangered	Endangered	S1B	1 At Risk	591	32.3 ± 0.0	NS
A	*Sterna dougallii*	Roseate Tern	Endangered	Endangered	Endangered	S1B	1 At Risk	12	80.6 ± 7.0	NS
A	*Calidris canutus rufa*	Red Knot rufa ssp	Endangered	Endangered	Endangered	S2M	1 At Risk	135	43.5 ± 0.0	NS
A	*Rangifer tarandus pop. 2*	Woodland Caribou (Atlantic-Gasp├⌐sie pop.)	Endangered	Endangered	Extirpated	SX	0.1 Extirpated	1	89.3 ± 0.0	NS
A	*Antrostomus vociferus*	Eastern Whip-Poor-Will	Threatened	Threatened	Threatened	S1?B	1 At Risk	3	37.4 ± 0.0	NS
A	*Catharus bicknelli*	Bicknell's Thrush	Threatened	Special Concern	Endangered	S1S2B	1 At Risk	223	23.6 ± 7.0	NS
A	*Glyptemys insculpta*	Wood Turtle	Threatened	Threatened	Threatened	S2	3 Sensitive	71	8.4 ± 0.0	NS
A	*Acipenser oxyrinchus*	Atlantic Sturgeon	Threatened			S2	2 May Be At Risk	1	57.4 ± 0.0	NS
A	*Anguilla rostrata*	American Eel	Threatened			S2	4 Secure	2	7.8 ± 0.0	NS
A	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Endangered	S2B,S1M	1 At Risk	63	19.6 ± 0.0	NS
A	*Riparia riparia*	Bank Swallow	Threatened	Threatened	Endangered	S2S3B	2 May Be At Risk	226	2.5 ± 7.0	NS
A	*Hirundo rustica*	Barn Swallow	Threatened	Threatened	Endangered	S2S3B	1 At Risk	400	2.5 ± 7.0	NS
A	*Cardellina canadensis*	Canada Warbler	Threatened	Threatened	Endangered	S3B	1 At Risk	211	7.3 ± 0.0	NS
A	*Dolichonyx oryzivorus*	Bobolink	Threatened	Threatened	Vulnerable	S3S4B	3 Sensitive	207	2.5 ± 7.0	NS
A	*Sturnella magna*	Eastern Meadowlark	Threatened	Threatened		SHB	3 Sensitive	2	80.6 ± 7.0	NS
A	*Hylocichla mustelina*	Wood Thrush	Threatened	Threatened		SUB	5 Undetermined	7	75.7 ± 7.0	NS
A	*Falco peregrinus pop. 1*	Peregrine Falcon - anatum/tundrius	Special Concern	Special Concern	Vulnerable	S1B,SNAM	3 Sensitive	4	47.6 ± 7.0	NS
A	*Bucephala islandica (Eastern pop.)*	Barrow's Goldeneye - Eastern pop.	Special Concern	Special Concern		S1N	1 At Risk	1	69.3 ± 16.0	NS
A	*Asio flammeus*	Short-eared Owl	Special Concern	Special Concern		S1S2B	2 May Be At Risk	6	24.2 ± 0.0	NS
A	*Euphagus carolinus*	Rusty Blackbird	Special Concern	Special Concern	Endangered	S2B	2 May Be At Risk	154	6.8 ± 0.0	NS
A	*Chordeiles minor*	Common Nighthawk	Special Concern	Threatened	Threatened	S2B	1 At Risk	74	5.8 ± 0.0	NS
A	*Contopus cooperi*	Olive-sided Flycatcher	Special Concern	Threatened	Threatened	S2B	1 At Risk	531	2.5 ± 7.0	NS
A	*Histrionicus histrionicus pop. 1*	Harlequin Duck - Eastern pop.	Special Concern	Special Concern	Endangered	S2N	1 At Risk	11	51.5 ± 7.0	NS
A	*Phalaropus lobatus*	Red-necked Phalarope	Special Concern			S2S3M	3 Sensitive	1	89.4 ± 0.0	NS
A	*Morone saxatilis pop. 1*	Striped Bass- Southern Gulf of St Lawrence pop.	Special Concern			S2S3N	2 May Be At Risk	1	79.4 ± 1.0	NS
A	*Chelydra serpentina*	Snapping Turtle	Special Concern	Special Concern	Vulnerable	S3	3 Sensitive	8	42.0 ± 10.0	NS
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern	Special Concern	Vulnerable	S3S4B	3 Sensitive	173	3.9 ± 0.0	NS
A	*Coccothraustes vespertinus*	Evening Grosbeak	Special Concern		Vulnerable	S3S4B,S3N	4 Secure	202	7.6 ± 0.0	NS
A	*Chrysemys picta picta*	Eastern Painted Turtle	Special Concern			S4S5	4 Secure	1	97.2 ± 1.0	NS
A	*Lynx canadensis*	Canadian Lynx	Not At Risk		Endangered	S1	1 At Risk	157	18.3 ± 1.0	NS
A	*Accipiter cooperii*	Cooper's Hawk	Not At Risk			S1?B	5 Undetermined	1	63.0 ± 7.0	NS
A	*Fulica americana*	American Coot	Not At Risk			S1B	5 Undetermined	2	93.2 ± 0.0	PE
A	*Sorex dispar*	Long-tailed Shrew	Not At Risk	Special Concern		S2	3 Sensitive	18	2.2 ± 0.0	NS
A	*Aegolius funereus*	Boreal Owl	Not At Risk			S2?B	5 Undetermined	14	30.7 ± 7.0	NS
A	*Globicephala melas*	Long-finned Pilot Whale	Not At Risk			S2S3		6	72.8 ± 1.0	NS
A	*Hemidactylium scutatum*	Four-toed Salamander	Not At Risk			S3	4 Secure	18	30.2 ± 1.0	NS
A	*Sterna hirundo*	Common Tern	Not At Risk			S3B	3 Sensitive	408	8.8 ± 7.0	NS
A	*Sialia sialis*	Eastern Bluebird	Not At Risk			S3B	3 Sensitive	12	28.7 ± 7.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	*Buteo lagopus*	Rough-legged Hawk	Not At Risk			S3N	4 Secure	2	71.6 ± 4.0	NS
A	*Accipiter gentilis*	Northern Goshawk	Not At Risk			S3S4	4 Secure	76	12.1 ± 7.0	NS
A	*Circus hudsonius*	Northern Harrier	Not At Risk			S3S4B	4 Secure	220	3.2 ± 0.0	NS
A	*Ammospiza nelsoni*	Nelson's Sparrow	Not At Risk			S3S4B	4 Secure	79	2.5 ± 7.0	NS
A	*Morone saxatilis*	Striped Bass	E,E,SC			S2S3	2 May Be At Risk	4	47.3 ± 0.0	NS
A	*Martes americana*	American Marten			Endangered	S1	1 At Risk	30	11.5 ± 1.0	NS
A	*Alces americanus*	Moose			Endangered	S1	1 At Risk	13	27.2 ± 0.0	NS
A	*Salmo salar*	Atlantic Salmon				S1	2 May Be At Risk	87	2.2 ± 1.0	NS
A	*Picoides dorsalis*	American Three-toed Woodpecker				S1?	5 Undetermined	7	9.5 ± 0.0	NS
A	*Passerina cyanea*	Indigo Bunting				S1?B	5 Undetermined	3	68.6 ± 7.0	NS
A	*Uria aalge*	Common Murre				S1?B,S5N	4 Secure	3	67.4 ± 0.0	NS
A	*Nycticorax nycticorax*	Black-crowned Night-heron				S1B	2 May Be At Risk	1	73.8 ± 7.0	NS
A	*Anas acuta*	Northern Pintail				S1B	2 May Be At Risk	7	63.8 ± 0.0	NS
A	*Oxyura jamaicensis*	Ruddy Duck				S1B	4 Secure	2	89.1 ± 0.0	NS
A	*Haematopus palliatus*	American Oystercatcher				S1B	5 Undetermined	7	68.6 ± 7.0	NS
A	*Mimus polyglottos*	Northern Mockingbird				S1B	4 Secure	17	24.8 ± 7.0	NS
A	*Toxostoma rufum*	Brown Thrasher				S1B	5 Undetermined	3	68.0 ± 0.0	NS
A	*Vireo gilvus*	Warbling Vireo				S1B	5 Undetermined	7	33.7 ± 7.0	NS
A	*Calidris minutilla*	Least Sandpiper				S1B,S3M	4 Secure	224	43.5 ± 0.0	NS
A	*Charadrius semipalmatus*	Semipalmated Plover				S1B,S3S4M	4 Secure	334	36.2 ± 0.0	NS
A	*Pluvialis dominica*	American Golden-Plover				S1S2M	3 Sensitive	80	51.9 ± 0.0	NS
A	*Limosa haemastica*	Hudsonian Godwit				S1S2M	3 Sensitive	95	51.9 ± 0.0	NS
A	*Microtus chrotorrhinus*	Rock Vole				S2	4 Secure	26	2.2 ± 0.0	NS
A	*Vireo philadelphicus*	Philadelphia Vireo				S2?B	5 Undetermined	10	43.5 ± 7.0	NS
A	*Spatula clypeata*	Northern Shoveler				S2B	2 May Be At Risk	5	66.1 ± 0.0	NS
A	*Mareca strepera*	Gadwall				S2B	2 May Be At Risk	7	66.6 ± 0.0	NS
A	*Empidonax traillii*	Willow Flycatcher				S2B	3 Sensitive	4	58.7 ± 0.0	NS
A	*Setophaga tigrina*	Cape May Warbler				S2B	3 Sensitive	58	21.4 ± 7.0	NS
A	*Piranga olivacea*	Scarlet Tanager				S2B	5 Undetermined	4	8.8 ± 7.0	NS
A	*Pooecetes gramineus*	Vesper Sparrow				S2B	2 May Be At Risk	11	33.7 ± 7.0	NS
A	*Molothrus ater*	Brown-headed Cowbird				S2B	4 Secure	30	35.3 ± 7.0	NS
A	*Alca torda*	Razorbill				S2B,S4N	3 Sensitive	50	45.6 ± 7.0	NS
A	*Bucephala clangula*	Common Goldeneye				S2B,S5N	4 Secure	90	8.2 ± 7.0	NS
A	*Branta bernicla*	Brant				S2M	3 Sensitive	1	69.1 ± 16.0	NS
A	*Phalacrocorax carbo*	Great Cormorant				S2S3	3 Sensitive	322	31.2 ± 0.0	NS
A	*Asio otus*	Long-eared Owl				S2S3	2 May Be At Risk	19	30.7 ± 7.0	NS
A	*Spinus pinus*	Pine Siskin				S2S3	3 Sensitive	251	8.2 ± 7.0	NS
A	*Cathartes aura*	Turkey Vulture				S2S3B	3 Sensitive	2	93.5 ± 7.0	PE
A	*Rallus limicola*	Virginia Rail				S2S3B	5 Undetermined	6	42.2 ± 7.0	NS
A	*Tringa semipalmata*	Willet				S2S3B	2 May Be At Risk	510	8.8 ± 7.0	NS
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S2S3B	2 May Be At Risk	110	2.5 ± 7.0	NS
A	*Pheucticus ludovicianus*	Rose-breasted Grosbeak				S2S3B	3 Sensitive	130	6.5 ± 0.0	NS
A	*Icterus galbula*	Baltimore Oriole				S2S3B	2 May Be At Risk	4	47.6 ± 7.0	NS
A	*Pinicola enucleator*	Pine Grosbeak				S2S3B,S5N	2 May Be At Risk	161	4.3 ± 0.0	NS
A	*Numenius phaeopus hudsonicus*	Hudsonian Whimbrel				S2S3M	3 Sensitive	155	36.2 ± 0.0	NS
A	*Calidris melanotos*	Pectoral Sandpiper				S2S3M	4 Secure	75	51.9 ± 0.0	NS
A	*Phalaropus fulicarius*	Red Phalarope				S2S3M	3 Sensitive	1	69.0 ± 0.0	NS
A	*Perisoreus canadensis*	Canada Jay				S3	3 Sensitive	332	6.0 ± 0.0	NS
A	*Poecile hudsonicus*	Boreal Chickadee				S3	3 Sensitive	659	2.5 ± 7.0	NS
A	*Sitta canadensis*	Red-breasted Nuthatch				S3	4 Secure	480	2.5 ± 7.0	NS
A	*Alosa pseudoharengus*	Alewife				S3	3 Sensitive	44	5.3 ± 0.0	NS
A	*Salvelinus fontinalis*	Brook Trout				S3	3 Sensitive	60	11.6 ± 0.0	NS
A	*Synaptomys cooperi*	Southern Bog Lemming				S3	4 Secure	10	2.2 ± 0.0	NS
A	*Pekania pennanti*	Fisher				S3	3 Sensitive	1	35.7 ± 0.0	NS
A	*Calidris maritima*	Purple Sandpiper				S3?N	3 Sensitive	26	47.8 ± 10.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	*Falco sparverius*	American Kestrel				S3B	4 Secure	221	2.5 ± 7.0	NS
A	*Charadrius vociferus*	Killdeer				S3B	3 Sensitive	185	2.5 ± 7.0	NS
A	*Gallinago delicata*	Wilson's Snipe				S3B	3 Sensitive	364	5.4 ± 0.0	NS
A	*Sterna paradisaea*	Arctic Tern				S3B	2 May Be At Risk	92	24.0 ± 0.0	NS
A	*Coccyzus erythropthalmus*	Black-billed Cuckoo				S3B	2 May Be At Risk	18	19.9 ± 7.0	NS
A	*Tyrannus tyrannus*	Eastern Kingbird				S3B	3 Sensitive	68	2.5 ± 7.0	NS
A	*Dumetella carolinensis*	Gray Catbird				S3B	2 May Be At Risk	124	2.5 ± 7.0	NS
A	*Cardellina pusilla*	Wilson's Warbler				S3B	3 Sensitive	87	8.2 ± 7.0	NS
A	*Tringa melanoleuca*	Greater Yellowlegs				S3B,S3S4M	3 Sensitive	477	7.3 ± 0.0	NS
A	*Rissa tridactyla*	Black-legged Kittiwake				S3B,S5N	3 Sensitive	76	64.0 ± 7.0	NS
A	*Fratercula arctica*	Atlantic Puffin				S3B,S5N	3 Sensitive	34	64.2 ± 0.0	NS
A	*Pluvialis squatarola*	Black-bellied Plover				S3M	4 Secure	344	36.2 ± 0.0	NS
A	*Tringa flavipes*	Lesser Yellowlegs				S3M	4 Secure	233	51.9 ± 0.0	NS
A	*Arenaria interpres*	Ruddy Turnstone				S3M	4 Secure	156	43.5 ± 0.0	NS
A	*Calidris pusilla*	Semipalmated Sandpiper				S3M	3 Sensitive	282	36.2 ± 0.0	NS
A	*Calidris fuscicollis*	White-rumped Sandpiper				S3M	4 Secure	160	43.5 ± 0.0	NS
A	*Limnodromus griseus*	Short-billed Dowitcher				S3M	4 Secure	162	51.9 ± 0.0	NS
A	*Calidris alba*	Sanderling				S3M,S2N	4 Secure	180	43.5 ± 0.0	NS
A	*Somateria mollissima*	Common Eider				S3S4	4 Secure	248	38.6 ± 7.0	NS
A	*Picoides arcticus*	Black-backed Woodpecker				S3S4	3 Sensitive	61	28.1 ± 7.0	NS
A	*Loxia curvirostra*	Red Crossbill				S3S4	4 Secure	31	22.5 ± 0.0	NS
A	*Sorex palustris*	American Water Shrew				S3S4	4 Secure	7	76.8 ± 1.0	NS
A	*Botaurus lentiginosus*	American Bittern				S3S4B	3 Sensitive	107	22.9 ± 7.0	NS
A	*Spatula discors*	Blue-winged Teal				S3S4B	2 May Be At Risk	89	8.2 ± 7.0	NS
A	*Actitis macularius*	Spotted Sandpiper				S3S4B	3 Sensitive	607	2.5 ± 7.0	NS
A	*Empidonax flaviventris*	Yellow-bellied Flycatcher				S3S4B	3 Sensitive	579	4.8 ± 0.0	NS
A	*Regulus calendula*	Ruby-crowned Kinglet				S3S4B	3 Sensitive	1443	2.5 ± 7.0	NS
A	*Catharus fuscescens*	Veery				S3S4B	4 Secure	148	5.6 ± 0.0	NS
A	*Catharus ustulatus*	Swainson's Thrush				S3S4B	4 Secure	950	4.7 ± 0.0	NS
A	*Oreothlypis peregrina*	Tennessee Warbler				S3S4B	3 Sensitive	136	16.7 ± 0.0	NS
A	*Setophaga castanea*	Bay-breasted Warbler				S3S4B	3 Sensitive	174	11.6 ± 7.0	NS
A	*Setophaga striata*	Blackpoll Warbler				S3S4B	3 Sensitive	191	16.6 ± 7.0	NS
A	*Passerella iliaca*	Fox Sparrow				S3S4B	4 Secure	263	11.6 ± 7.0	NS
A	*Mergus serrator*	Red-breasted Merganser				S3S4B,S5N	4 Secure	136	8.8 ± 7.0	NS
A	*Bucephala albeola*	Bufflehead				S3S4N	4 Secure	16	64.9 ± 11.0	NS
A	*Eremophila alpestris*	Horned Lark				SHB,S4S5N	4 Secure	2	75.1 ± 7.0	NS
A	*Morus bassanus*	Northern Gannet				SHB,S5M	4 Secure	38	38.6 ± 0.0	NS
A	*Aythya americana*	Redhead				SHB,SNAM	4 Secure	2	87.3 ± 15.0	NS
I	*Danaus plexippus*	Monarch	Endangered	Special Concern	Endangered	S2B	3 Sensitive	15	5.9 ± 0.0	NS
I	*Lampsilis cariosa*	Yellow Lampmussel	Special Concern	Special Concern	Threatened	S1	1 At Risk	37	55.7 ± 0.0	NS
I	*Alasmidonta varicosa*	Brook Floater	Special Concern		Threatened	S1S2	3 Sensitive	3	78.1 ± 0.0	NS
I	*Bombus terricola*	Yellow-banded Bumblebee	Special Concern		Vulnerable	S3	3 Sensitive	3	36.0 ± 0.0	NS
I	*Quedius spelaeus*	Spelean Rove Beetle				S1		1	60.6 ± 1.0	NS
I	*Papilio brevicauda bretonensis*	Short-tailed Swallowtail				S1	1 At Risk	15	25.2 ± 1.0	NS
I	*Somatochlora albicincta*	Ringed Emerald				S1	2 May Be At Risk	7	64.4 ± 0.0	NS
I	*Somatochlora brevicincta*	Quebec Emerald				S1	2 May Be At Risk	7	95.5 ± 0.0	NS
I	*Leucorrhinia patricia*	Canada Whiteface				S1	2 May Be At Risk	1	67.8 ± 0.0	NS
I	*Coenagrion interrogatum*	Subarctic Bluet				S1	2 May Be At Risk	2	43.8 ± 0.0	NS
I	*Leptodea ochracea*	Tidewater Mucket				S1	3 Sensitive	17	54.5 ± 1.0	NS
I	*Lycaena dorcas*	Dorcas Copper				S1?	6 Not Assessed	24	12.4 ± 0.0	NS
I	*Polygonia satyrus*	Satyr Comma				S1?	3 Sensitive	1	67.8 ± 1.0	NS
I	*Strymon melinus*	Grey Hairstreak				S1S2	4 Secure	1	39.0 ± 0.0	NS
I	*Nymphalis l-album*	Compton Tortoiseshell				S1S2	4 Secure	1	35.5 ± 1.0	NS
I	*Haematopota rara*	Shy Cleg				S1S3	5 Undetermined	2	49.9 ± 0.0	NS
I	*Lycaena dospassosi*	Salt Marsh Copper				S2	1 At Risk	1	31.9 ± 0.0	NS
I	*Boloria chariclea grandis*	Purple Lesser Fritillary				S2	3 Sensitive	7	31.5 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
I	*Aglais milberti milberti*	Milbert's Tortoise Shell				S2	4 Secure	1	25.2 ± 1.0	NS
I	*Somatochlora septentrionalis*	Muskeg Emerald				S2	3 Sensitive	28	28.4 ± 0.0	NS
I	*Somatochlora williamsoni*	Williamson's Emerald				S2	2 May Be At Risk	10	28.7 ± 0.0	NS
I	*Margaritifera margaritifera*	Eastern Pearlshell				S2	3 Sensitive	97	20.1 ± 0.0	NS
I	*Pantala hymenaea*	Spot-Winged Glider				S2?B	3 Sensitive	2	31.5 ± 0.0	NS
I	*Thorybes pylades*	Northern Cloudywing				S2S3	3 Sensitive	4	20.9 ± 0.0	NS
I	*Euphydryas phaeton*	Baltimore Checkerspot				S2S3	4 Secure	9	17.5 ± 1.0	NS
I	*Gomphus descriptus*	Harpoon Clubtail				S2S3	3 Sensitive	16	14.4 ± 0.0	NS
I	*Ophiogomphus aspersus*	Brook Snaketail				S2S3	2 May Be At Risk	5	21.6 ± 0.0	NS
I	*Ophiogomphus mainensis*	Maine Snaketail				S2S3	2 May Be At Risk	1	98.2 ± 0.0	NS
I	*Somatochlora forcipata*	Forcipate Emerald				S2S3	2 May Be At Risk	9	17.6 ± 1.0	NS
I	*Alasmidonta undulata*	Triangle Floater				S2S3	4 Secure	5	49.9 ± 0.0	NS
I	*Iphthiminus opacus*	a Darkling Beetle				S3		1	14.8 ± 0.0	NS
I	*Speyeria aphrodite*	Aphrodite Fritillary				S3	4 Secure	2	74.7 ± 1.0	NS
I	*Polygonia faunus*	Green Comma				S3	4 Secure	13	21.7 ± 0.0	NS
I	*Oeneis jutta*	Jutta Arctic				S3	2 May Be At Risk	10	17.2 ± 0.0	NS
I	*Aeshna clepsydra*	Mottled Darner				S3	4 Secure	1	43.7 ± 0.0	NS
I	*Boyeria grafiana*	Ocellated Darner				S3	3 Sensitive	1	67.5 ± 1.0	NS
I	*Gomphaeschna furcillata*	Harlequin Darner				S3	3 Sensitive	3	14.4 ± 0.0	NS
I	*Somatochlora tenebrosa*	Clamp-Tipped Emerald				S3	4 Secure	2	38.7 ± 0.0	NS
I	*Nannothemis bella*	Elfin Skimmer				S3	4 Secure	3	36.1 ± 0.0	NS
I	*Sympetrum danae*	Black Meadowhawk				S3	3 Sensitive	15	33.1 ± 1.0	NS
I	*Enallagma vernale*	Vernal Bluet				S3	5 Undetermined	8	14.4 ± 0.0	NS
I	*Amphiagrion saucium*	Eastern Red Damsel				S3	4 Secure	23	8.2 ± 1.0	NS
I	*Polygonia interrogationis*	Question Mark				S3B	4 Secure	16	25.2 ± 1.0	NS
I	*Erynnis juvenalis*	Juvenal's Duskywing				S3S4	4 Secure	1	84.3 ± 1.0	NS
I	*Polygonia progne*	Grey Comma				S3S4	4 Secure	15	17.7 ± 0.0	NS
I	*Lanthus parvulus*	Northern Pygmy Clubtail				S3S4	4 Secure	20	17.6 ± 1.0	NS
I	*Lampsilis radiata*	Eastern Lampmussel				S3S4	3 Sensitive	13	21.7 ± 0.0	NS
N	*Erioderma pedicellatum (Atlantic pop.)*	Boreal Felt Lichen - Atlantic pop.	Endangered	Endangered	Endangered	S1	1 At Risk	280	10.9 ± 0.0	NS
N	*Pannaria lurida*	Wrinkled Shingle Lichen	Threatened		Threatened	S1S2	2 May Be At Risk	1	42.4 ± 0.0	NS
N	*Sclerophora peronella (Nova Scotia pop.)*	Frosted Glass-whiskers Lichen - Nova Scotia pop.	Special Concern	Special Concern		S1?		5	47.2 ± 0.0	NS
N	*Degelia plumbea*	Blue Felt Lichen	Special Concern	Special Concern	Vulnerable	S3	4 Secure	73	6.5 ± 0.0	NS
N	*Cladonia brevis*	Short Peg Lichen				S1		1	51.0 ± 0.0	NS
N	*Peltigera lepidophora*	Scaly Pelt Lichen				S1	2 May Be At Risk	2	13.0 ± 0.0	NS
N	*Gowardia nigricans*	Gray Witch's Beard Lichen				S1	6 Not Assessed	1	82.0 ± 1.0	NS
N	*Cavernularia hultenii*	Powdered Honeycomb Lichen				S1	2 May Be At Risk	1	94.1 ± 1.0	NS
N	*Metacalypogeia schusterana*	Schuster's Pouchwort				S1?	5 Undetermined	1	31.4 ± 0.0	NS
N	*Moerckia hibernica*	Irish Ruffwort				S1?		1	31.4 ± 0.0	NS
N	*Brachythecium erythrorrhizon*	Taiga Ragged Moss				S1?		2	31.3 ± 0.0	NS
N	*Calliergon richardsonii*	Richardson's Spear Moss				S1?		1	87.7 ± 0.0	NS
N	*Conardia compacta*	Coast Creeping Moss				S1?	3 Sensitive	2	25.3 ± 2.0	NS
N	*Dicranum elongatum*	Long-forked Broom Moss				S1?	3 Sensitive	3	99.4 ± 0.0	NS
N	*Dicranum groenlandicum*	Mountain Broom Moss				S1?	3 Sensitive	1	99.4 ± 0.0	NS
N	*Entodon concinnus*	Lime Entodon Moss				S1?	3 Sensitive	2	82.6 ± 0.0	NS
N	*Grimmia laevigata*	a Moss				S1?	3 Sensitive	2	77.5 ± 0.0	NS
N	*Grimmia pilifera*	a Moss				S1?	3 Sensitive	2	82.6 ± 0.0	NS
N	*Hygrohypnum smithii*	Smith's Brook Moss				S1?	3 Sensitive	1	82.9 ± 0.0	NS
N	*Orthothecium strictum*	Shiny Erect-capsule Moss				S1?	3 Sensitive	2	82.6 ± 0.0	NS
N	*Paludella squarrosa*	Tufted Fen Moss				S1?	3 Sensitive	1	25.3 ± 5.0	NS
N	*Seligeria recurvata*	a Moss				S1?	3 Sensitive	1	96.1 ± 1.0	NS
N	*Seligeria tristichoides*	a Moss				S1?	3 Sensitive	1	96.1 ± 1.0	NS
N	*Timmia norvegica*	a moss				S1?	3 Sensitive	1	89.2 ± 50.0	NS
N	*Syntrichia ruralis*	a Moss				S1?	3 Sensitive	1	54.6 ± 1.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
N	*Ulota curvifolia*	a Moss				S1?	3 Sensitive	1	77.5 ± 0.0	NS
N	*Plagiomnium ellipticum*	Marsh Leafy Moss				S1?	2 May Be At Risk	1	82.6 ± 2.0	NS
N	*Flavocetraria nivalis*	Crinkled Snow Lichen				S1?	3 Sensitive	1	65.1 ± 0.0	NS
N	*Parmeliella parvula*	Poor-man's Shingles Lichen				S1?	2 May Be At Risk	6	50.1 ± 0.0	NS
N	*Buxbaumia minakatae*	Hump-Backed Elves				S1S2	3 Sensitive	1	29.9 ± 100.0	NS
N	*Ctenidium molluscum*	Mollusc Ctenidium moss				S1S2		1	75.5 ± 1.0	NS
N	*Dicranodontium denudatum*	Beaked Bow Moss				S1S2	3 Sensitive	3	82.6 ± 0.0	NS
N	*Dicranoweisia crispula*	Mountain Thatch Moss				S1S2	3 Sensitive	1	73.6 ± 0.0	NS
N	*Didymodon ferrugineus*	a moss				S1S2	3 Sensitive	2	94.4 ± 0.0	NS
N	*Hypnum pratense*	Meadow Plait Moss				S1S2	3 Sensitive	1	99.8 ± 1.0	NS
N	*Mnium thomsonii*	Thomson's Leafy Moss				S1S2	3 Sensitive	2	94.4 ± 0.0	NS
N	*Plagiobryum zieri*	a Moss				S1S2	3 Sensitive	6	82.6 ± 0.0	NS
N	*Platydictya confervoides*	a Moss				S1S2	3 Sensitive	1	55.6 ± 3.0	NS
N	*Seligeria calcarea*	Chalk Brittle Moss				S1S2	3 Sensitive	2	94.4 ± 0.0	NS
N	*Sphagnum platyphyllum*	Flat-leaved Peat Moss				S1S2		2	17.4 ± 0.0	NS
N	*Hamatocaulis vernicosus*	a Moss				S1S2	3 Sensitive	2	12.5 ± 0.0	NS
N	*Schistidium trichodon*	a Moss				S1S2	3 Sensitive	2	94.4 ± 0.0	NS
N	*Anacamptodon splachnoides*	a Moss				S2?	3 Sensitive	1	95.2 ± 1.0	NS
N	*Anomodon viticulosus*	a Moss				S2?	3 Sensitive	7	94.4 ± 0.0	NS
N	*Atrichum angustatum*	Lesser Smoothcap Moss				S2?	3 Sensitive	3	35.2 ± 30.0	NS
N	*Campylium polygamum*	a Moss				S2?	5 Undetermined	1	93.1 ± 2.0	NS
N	*Campylium radicale*	Long-stalked Fine Wet Moss				S2?	5 Undetermined	1	16.7 ± 0.0	NS
N	*Dicranum condensatum*	Condensed Broom Moss				S2?	5 Undetermined	1	95.5 ± 0.0	PE
N	*Fontinalis hypnoides*	a moss				S2?	5 Undetermined	2	84.2 ± 1.0	NS
N	*Fontinalis sullivantii*	a Moss				S2?	3 Sensitive	1	29.9 ± 100.0	NS
N	*Grimmia anomala*	Mountain Forest Grimmia				S2?	3 Sensitive	3	50.9 ± 0.0	NS
N	*Hygrohypnum bestii*	Best's Brook Moss				S2?	3 Sensitive	2	97.7 ± 0.0	NS
N	*Kiaeria starkei*	Starke's Fork Moss				S2?	3 Sensitive	1	96.1 ± 1.0	NS
N	*Orthotrichum anomalum*	Anomalous Bristle Moss				S2?	3 Sensitive	1	77.5 ± 0.0	NS
N	*Philonotis marchica*	a Moss				S2?	5 Undetermined	2	94.8 ± 5.0	NS
N	*Platydictya jungermannioides*	False Willow Moss				S2?	3 Sensitive	4	30.9 ± 0.0	NS
N	*Pseudoleskea patens*	Patent Leskea Moss				S2?	3 Sensitive	5	89.4 ± 0.0	NS
N	*Pseudoleskea stenophylla*	Narrow-leaved Leskea Moss				S2?	3 Sensitive	7	92.0 ± 1.0	NS
N	*Rhytidium rugosum*	Wrinkle-leaved Moss				S2?	3 Sensitive	4	81.8 ± 0.0	NS
N	*Scorpidium scorpioides*	Hooked Scorpion Moss				S2?	3 Sensitive	9	6.4 ± 0.0	NS
N	*Seligeria donniana*	Donian Beardless Moss				S2?	3 Sensitive	3	93.1 ± 2.0	NS
N	*Sematophyllum marylandicum*	a Moss				S2?	3 Sensitive	4	82.6 ± 0.0	NS
N	*Sphagnum subnitens*	Lustrous Peat Moss				S2?	3 Sensitive	1	98.1 ± 5.0	NS
N	*Tetraplodon angustatus*	Toothed-leaved Nitrogen Moss				S2?	3 Sensitive	2	86.8 ± 0.0	NS
N	*Tortella fragilis*	Fragile Twisted Moss				S2?	3 Sensitive	6	31.1 ± 0.0	NS
N	*Anomobryum filiforme*	a moss				S2?		5	81.8 ± 0.0	NS
N	*Cyrtomnium hymenophylloides*	Short-pointed Lantern Moss				S2?	3 Sensitive	6	31.7 ± 0.0	NS
N	*Platylomella lescurii*	a Moss				S2?	3 Sensitive	2	82.6 ± 1.0	NS
N	*Nephroma arcticum*	Arctic Kidney Lichen				S2?	2 May Be At Risk	1	33.0 ± 0.0	NS
N	*Peltigera collina*	Tree Pelt Lichen				S2?	3 Sensitive	16	17.8 ± 0.0	NS
N	*Platydictya subtilis*	Bark Willow Moss				S2S3	3 Sensitive	1	89.4 ± 0.0	NS
N	*Tetraplodon mnioides*	Entire-leaved Nitrogen Moss				S2S3	4 Secure	9	82.6 ± 0.0	NS
N	*Limprichtia revolvens*	a Moss				S2S3	3 Sensitive	6	12.3 ± 0.0	NS
N	*Cetraria muricata*	Spiny Heath Lichen				S2S3	5 Undetermined	4	82.0 ± 1.0	NS
N	*Fuscopannaria leucosticta*	Rimmed Shingles Lichen				S2S3	2 May Be At Risk	1	52.1 ± 0.0	NS
N	*Leptogium tenuissimum*	Birdnest Jellyskin Lichen				S2S3	6 Not Assessed	2	13.0 ± 0.0	NS
N	*Racodium rupestre*	Rockhair Lichen				S2S3	5 Undetermined	1	88.1 ± 0.0	NS
N	*Usnea mutabilis*	Bloody Beard Lichen				S2S3	3 Sensitive	1	19.6 ± 0.0	NS
N	*Collema tenax*	Soil Tarpaper Lichen				S3		2	12.9 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
N	*Sticta fuliginosa*	Peppered Moon Lichen				S3	3 Sensitive	3	46.2 ± 0.0	NS
N	*Fuscopannaria ahlneri*	Corrugated Shingles Lichen				S3	4 Secure	36	18.7 ± 0.0	NS
N	*Heterodermia speciosa*	Powdered Fringe Lichen				S3	4 Secure	1	51.8 ± 0.0	NS
N	*Leptogium corticola*	Blistered Jellyskin Lichen				S3	3 Sensitive	1	49.8 ± 0.0	NS
N	*Leptogium lichenoides*	Tattered Jellyskin Lichen				S3	2 May Be At Risk	2	13.0 ± 0.0	NS
N	*Nephroma bellum*	Naked Kidney Lichen				S3	3 Sensitive	1	33.0 ± 0.0	NS
N	*Platismatia norvegica*	Oldgrowth Rag Lichen				S3	4 Secure	128	43.7 ± 0.0	NS
N	*Moelleropsis nebulosa*	Blue-gray Moss Shingle Lichen				S3	4 Secure	10	41.3 ± 0.0	NS
N	*Calliergon giganteum*	Giant Spear Moss				S3?	3 Sensitive	1	6.6 ± 0.0	NS
N	*Drummondia prorepens*	a Moss				S3?	3 Sensitive	5	72.9 ± 2.0	NS
N	*Anomodon tristis*	a Moss				S3?	3 Sensitive	2	73.3 ± 0.0	NS
N	*Mnium stellare*	Star Leafy Moss				S3?	5 Undetermined	2	31.3 ± 0.0	NS
N	*Anomodon rugelii*	Rugel's Anomodon Moss				S3S4	3 Sensitive	1	94.5 ± 0.0	NS
N	*Dicranella varia*	a Moss				S3S4	5 Undetermined	2	17.7 ± 0.0	NS
N	*Dicranum leioneuron*	a Dicranum Moss				S3S4	4 Secure	10	82.6 ± 0.0	NS
N	*Encalypta procera*	Slender Extinguisher Moss				S3S4	4 Secure	5	30.0 ± 0.0	NS
N	*Myurella julacea*	Small Mouse-tail Moss				S3S4	3 Sensitive	2	82.6 ± 0.0	NS
N	*Sphagnum lindbergii*	Lindberg's Peat Moss				S3S4	4 Secure	1	89.8 ± 0.0	NS
N	*Splachnum ampullaceum*	Cruet Dung Moss				S3S4	4 Secure	2	86.8 ± 0.0	NS
N	*Thamnobryum alleghaniense*	a Moss				S3S4	3 Sensitive	6	75.5 ± 1.0	NS
N	*Schistidium agassizii*	Elf Bloom Moss				S3S4	4 Secure	4	73.6 ± 0.0	NS
N	*Hylocomiastrum pyrenaicum*	a Feather Moss				S3S4	3 Sensitive	1	24.4 ± 3.0	NS
N	*Arctoparmelia incurva*	Finger Ring Lichen				S3S4	4 Secure	3	82.0 ± 1.0	NS
N	*Hypogymnia vittata*	Slender Monk's Hood Lichen				S3S4	4 Secure	72	45.4 ± 0.0	NS
N	*Cladonia floerkeana*	Gritty British Soldiers Lichen				S3S4	5 Undetermined	3	48.2 ± 0.0	NS
N	*Leptogium acadiense*	Acadian Jellyskin Lichen				S3S4		1	44.4 ± 0.0	NS
N	*Coccocarpia palmicola*	Salted Shell Lichen				S3S4	4 Secure	309	33.4 ± 0.0	NS
N	*Anaptychia palmulata*	Shaggy Fringed Lichen				S3S4	4 Secure	5	86.0 ± 0.0	NS
N	*Heterodermia neglecta*	Fringe Lichen				S3S4	4 Secure	6	14.6 ± 2.0	NS
P	*Juncus caesariensis*	New Jersey Rush	Special Concern	Special Concern	Vulnerable	S2	3 Sensitive	239	46.3 ± 0.0	NS
P	*Isoetes prototypus*	Prototype Quillwort	Special Concern	Special Concern	Vulnerable	S2	3 Sensitive	13	59.1 ± 0.0	NS
P	*Floerkea proserpinacoides*	False Mermaidweed	Not At Risk			S2	3 Sensitive	21	27.1 ± 1.0	NS
P	*Salix candida*	Sage Willow			Endangered	S1	2 May Be At Risk	42	27.2 ± 0.0	NS
P	*Thuja occidentalis*	Eastern White Cedar			Vulnerable	S1	1 At Risk	3	87.0 ± 7.0	NS
P	*Acer saccharinum*	Silver Maple				S1	5 Undetermined	1	64.8 ± 0.0	NS
P	*Sanicula odorata*	Clustered Sanicle				S1	2 May Be At Risk	6	24.9 ± 1.0	NS
P	*Zizia aurea*	Golden Alexanders				S1	2 May Be At Risk	7	77.0 ± 1.0	NS
P	*Arnica lonchophylla*	Northern Arnica				S1	2 May Be At Risk	11	38.6 ± 7.0	NS
P	*Bidens hyperborea*	Estuary Beggarticks				S1	2 May Be At Risk	3	42.2 ± 7.0	NS
P	*Nabalus racemosus*	Glaucous Rattlesnakeroot				S1	2 May Be At Risk	1	68.5 ± 3.0	NS
P	*Ageratina altissima*	White Snakeroot				S1	2 May Be At Risk	2	76.4 ± 1.0	NS
P	*Betula glandulosa*	Glandular Birch				S1	2 May Be At Risk	5	78.3 ± 7.0	NS
P	*Cardamine dentata*	Toothed Bittercress				S1	2 May Be At Risk	5	18.0 ± 0.0	NS
P	*Cochlearia tridactylites*	Limestone Scurvy-grass				S1	2 May Be At Risk	4	83.6 ± 0.0	NS
P	*Draba glabella*	Rock Whitlow-Grass				S1	2 May Be At Risk	3	77.6 ± 0.0	NS
P	*Draba norvegica*	Norwegian Whitlow-Grass				S1	2 May Be At Risk	8	50.5 ± 2.0	NS
P	*Stellaria crassifolia*	Fleshy Stitchwort				S1	2 May Be At Risk	2	10.1 ± 2.0	NS
P	*Hudsonia tomentosa*	Woolly Beach-heath				S1	2 May Be At Risk	7	71.2 ± 1.0	NS
P	*Diapensia lapponica*	Diapensia				S1	2 May Be At Risk	1	74.3 ± 0.0	NS
P	*Kalmia procumbens*	Alpine Azalea				S1	2 May Be At Risk	1	98.9 ± 0.0	NS
P	*Pinguicula vulgaris*	Common Butterwort				S1	2 May Be At Risk	6	74.3 ± 1.0	NS
P	*Utricularia ochroleuca*	Yellowish-white Bladderwort				S1	5 Undetermined	1	57.9 ± 1.0	NS
P	*Oxyria digyna*	Mountain Sorrel				S1	2 May Be At Risk	8	91.1 ± 0.0	NS
P	*Bistorta vivipara*	Alpine Bistort				S1	2 May Be At Risk	1	37.8 ± 1.0	NS
P	*Montia fontana*	Water Blinks				S1	2 May Be At Risk	2	48.0 ± 1.0	NS
P	*Anemone multifida*	Cut-leaved Anemone				S1	2 May Be At Risk	4	76.7 ± 1.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	*Potentilla litoralis*	Coastal Cinquefoil				S1	0.1 Extirpated	4	81.8 ± 1.0	NS
P	*Salix vestita*	Hairy Willow				S1	2 May Be At Risk	1	82.8 ± 0.0	NS
P	*Saxifraga aizoides*	Yellow Mountain Saxifrage				S1	2 May Be At Risk	8	82.8 ± 0.0	NS
P	*Saxifraga oppositifolia*	Purple Mountain Saxifrage				S1	2 May Be At Risk	2	82.3 ± 1.0	NS
P	*Agalinis purpurea var. parviflora*	Small-flowered Purple False Foxglove				S1		1	16.3 ± 0.0	NS
P	*Pedicularis palustris*	Marsh Lousewort				S1	2 May Be At Risk	3	93.0 ± 0.0	NS
P	*Scrophularia lanceolata*	Lance-leaved Figwort				S1	5 Undetermined	2	30.3 ± 1.0	NS
P	*Carex alopecoidea*	Foxtail Sedge				S1	2 May Be At Risk	2	70.3 ± 0.0	NS
P	*Carex granularis*	Limestone Meadow Sedge				S1	2 May Be At Risk	21	5.9 ± 0.0	NS
P	*Carex gynocrates*	Northern Bog Sedge				S1	2 May Be At Risk	16	6.5 ± 0.0	NS
P	*Carex haydenii*	Hayden's Sedge				S1	2 May Be At Risk	2	16.2 ± 0.0	NS
P	*Carex rariflora*	Loose-flowered Alpine Sedge				S1	2 May Be At Risk	10	82.1 ± 5.0	NS
P	*Carex tenuiflora*	Sparse-Flowered Sedge				S1	2 May Be At Risk	3	49.6 ± 0.0	NS
P	*Carex tincta*	Tinged Sedge				S1	2 May Be At Risk	1	70.3 ± 1.0	NS
P	*Carex viridula var. elatior*	Greenish Sedge				S1	2 May Be At Risk	54	4.4 ± 0.0	NS
P	*Carex grisea*	Inflated Narrow-leaved Sedge				S1	2 May Be At Risk	6	80.8 ± 0.0	NS
P	*Carex saxatilis*	Russet Sedge				S1	2 May Be At Risk	7	91.7 ± 7.0	NS
P	*Cyperus lupulinus*	Hop Flatsedge				S1	2 May Be At Risk	5	70.5 ± 0.0	NS
P	*Cyperus lupulinus ssp. macilentus*	Hop Flatsedge				S1	2 May Be At Risk	8	71.1 ± 1.0	NS
P	*Eleocharis erythropoda*	Red-stemmed Spikerush				S1	2 May Be At Risk	6	4.6 ± 0.0	NS
P	*Rhynchospora capillacea*	Slender Beakrush				S1	2 May Be At Risk	8	10.8 ± 10.0	NS
P	*Blysmopsis rufa*	Red Bulrush				S1	2 May Be At Risk	1	69.2 ± 1.0	NS
P	*Iris prismatica*	Slender Blue Flag				S1	2 May Be At Risk	2	30.0 ± 0.0	NS
P	*Triantha glutinosa*	Sticky False-Asphodel				S1	2 May Be At Risk	15	27.2 ± 0.0	NS
P	*Malaxis monophyllos*	White Adder's-mouth				S1	2 May Be At Risk	1	61.6 ± 7.0	NS
P	*Bromus latiglumis*	Broad-Glumed Brome				S1	2 May Be At Risk	11	34.6 ± 0.0	NS
P	*Elymus wiegandii*	Wiegand's Wild Rye				S1	2 May Be At Risk	9	34.9 ± 0.0	NS
P	*Elymus hystrix*	Spreading Wild Rye				S1	2 May Be At Risk	1	88.0 ± 4.0	NS
P	*Hordeum brachyantherum*	Meadow Barley				S1	2 May Be At Risk	1	56.9 ± 0.0	NS
P	*Phleum alpinum*	Alpine Timothy				S1	2 May Be At Risk	7	55.3 ± 0.0	NS
P	*Torreyochloa pallida var. pallida*	Pale False Manna Grass				S1	0.1 Extirpated	2	67.7 ± 1.0	NS
P	*Graphephorum melicoides*	Purple False Oats				S1	2 May Be At Risk	4	44.6 ± 0.0	NS
P	*Sparganium androcladum*	Branching Bur-Reed				S1	2 May Be At Risk	2	14.0 ± 0.0	NS
P	*Equisetum palustre*	Marsh Horsetail				S1	2 May Be At Risk	8	32.7 ± 0.0	NS
P	*Botrychium lunaria*	Common Moonwort				S1	2 May Be At Risk	2	57.9 ± 1.0	NS
P	*Epilobium lactiflorum*	White-flowered Willowherb				S1?	2 May Be At Risk	1	90.4 ± 5.0	NS
P	*Bolboschoenus robustus*	Sturdy Bulrush				S1?	5 Undetermined	2	24.7 ± 5.0	NS
P	*Dichanthelium lindheimeri*	Lindheimer's Panicgrass				S1?	5 Undetermined	1	90.9 ± 1.0	NS
P	*Huperzia selago*	Northern Firmoss				S1?	2 May Be At Risk	2	64.5 ± 2.0	NS
P	*Fraxinus nigra*	Black Ash			Threatened	S1S2	1 At Risk	98	4.5 ± 0.0	NS
P	*Rudbeckia laciniata*	Cut-Leaved Coneflower				S1S2	2 May Be At Risk	1	78.2 ± 7.0	NS
P	*Arabis pycnocarpa*	Cream-flowered Rockcress				S1S2	2 May Be At Risk	7	57.3 ± 0.0	NS
P	*Cornus suecica*	Swedish Bunchberry				S1S2	3 Sensitive	23	72.6 ± 6.0	NS
P	*Anemone virginiana var. alba*	Virginia Anemone				S1S2	3 Sensitive	8	7.7 ± 1.0	NS
P	*Ranunculus sceleratus*	Cursed Buttercup				S1S2	2 May Be At Risk	6	32.5 ± 7.0	NS
P	*Parnassia parviflora*	Small-flowered Grass-of-Parnassus				S1S2	2 May Be At Risk	17	33.3 ± 3.0	NS
P	*Carex livida*	Livid Sedge				S1S2	2 May Be At Risk	27	41.8 ± 5.0	NS
P	*Juncus greenei*	Greene's Rush				S1S2	2 May Be At Risk	1	71.2 ± 1.0	NS
P	*Juncus alpinoarticulatus ssp. Rariflorus*					S1S2	2 May Be At Risk	13	16.0 ± 0.0	NS
P	*Juncus bulbosus*	Bulbous Rush				S1S2	5 Undetermined	12	73.9 ± 0.0	NS
P	*Platanthera huronensis*	Fragrant Green Orchid				S1S2	5 Undetermined	4	13.0 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	*Calamagrostis stricta ssp. stricta*	Slim-stemmed Reed Grass				S1S2	3 Sensitive	2	25.4 ± 1.0	NS
P	*Cinna arundinacea*	Sweet Wood Reed Grass				S1S2	2 May Be At Risk	24	33.0 ± 0.0	NS
P	*Festuca prolifera*	Proliferous Fescue				S1S2	3 Sensitive	6	73.2 ± 1.0	NS
P	*Sparganium hyperboreum*	Northern Burreed				S1S2	3 Sensitive	13	30.3 ± 1.0	NS
P	*Cryptogramma stelleri*	Steller's Rockbrake				S1S2	2 May Be At Risk	17	8.5 ± 0.0	NS
P	*Woodsia alpina*	Alpine Cliff Fern				S1S2	2 May Be At Risk	10	59.6 ± 2.0	NS
P	*Selaginella selaginoides*	Low Spikemoss				S1S2	2 May Be At Risk	5	44.5 ± 0.0	NS
P	*Carex vacillans*	Estuarine Sedge				S1S3	5 Undetermined	2	70.3 ± 0.0	NS
P	*Conioselinum chinense*	Chinese Hemlock-parsley				S2	3 Sensitive	3	82.6 ± 0.0	NS
P	*Osmorhiza longistylis*	Smooth Sweet Cicely				S2	2 May Be At Risk	21	8.1 ± 10.0	NS
P	*Erigeron philadelphicus*	Philadelphia Fleabane				S2	3 Sensitive	8	7.6 ± 0.0	NS
P	*Solidago multiradiata*	Multi-rayed Goldenrod				S2	2 May Be At Risk	11	66.1 ± 2.0	NS
P	*Symphyotrichum ciliolatum*	Fringed Blue Aster				S2	3 Sensitive	1	51.5 ± 7.0	NS
P	*Impatiens pallida*	Pale Jewelweed				S2	3 Sensitive	10	8.2 ± 7.0	NS
P	*Caulophyllum thalictroides*	Blue Cohosh				S2	2 May Be At Risk	19	21.1 ± 0.0	NS
P	*Boechera stricta*	Drummond's Rockcress				S2	3 Sensitive	6	52.5 ± 0.0	NS
P	*Cardamine parviflora*	Small-flowered Bittercress				S2	3 Sensitive	9	62.0 ± 1.0	NS
P	*Draba arabisans*	Rock Whitlow-Grass				S2	3 Sensitive	14	14.6 ± 1.0	NS
P	*Lobelia kalmii*	Brook Lobelia				S2	2 May Be At Risk	95	4.4 ± 0.0	NS
P	*Stellaria humifusa*	Saltmarsh Starwort				S2	3 Sensitive	5	82.6 ± 0.0	NS
P	*Stellaria longifolia*	Long-leaved Starwort				S2	3 Sensitive	1	34.6 ± 0.0	NS
P	*Oxybasis rubra*	Red Goosefoot				S2	2 May Be At Risk	4	40.0 ± 2.0	NS
P	*Hudsonia ericoides*	Pinebarren Golden Heather				S2	3 Sensitive	11	83.9 ± 1.0	NS
P	*Hypericum majus*	Large St John's-wort				S2	3 Sensitive	2	13.1 ± 1.0	NS
P	*Crassula aquatica*	Water Pygmyweed				S2	3 Sensitive	6	40.3 ± 7.0	NS
P	*Oxytropis campestris var. johannensis*	Field Locoweed				S2	2 May Be At Risk	5	77.6 ± 0.0	NS
P	*Myriophyllum farwellii*	Farwell's Water Milfoil				S2	3 Sensitive	1	54.1 ± 7.0	NS
P	*Myriophyllum verticillatum*	Whorled Water Milfoil				S2	3 Sensitive	6	5.4 ± 0.0	NS
P	*Utricularia resupinata*	Inverted Bladderwort				S2	3 Sensitive	1	45.4 ± 0.0	NS
P	*Oenothera fruticosa ssp. tetragona*	Narrow-leaved Evening Primrose				S2	5 Undetermined	1	27.2 ± 1.0	NS
P	*Rumex triangulivalvis*	Triangular-valve Dock				S2	3 Sensitive	10	8.2 ± 7.0	NS
P	*Primula mistassinica*	Mistassini Primrose				S2	3 Sensitive	10	73.6 ± 1.0	NS
P	*Anemonastrum canadense*	Canada Anemone				S2	2 May Be At Risk	10	51.3 ± 3.0	NS
P	*Anemone quinquefolia*	Wood Anemone				S2	3 Sensitive	4	22.8 ± 1.0	NS
P	*Anemone virginiana*	Virginia Anemone				S2	3 Sensitive	23	24.8 ± 0.0	NS
P	*Caltha palustris*	Yellow Marsh Marigold				S2	3 Sensitive	35	20.3 ± 0.0	NS
P	*Galium labradoricum*	Labrador Bedstraw				S2	3 Sensitive	93	3.6 ± 0.0	NS
P	*Salix pedicellaris*	Bog Willow				S2	3 Sensitive	12	18.1 ± 0.0	NS
P	*Comandra umbellata*	Bastard's Toadflax				S2	2 May Be At Risk	28	12.1 ± 7.0	NS
P	*Saxifraga paniculata ssp. Laestadii*	Laestadius' Saxifrage				S2	3 Sensitive	16	18.1 ± 7.0	NS
P	*Viola nephrophylla*	Northern Bog Violet				S2	3 Sensitive	11	15.0 ± 0.0	NS
P	*Carex bebbii*	Bebb's Sedge				S2	3 Sensitive	30	4.5 ± 0.0	NS
P	*Carex capillaris*	Hairlike Sedge				S2	3 Sensitive	14	74.6 ± 1.0	NS
P	*Carex castanea*	Chestnut Sedge				S2	2 May Be At Risk	24	12.0 ± 0.0	NS
P	*Carex comosa*	Bearded Sedge				S2	3 Sensitive	1	37.3 ± 1.0	NS
P	*Carex hystericina*	Porcupine Sedge				S2	2 May Be At Risk	37	10.7 ± 5.0	NS
P	*Carex scirpoidea*	Scirpuslike Sedge				S2	3 Sensitive	13	53.0 ± 4.0	NS
P	*Carex tenera*	Tender Sedge				S2	3 Sensitive	3	56.0 ± 1.0	NS
P	*Carex tuckermanii*	Tuckerman's Sedge				S2	3 Sensitive	2	28.9 ± 0.0	NS
P	*Carex atratiformis*	Scabrous Black Sedge				S2	3 Sensitive	19	8.2 ± 7.0	NS
P	*Eleocharis quinqueflora*	Few-flowered Spikerush				S2	3 Sensitive	30	6.4 ± 0.0	NS
P	*Vallisneria americana*	Wild Celery				S2	2 May Be At Risk	2	60.3 ± 10.0	NS
P	*Juncus stygius ssp.*	Moor Rush				S2	3 Sensitive	38	36.3 ± 7.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
	americanus									
P	*Allium schoenoprasum*	Wild Chives				S2	2 May Be At Risk	1	65.0 ± 0.0	NS
P	*Allium schoenoprasum var. sibiricum*	Wild Chives				S2	2 May Be At Risk	8	48.6 ± 7.0	NS
P	*Lilium canadense*	Canada Lily				S2	2 May Be At Risk	20	8.6 ± 1.0	NS
P	*Cypripedium parviflorum var. pubescens*	Yellow Lady's-slipper				S2	3 Sensitive	12	6.7 ± 0.0	NS
P	*Cypripedium parviflorum var. makasin*	Small Yellow Lady's-Slipper				S2	3 Sensitive	18	4.8 ± 0.0	NS
P	*Cypripedium reginae*	Showy Lady's-Slipper				S2	2 May Be At Risk	360	6.5 ± 0.0	NS
P	*Platanthera macrophylla*	Large Round-Leaved Orchid				S2	3 Sensitive	1	96.5 ± 0.0	NS
P	*Spiranthes lucida*	Shining Ladies'-Tresses				S2	2 May Be At Risk	26	24.7 ± 0.0	NS
P	*Calamagrostis stricta*	Slim-stemmed Reed Grass				S2	3 Sensitive	5	93.1 ± 0.0	PE
P	*Piptatheropsis canadensis*	Canada Ricegrass				S2	3 Sensitive	1	67.8 ± 0.0	NS
P	*Piptatheropsis pungens*	Slender Ricegrass				S2	3 Sensitive	1	81.9 ± 10.0	NS
P	*Potamogeton friesii*	Fries' Pondweed				S2	2 May Be At Risk	8	28.6 ± 0.0	NS
P	*Potamogeton richardsonii*	Richardson's Pondweed				S2	2 May Be At Risk	9	3.8 ± 0.0	NS
P	*Cystopteris laurentiana*	Laurentian Bladder Fern				S2	2 May Be At Risk	23	8.2 ± 10.0	NS
P	*Dryopteris fragrans*	Fragrant Wood Fern				S2	3 Sensitive	11	46.9 ± 7.0	NS
P	*Polystichum lonchitis*	Northern Holly Fern				S2	3 Sensitive	21	8.8 ± 7.0	NS
P	*Woodsia glabella*	Smooth Cliff Fern				S2	3 Sensitive	24	8.2 ± 7.0	NS
P	*Symphyotrichum boreale*	Boreal Aster				S2?	3 Sensitive	59	3.6 ± 0.0	NS
P	*Cuscuta cephalanthi*	Buttonbush Dodder				S2?	5 Undetermined	3	69.6 ± 7.0	NS
P	*Epilobium coloratum*	Purple-veined Willowherb				S2?	3 Sensitive	2	76.7 ± 0.0	NS
P	*Rumex persicarioides*	Peach-leaved Dock				S2?	2 May Be At Risk	1	14.0 ± 0.0	NS
P	*Crataegus submollis*	Quebec Hawthorn				S2?	5 Undetermined	1	96.1 ± 7.0	NS
P	*Eleocharis ovata*	Ovate Spikerush				S2?	3 Sensitive	2	62.6 ± 0.0	NS
P	*Scirpus pedicellatus*	Stalked Bulrush				S2?	3 Sensitive	4	34.1 ± 0.0	NS
P	*Hieracium robinsonii*	Robinson's Hawkweed				S2S3	3 Sensitive	41	47.0 ± 1.0	NS
P	*Iva frutescens*	Big-leaved Marsh-elder				S2S3	3 Sensitive	1	87.3 ± 4.0	NS
P	*Senecio pseudoarnica*	Seabeach Ragwort				S2S3	3 Sensitive	13	30.8 ± 0.0	NS
P	*Betula michauxii*	Michaux's Dwarf Birch				S2S3	3 Sensitive	10	86.2 ± 0.0	NS
P	*Sagina nodosa*	Knotted Pearlwort				S2S3	4 Secure	1	71.4 ± 5.0	NS
P	*Sagina nodosa ssp. borealis*	Knotted Pearlwort				S2S3	4 Secure	1	94.0 ± 5.0	PE
P	*Hypericum x dissimulatum*	Disguised St. John's-wort				S2S3	3 Sensitive	2	45.5 ± 2.0	NS
P	*Triosteum aurantiacum*	Orange-fruited Tinker's Weed				S2S3	3 Sensitive	123	8.2 ± 7.0	NS
P	*Shepherdia canadensis*	Soapberry				S2S3	3 Sensitive	140	28.8 ± 0.0	NS
P	*Empetrum atropurpureum*	Purple Crowberry				S2S3	3 Sensitive	9	71.5 ± 3.0	NS
P	*Euphorbia polygonifolia*	Seaside Spurge				S2S3	3 Sensitive	13	16.8 ± 1.0	NS
P	*Halenia deflexa*	Spurred Gentian				S2S3	3 Sensitive	46	20.7 ± 0.0	NS
P	*Hedeoma pulegioides*	American False Pennyroyal				S2S3	3 Sensitive	2	65.0 ± 1.0	NS
P	*Polygonum aviculare ssp. buxiforme*	Box Knotweed				S2S3	5 Undetermined	1	52.1 ± 7.0	NS
P	*Polygonum oxyspermum ssp. raii*	Ray's Knotweed				S2S3	5 Undetermined	16	3.1 ± 5.0	NS
P	*Amelanchier fernaldii*	Fernald's Serviceberry				S2S3	5 Undetermined	7	23.0 ± 1.0	NS
P	*Potentilla canadensis*	Canada Cinquefoil				S2S3	3 Sensitive	2	50.5 ± 2.0	NS
P	*Galium aparine*	Common Bedstraw				S2S3	3 Sensitive	1	80.9 ± 0.0	NS
P	*Salix pellita*	Satiny Willow				S2S3	3 Sensitive	5	18.5 ± 2.0	NS
P	*Carex adusta*	Lesser Brown Sedge				S2S3	3 Sensitive	3	91.7 ± 7.0	NS
P	*Carex hirtifolia*	Pubescent Sedge				S2S3	3 Sensitive	9	16.4 ± 0.0	NS
P	*Eleocharis flavescens*	Pale Spikerush				S2S3	3 Sensitive	3	84.7 ± 5.0	NS
P	*Eriophorum gracile*	Slender Cottongrass				S2S3	3 Sensitive	8	18.0 ± 0.0	NS
P	*Oreojuncus trifidus*	Highland Rush				S2S3	3 Sensitive	16	7.4 ± 0.0	NS
P	*Coeloglossum viride*	Long-bracted Frog Orchid				S2S3	2 May Be At Risk	16	91.2 ± 1.0	NS
P	*Cypripedium parviflorum*	Yellow Lady's-slipper				S2S3	3 Sensitive	99	5.8 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	*Poa glauca*	Glaucous Blue Grass				S2S3	3 Sensitive	19	8.5 ± 0.0	NS
P	*Stuckenia filiformis*	Thread-leaved Pondweed				S2S3	3 Sensitive	46	2.5 ± 7.0	NS
P	*Botrychium lanceolatum ssp. angustisegmentum*	Narrow Triangle Moonwort				S2S3	3 Sensitive	9	8.2 ± 7.0	NS
P	*Botrychium simplex*	Least Moonwort				S2S3	3 Sensitive	8	25.3 ± 5.0	NS
P	*Ophioglossum pusillum*	Northern Adder's-tongue				S2S3	3 Sensitive	1	52.3 ± 5.0	NS
P	*Angelica atropurpurea*	Purple-stemmed Angelica				S3	4 Secure	33	26.2 ± 0.0	NS
P	*Erigeron hyssopifolius*	Hyssop-leaved Fleabane				S3	3 Sensitive	100	4.8 ± 0.0	NS
P	*Bidens beckii*	Water Beggarticks				S3	4 Secure	7	21.6 ± 0.0	NS
P	*Packera paupercula*	Balsam Groundsel				S3	4 Secure	142	4.8 ± 0.0	NS
P	*Betula pumila var. pumila*	Bog Birch				S3	3 Sensitive	14	21.4 ± 7.0	NS
P	*Betula pumila*	Bog Birch				S3	3 Sensitive	41	17.4 ± 0.0	NS
P	*Campanula aparinoides*	Marsh Bellflower				S3	3 Sensitive	2	7.5 ± 5.0	NS
P	*Mononeuria groenlandica*	Greenland Stitchwort				S3	3 Sensitive	1	82.5 ± 0.0	NS
P	*Viburnum edule*	Squashberry				S3	3 Sensitive	64	51.5 ± 7.0	NS
P	*Empetrum eamesii*	Pink Crowberry				S3	3 Sensitive	20	46.0 ± 0.0	NS
P	*Vaccinium boreale*	Northern Blueberry				S3	3 Sensitive	48	18.1 ± 7.0	NS
P	*Vaccinium cespitosum*	dwarf bilberry				S3	4 Secure	28	38.4 ± 7.0	NS
P	*Vaccinium uliginosum*	Alpine Bilberry				S3	3 Sensitive	23	61.8 ± 0.0	NS
P	*Bartonia virginica*	Yellow Bartonia				S3	4 Secure	1	37.0 ± 0.0	NS
P	*Proserpinaca palustris*	Marsh Mermaidweed				S3	4 Secure	49	3.5 ± 5.0	NS
P	*Teucrium canadense*	Canada Germander				S3	3 Sensitive	55	7.1 ± 0.0	NS
P	*Decodon verticillatus*	Swamp Loosestrife				S3	4 Secure	4	17.3 ± 7.0	NS
P	*Epilobium hornemannii*	Hornemann's Willowherb				S3	4 Secure	27	32.2 ± 2.0	NS
P	*Epilobium strictum*	Downy Willowherb				S3	3 Sensitive	20	7.0 ± 0.0	NS
P	*Polygala sanguinea*	Blood Milkwort				S3	3 Sensitive	1	60.6 ± 7.0	NS
P	*Persicaria pensylvanica*	Pennsylvania Smartweed				S3	4 Secure	11	8.1 ± 3.0	NS
P	*Fallopia scandens*	Climbing False Buckwheat				S3	3 Sensitive	12	33.5 ± 0.0	NS
P	*Plantago rugelii*	Rugel's Plantain				S3	4 Secure	1	5.9 ± 0.0	NS
P	*Primula laurentiana*	Laurentian Primrose				S3	4 Secure	1	43.2 ± 7.0	NS
P	*Samolus parviflorus*	Seaside Brookweed				S3	3 Sensitive	16	4.0 ± 0.0	NS
P	*Pyrola asarifolia*	Pink Pyrola				S3	4 Secure	34	19.6 ± 0.0	NS
P	*Pyrola minor*	Lesser Pyrola				S3	3 Sensitive	21	4.0 ± 0.0	NS
P	*Ranunculus gmelinii*	Gmelin's Water Buttercup				S3	4 Secure	96	3.3 ± 5.0	NS
P	*Endotropis alnifolia*	alder-leaved buckthorn				S3	4 Secure	459	5.1 ± 0.0	NS
P	*Agrimonia gryposepala*	Hooked Agrimony				S3	4 Secure	220	5.9 ± 0.0	NS
P	*Amelanchier spicata*	Running Serviceberry				S3	4 Secure	7	40.3 ± 0.0	NS
P	*Galium kamtschaticum*	Northern Wild Licorice				S3	4 Secure	54	13.8 ± 1.0	NS
P	*Geocaulon lividum*	Northern Comandra				S3	4 Secure	21	51.3 ± 0.0	NS
P	*Limosella australis*	Southern Mudwort				S3	4 Secure	9	45.5 ± 5.0	NS
P	*Lindernia dubia*	Yellow-seeded False Pimperel				S3	4 Secure	2	34.9 ± 0.0	NS
P	*Laportea canadensis*	Canada Wood Nettle				S3	3 Sensitive	17	26.3 ± 2.0	NS
P	*Verbena hastata*	Blue Vervain				S3	4 Secure	20	8.1 ± 0.0	NS
P	*Carex cryptolepis*	Hidden-scaled Sedge				S3	4 Secure	17	6.4 ± 0.0	NS
P	*Carex eburnea*	Bristle-leaved Sedge				S3	3 Sensitive	164	4.1 ± 0.0	NS
P	*Carex lupulina*	Hop Sedge				S3	4 Secure	6	76.8 ± 0.0	NS
P	*Carex rosea*	Rosy Sedge				S3	4 Secure	4	25.6 ± 5.0	NS
P	*Carex tribuloides*	Blunt Broom Sedge				S3	4 Secure	9	29.6 ± 0.0	NS
P	*Carex wiegandii*	Wiegand's Sedge				S3	3 Sensitive	63	18.9 ± 0.0	NS
P	*Carex foenea*	Fernald's Hay Sedge				S3	4 Secure	3	87.3 ± 0.0	NS
P	*Eleocharis nitida*	Quill Spikerush				S3	4 Secure	2	99.3 ± 0.0	NS
P	*Elodea canadensis*	Canada Waterweed				S3	4 Secure	8	24.6 ± 0.0	NS
P	*Juncus subcaudatus*	Woods-Rush				S3	3 Sensitive	10	45.6 ± 0.0	NS
P	*Juncus dudleyi*	Dudley's Rush				S3	4 Secure	63	4.5 ± 0.0	NS
P	*Goodyera oblongifolia*	Menzies' Rattlesnake-plantain				S3	3 Sensitive	27	32.2 ± 3.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	*Goodyera repens*	Lesser Rattlesnake-plantain				S3	3 Sensitive	31	4.3 ± 0.0	NS
P	*Neottia bifolia*	Southern Twayblade				S3	4 Secure	51	8.2 ± 7.0	NS
P	*Platanthera grandiflora*	Large Purple Fringed Orchid				S3	4 Secure	23	7.5 ± 5.0	NS
P	*Platanthera hookeri*	Hooker's Orchid				S3	4 Secure	6	5.9 ± 0.0	NS
P	*Platanthera orbiculata*	Small Round-leaved Orchid				S3	4 Secure	13	4.3 ± 0.0	NS
P	*Spiranthes ochroleuca*	Yellow Ladies'-tresses				S3	4 Secure	6	12.6 ± 0.0	NS
P	*Alopecurus aequalis*	Short-awned Foxtail				S3	4 Secure	19	28.1 ± 0.0	NS
P	*Potamogeton obtusifolius*	Blunt-leaved Pondweed				S3	4 Secure	22	20.1 ± 1.0	NS
P	*Potamogeton praelongus*	White-stemmed Pondweed				S3	3 Sensitive	17	15.6 ± 0.0	NS
P	*Potamogeton zosteriformis*	Flat-stemmed Pondweed				S3	3 Sensitive	12	14.0 ± 7.0	NS
P	*Sparganium natans*	Small Burreed				S3	4 Secure	18	4.3 ± 5.0	NS
P	*Asplenium trichomanes*	Maidenhair Spleenwort				S3	4 Secure	27	19.6 ± 0.0	NS
P	*Asplenium viride*	Green Spleenwort				S3	3 Sensitive	35	8.5 ± 0.0	NS
P	*Equisetum pratense*	Meadow Horsetail				S3	3 Sensitive	23	15.4 ± 0.0	NS
P	*Equisetum variegatum*	Variegated Horsetail				S3	4 Secure	38	17.8 ± 0.0	NS
P	*Isoetes acadiensis*	Acadian Quillwort				S3	3 Sensitive	10	58.2 ± 1.0	NS
P	*Diphasiastrum sitchense*	Sitka Ground-cedar				S3	4 Secure	10	24.6 ± 5.0	NS
P	*Huperzia appressa*	Mountain Firmoss				S3	3 Sensitive	23	27.1 ± 1.0	NS
P	*Sceptridium dissectum*	Dissected Moonwort				S3	4 Secure	3	52.3 ± 5.0	NS
P	*Polypodium appalachianum*	Appalachian Polypody				S3	5 Undetermined	5	5.1 ± 0.0	NS
P	*Asclepias incarnata ssp. pulchra*	Swamp Milkweed				S3?	5 Undetermined	57	3.5 ± 2.0	NS
P	*Diphasiastrum x sabinifolium*	Savin-leaved Ground-cedar				S3?	4 Secure	8	14.4 ± 1.0	NS
P	*Atriplex glabriuscula var. franktonii*	Frankton's Saltbush				S3S4	4 Secure	9	21.9 ± 2.0	NS
P	*Suaeda calceoliformis*	Horned Sea-blite				S3S4	4 Secure	5	41.0 ± 1.0	NS
P	*Myriophyllum sibiricum*	Siberian Water Milfoil				S3S4	4 Secure	17	5.7 ± 0.0	NS
P	*Sanguinaria canadensis*	Bloodroot				S3S4	4 Secure	148	15.0 ± 0.0	NS
P	*Polygonum fowleri*	Fowler's Knotweed				S3S4	4 Secure	1	77.7 ± 0.0	NS
P	*Rumex fueginus*	Tierra del Fuego Dock				S3S4	4 Secure	2	93.4 ± 0.0	PE
P	*Fragaria vesca ssp. americana*	Woodland Strawberry				S3S4	4 Secure	72	3.9 ± 0.0	NS
P	*Salix petiolaris*	Meadow Willow				S3S4	4 Secure	8	18.0 ± 0.0	NS
P	*Carex argyrantha*	Silvery-flowered Sedge				S3S4	4 Secure	3	16.8 ± 0.0	NS
P	*Eriophorum russeolum*	Russet Cottongrass				S3S4	4 Secure	4	17.9 ± 0.0	NS
P	*Triglochin gaspensis*	Gasp ├⌐ Arrowgrass				S3S4	5 Undetermined	8	15.6 ± 0.0	NS
P	*Juncus acuminatus*	Sharp-Fruit Rush				S3S4	4 Secure	4	3.6 ± 4.0	NS
P	*Luzula parviflora*	Small-flowered Woodrush				S3S4	4 Secure	44	25.4 ± 5.0	NS
P	*Liparis loeselii*	Loesel's Twayblade				S3S4	4 Secure	16	9.7 ± 1.0	NS
P	*Panicum philadelphicum*	Philadelphia Panicgrass				S3S4	4 Secure	1	22.2 ± 0.0	NS
P	*Trisetum spicatum*	Narrow False Oats				S3S4	4 Secure	20	7.4 ± 0.0	NS
P	*Cystopteris bulbifera*	Bulblet Bladder Fern				S3S4	4 Secure	418	3.9 ± 0.0	NS
P	*Equisetum hyemale ssp. affine*	common scouring-rush				S3S4	4 Secure	36	8.2 ± 10.0	NS
P	*Equisetum scirpoides*	Dwarf Scouring-Rush				S3S4	4 Secure	76	6.2 ± 0.0	NS
P	*Diphasiastrum complanatum*	Northern Ground-cedar				S3S4	4 Secure	6	17.3 ± 5.0	NS
P	*Schizaea pusilla*	Little Curlygrass Fern				S3S4	4 Secure	36	32.8 ± 0.0	NS
P	*Viola canadensis*	Canada Violet				SH	0.1 Extirpated	1	25.3 ± 0.0	NS
P	*Poa alpina*	Alpine Blue Grass				SH	0.1 Extirpated	2	64.2 ± 0.0	NS
P	*Botrychium minganense*	Mingan Moonwort				SH	0.1 Extirpated	1	58.7 ± 1.0	NS
P	*Solidago randii*	Rand's Goldenrod				SNA		1	75.2 ± 5.0	NS

5.1 SOURCE BIBLIOGRAPHY (100 km)

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

# recs	CITATION
9548	Lepage, D. 2014. Maritime Breeding Bird Atlas Database. Bird Studies Canada, Sackville NB, 407,838 recs.
3412	Morrison, Guy. 2011. Maritime Shorebird Survey (MSS) database. Canadian Wildlife Service, Ottawa, 15939 surveys. 86171 recs.
2016	Erskine, A.J. 1992. Maritime Breeding Bird Atlas Database. NS Museum & Nimbus Publ., Halifax, 82,125 recs.
998	Blaney, C.S.; Mazerolle, D.M.; Belliveau, A.B. 2014. Atlantic Canada Conservation Data Centre Fieldwork 2014. Atlantic Canada Conservation Data Centre, # recs.
958	Blaney, C.S.; Mazerolle, D.M.; Belliveau, A.B. 2015. Atlantic Canada Conservation Data Centre Fieldwork 2015. Atlantic Canada Conservation Data Centre, # recs.
696	Blaney, C.S.; Mazerolle, D.M. 2010. Fieldwork 2010. Atlantic Canada Conservation Data Centre. Sackville NB, 15508 recs.
558	Newell, R.E. 2000. E.C. Smith Herbarium Database. Acadia University, Wolfville NS, 7139 recs.
527	Benjamin, L.K. (compiler). 2012. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 4965 recs.
512	Benjamin, L.K. (compiler). 2007. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 8439 recs.
461	Blaney, C.S.; Mazerolle, D.M. 2012. Fieldwork 2012. Atlantic Canada Conservation Data Centre, 13,278 recs.
460	Blaney, C.S.; Mazerolle, D.M. 2009. Fieldwork 2009. Atlantic Canada Conservation Data Centre. Sackville NB, 13395 recs.
367	Belliveau, A.G. 2016. Atlantic Canada Conservation Data Centre Fieldwork 2016. Atlantic Canada Conservation Data Centre, 10695 recs.
278	Pronych, G. & Wilson, A. 1993. Atlas of Rare Vascular Plants in Nova Scotia. Nova Scotia Museum, Halifax NS, I:1-168, II:169-331. 1446 recs.
266	Newell, R.E. 2005. E.C. Smith Digital Herbarium. E.C. Smith Herbarium, Irving Biodiversity Collection, Acadia University, Web site: http://luxor.acadiau.ca/library/Herbarium/project/. 582 recs.
249	Amirault, D.L. & Stewart, J. 2007. Piping Plover Database 1894-2006. Canadian Wildlife Service, Sackville, 3344 recs, 1228 new.
249	Wilhelm, S.I. et al. 2011. Colonial Waterbird Database. Canadian Wildlife Service, Sackville, 2698 sites, 9718 recs (8192 obs).
203	Neily, T.H. & Pepper, C.; Toms, B. 2018. Nova Scotia lichen database [as of 2018-03]. Mersey Tobeatic Research Institute.
183	Hicks, Andrew. 2009. Coastal Waterfowl Surveys Database, 2000-08. Canadian Wildlife Service, Sackville, 46488 recs (11149 non-zero).
165	Belliveau, A.G. 2018. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
165	Neily, T.H. & Pepper, C.; Toms, B. 2013. Nova Scotia lichen location database. Mersey Tobeatic Research Institute, 1301 records.
159	Klymko, J.J.D.; Robinson, S.L. 2012. 2012 field data. Atlantic Canada Conservation Data Centre, 447 recs.
153	Belland, R.J. Maritimes moss records from various herbarium databases. 2014.
149	Neily, T.H. 2017. Nova Scotia lichen records. Mersey Tobeatic Research Institute.
140	Quigley, E.J. & Neily, P.D,. 2012. Botanical Discoveries in Inverness County, NS. Nova Scotia Dept Natural Resources. Pers. comm. to C.S. Blaney, Nov. 29, 141 rec.
127	Cameron, R.P. 2011. Lichen observations, 2011. Nova Scotia Environment & Labour, 731 recs.
122	Blaney, C.S. 2016. Atlantic Canada Conservation Data Centre Fieldwork 2016. Atlantic Canada Conservation Data Centre, 6719 recs.
107	Munro, Marian K. Nova Scotia Provincial Museum of Natural History Herbarium Database. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia. 2013.
103	Bridgland, J. 2006. Cape Breton Highlands National Park Digital Database. Parks Canada, 190 recs.
102	WIlliams, M. Cape Breton University Digital Herbarium. Cape Breton University Digital Herbarium. 2013.
94	Mazerolle, D.M. 2016. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
88	Zinck, M. & Roland, A.E. 1998. Roland's Flora of Nova Scotia. Nova Scotia Museum, 3rd ed., rev. M. Zinck; 2 Vol., 1297 pp.
86	Campbell, G. 2017. Maritimes Bicknell's Thrush database 2002-2015. Bird Studies Canada, Sackville NB, 609 recs.
80	Benjamin, L.K. 2009. D. Anderson Odonata Records for Cape Breton, 1997-2004. Nova Scotia Dept Natural Resources, 1316 recs.
68	Benjamin, L.K. 2012. NSDNR fieldwork & consultant reports 2008-2012. Nova Scotia Dept Natural Resources, 196 recs.
63	Blaney, C.S.; Spicer, C.D. 2001. Fieldwork 2001. Atlantic Canada Conservation Data Centre. Sackville NB, 981 recs.
61	Benjamin, L.K. (compiler). 2001. Significant Habitat & Species Database. Nova Scotia Dept of Natural Resources, 15 spp, 224 recs.
61	Brunelle, P.-M. (compiler). 2009. ADIP/MDDS Odonata Database: data to 2006 inclusive. Atlantic Dragonfly Inventory Program (ADIP), 24200 recs.
59	Roland, A.E. & Smith, E.C. 1969. The Flora of Nova Scotia, 1st Ed. Nova Scotia Museum, Halifax, 743pp.
57	Knapton, R. & Power, T.; Williams, M. 2001. SAR Inventory: Fortress Louisbourg NP. Parks Canada, Atlantic, SARINV01-13. 157 recs.
57	Mazerolle, D.M. 2017. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
54	Busby, D.G. 1999. 1997-1999 Bicknell's Thrush data, unpublished files. Canadian Wildlife Service, Sackville, 17 recs.
53	Amirault, D.L. & McKnight, J. 2003. Piping Plover Database 1991-2003. Canadian Wildlife Service, Sackville, unpublished data. 7 recs.
50	Canadian Wildlife Service, Dartmouth. 2010. Piping Plover censuses 2007-09, 304 recs.
50	LaPaix, R.W.; Crowell, M.J.; MacDonald, M. 2011. Stantec rare plant records, 2010-11. Stantec Consulting, 334 recs.
44	anon. 2001. S.. H.. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 76 recs.
41	Klymko, J.J.D. 2014. Maritimes Butterfly Atlas, 2012 submissions. Atlantic Canada Conservation Data Centre, 8552 records.
40	Layberry, R.A. & Hall, P.W., LaFontaine, J.D. 1998. The Butterflies of Canada. University of Toronto Press. 280 pp+plates.
40	Scott, F.W. 2002. Nova Scotia Herpetofauna Atlas Database. Acadia University, Wolfville NS, 8856 recs.
38	Blaney, C.S.; Mazerolle, D.M.; Belliveau, A.B. 2013. Atlantic Canada Conservation Data Centre Fieldwork 2013. Atlantic Canada Conservation Data Centre, 9000+ recs.
38	Parker, G.R., Maxwell, J.W., Morton, L.D. & Smith,G.E.J. 1983. The ecology of Lynx , Lynx canadensis, on Cape Breton Island. Canadian Journal of Zoology, 61:770-786. 51 recs.
34	Pulsifer, M.D. 2002. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 369 recs.
33	Neily, T.H. 2010. Erioderma Pedicellatum records 2005-09. Mersey Tobiatic Research Institute, 67 recs.
33	Sollows, M.C,. 2008. NBM Science Collections databases: mammals. New Brunswick Museum, Saint John NB, download Jan. 2008, 4983 recs.

# recs	CITATION
28	Blaney, C.S.; Spicer, C.D.; Mazerolle, D.M. 2005. Fieldwork 2005. Atlantic Canada Conservation Data Centre. Sackville NB, 2333 recs.
27	Neily, T.H. 2017. Maritmes Lichen and Bryophyte records. Atlantic Canada Conservation Data Centre.
26	Parks Canada. 2010. Specimens in or near National Parks in Atlantic Canada. Canadian National Museum, 3925 recs.
24	Klymko, J.J.D. 2012. Maritimes Butterfly Atlas, 2010 and 2011 records. Atlantic Canada Conservation Data Centre, 6318 recs.
24	Neily, T.H. 2013. Email communication to Sean Blaney regarding Listera australis observations made from 2007 to 2011 in Nova Scotia. , 50.
22	Benjamin, L.K. 2009. Boreal Felt Lichen, Mountain Avens, Orchid and other recent records. Nova Scotia Dept Natural Resources, 105 recs.
21	Belland, R.J. & W.B. Schofield. 1993. Salix vestita Pursh & Saxifraga oppositifolia L.: arctic-alpine species new to Nova Scotia. Rhodora, 95: 76-78.
21	Hill, N.M. 1994. Status report on the Long's bulrush Scirpus longii in Canada. Committee on the Status of Endangered Wildlife in Canada, 7 recs.
20	Cameron, R.P. 2012. Rob Cameron 2012 vascular plant data. NS Department of Environment, 30 recs.
20	Gillis, J. 2015. Rare plant records from Cape Breton gypsum sites. Pers. comm., 25 rare plant records.
20	Klymko, J.J.D. 2016. 2015 field data. Atlantic Canada Conservation Data Centre.
19	Cameron, R.P. 2013. 2013 rare species field data. Nova Scotia Department of Environment, 71 recs.
18	Benjamin, L.K. 2011. NSDNR fieldwork & consultant reports 1997, 2009-10. Nova Scotia Dept Natural Resources, 85 recs.
18	Manthorne, A. 2014. MaritimesSwiftwatch Project database 2013-2014. Bird Studies Canada, Sackville NB, 326 recs.
18	Misc. rare species records gathered by NSDNR staff or communicated to NSDNR and forwared to ACCDC
18	Pepper, C. 2013. 2013 rare bird and plant observations in Nova Scotia. , 181 records.
17	Adams, J. & Herman, T.B. 1998. Thesis, Unpublished map of C. insculpta sightings. Acadia University, Wolfville NS, 88 recs.
17	Whittam, R.M. 2006. Bicknell's Thrush in CBHNP, BSC database. Bird Studies Canada, 21 recs.
16	Basquill, S.P. 2012. 2012 rare vascular plant field data. Nova Scotia Department of Natural Resources, 37 recs.
15	Catling, P.M., Erskine, D.S. & MacLaren, R.B. 1985. The Plants of Prince Edward Island with new records, nomenclatural changes & corrections & deletions, 1st Ed. Research Branch, Agriculture Canada, Ottawa, Publication 1798. 22pp.
15	Newell, R.E. 2004. Assessment and update status report on the New Jersey Rush (Juncus caesariensis) in Canada. Committee on the Status of Endangered Wildlife in Canada, 15 recs.
14	Basquill, S.P. 2012. 2012 Bryophyte specimen data. Nova Scotia Department of Natural Resources, 37 recs.
14	Blaney, C.S. 2000. Fieldwork 2000. Atlantic Canada Conservation Data Centre. Sackville NB, 1265 recs.
14	Downes, C. 1998-2000. Breeding Bird Survey Data. Canadian Wildlife Service, Ottawa, 111 recs.
12	Robinson, S.L. 2011. 2011 ND dune survey field data. Atlantic Canada Conservation Data Centre, 2715 recs.
11	Burns, L. 2013. Personal communication concerning bat occurrence on PEI. Winter 2013. Pers. comm.
11	Klymko, J.J.D. 2012. Insect fieldwork & submissions, 2011. Atlantic Canada Conservation Data Centre. Sackville NB, 760 recs.
11	Neily, T.H. 2012. 2012 Erioderma pedicellatum records in Nova Scotia.
10	Murphy, S. 2006. Juncus caesariensis data from Yava Technologies In Situ Leach Mining Environmental Assessment. Jacques Whitford Inc., 10 recs.
10	Porter, K. 2013. 2013 rare and non-rare vascular plant field data. St. Mary's University, 57 recs.
9	Goltz, J.P. & Bishop, G. 2005. Confidential supplement to Status Report on Prototype Quillwort (Isoetes prototypus). Committee on the Status of Endangered Wildlife in Canada, 111 recs.
8	Oldham, M.J. 2000. Oldham database records from Maritime provinces. Oldham, M.J; ONHIC, 487 recs.
7	Cameron, R.P. 2009. Nova Scotia nonvascular plant observations, 1995-2007. Nova Scotia Dept Natural Resources, 27 recs.
7	Chaput, G. 2002. Atlantic Salmon: Maritime Provinces Overview for 2001. Dept of Fisheries & Oceans, Atlantic Region, Science Stock Status Report D3-14. 39 recs.
7	NS DNR. 2017. Black Ash records from NS DNR Permanent Sample Plots (PSPs), 1965-2016. NS Dept of Natural Resources.
7	Robinson, S.L. 2014. 2013 Field Data. Atlantic Canada Conservation Data Centre.
7	Taylor, B.R., and Tam, J.C. 2012. Local distribution of the rare plant Triosteum aurantiacum in northeastern Nova Scotia, Canada. Rhodora, 114(960): 366-382.
6	Cameron, R.P. 2009. Erioderma pedicellatum database, 1979-2008. Dept Environment & Labour, 103 recs.
6	Olsen, R. Herbarium Specimens. Nova Scotia Agricultural College, Truro. 2003.
6	Scott, F.W. 1988. Status Report on the Gaspé Shrew (Sorex gaspensis) in Canada. Committee on the Status of Endangered Wildlife in Canada, 12 recs.
5	Blaney, C.S.; Mazerolle, D.M.; Klymko, J; Spicer, C.D. 2006. Fieldwork 2006. Atlantic Canada Conservation Data Centre. Sackville NB, 8399 recs.
5	Cameron, R.P. 2009. Cyanolichen database. Nova Scotia Environment & Labour, 1724 recs.
5	MacDonald, M. 2008. PEI Power Corridor Floral Surveys, 2004-08. Jacques Whitford Ltd, 2238 recs (979 rare).
5	Marshall, L. 1998. Atlantic Salmon: Cape Breton SFA 18 (part) & SFA 19. Dept of Fisheries & Oceans, Atlantic Region, Science. Stock Status Report D3-09. 5 recs.
5	Plissner, J.H. & Haig, S.M. 1997. 1996 International piping plover census. US Geological Survey, Corvallis OR, 231 pp.
4	Bagnell, B.A. 2001. New Brunswick Bryophyte Occurrences. B&B Botanical, Sussex, 478 recs.
4	Basquill, S.P. 2018. Various specimens, NS DNR field work. NS Department of Natural Resources, 10.
4	Blaney, C.S.; Mazerolle, D.M. 2011. Fieldwork 2011. Atlantic Canada Conservation Data Centre. Sackville NB.
4	Blaney, C.S.; Mazerolle, D.M.; Oberndorfer, E. 2007. Fieldwork 2007. Atlantic Canada Conservation Data Centre. Sackville NB, 13770 recs.
4	Clayden, S.R. 2007. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, download Mar. 2007, 6914 recs.
4	Erskine, D. 1960. The plants of Prince Edward Island, 1st Ed. Research Branch, Agriculture Canada, Ottawa., Publication 1088. 1238 recs.
4	Neily, T.H. & Pepper, C.; Toms, B. 2015. Nova Scotia lichen location database [as of 2015-02-15]. Mersey Tobeatic Research Institute, 1691 records.
4	Newell, R.E. 2001. Fortress Louisbourg Species at Risk Survey 2001. Parks Canada, 4 recs.
4	Popma, T.M. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre. Sackville NB, 113 recs.
4	Porter, C.J.M. 2014. Field work data 2007-2014. Nova Scotia Nature Trust, 96 recs.
4	Rousseau, J. 1938. Notes Floristiques sur l'est de la Nouvelle-Ecosse in Contributions de l'Institut Botanique de l'Universite de Montreal. Universite de Montreal, 32, 13-62. 11 recs.

# recs	CITATION
3	Baechler, Lynn. 2012. Plant observations & photos, 2012. Pers. comm. to S. Blaney, July 2012, 4 recs.
3	Blaney, C.S.; Mazerolle, D.M. 2008. Fieldwork 2008. Atlantic Canada Conservation Data Centre. Sackville NB, 13343 recs.
3	Gilhen, J. 1984. Amphibians & Reptiles of Nova Scotia, 1st Ed. Nova Scotia Museum, 164pp.
3	Layberry, R.A. 2012. Lepidopteran records for the Maritimes, 1974-2008. Layberry Collection, 1060 recs.
3	Whittam, R.M. 1999. Status Report on the Roseate Tern (update) in Canada. Committee on the Status of Endangered Wildlife in Canada, 36 recs.
2	Amirault, D.L. 1997-2000. Unpublished files. Canadian Wildlife Service, Sackville, 470 recs.
2	Benedict, B. Connell Herbarium Specimens (Data) . University New Brunswick, Fredericton. 2003.
2	Blaney, C.S.; Spicer, C.D.; Rothfels, C. 2004. Fieldwork 2004. Atlantic Canada Conservation Data Centre. Sackville NB, 1343 recs.
2	Christie, D.S. 2000. Christmas Bird Count Data, 1997-2000. Nature NB, 54 recs.
2	Clayden, S.R. 1998. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, 19759 recs.
2	Dibblee, R.L. 1999. PEI Cormorant Survey. Prince Edward Island Fisheries, Aquaculture & Environment, 1p. 21 recs.
2	Doucet, D.A. 2007. Lepidopteran Records, 1988-2006. Doucet, 700 recs.
2	Edsall, J. 2007. Personal Butterfly Collection: specimens collected in the Canadian Maritimes, 1961-2007. J. Edsall, unpubl. report, 137 recs.
2	Gillis, J. 2007. Botanical observations from bog on Skye Mountain, NS. Pers. comm., 8 recs.
2	Hall, R.A. 2001. S.. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 178 recs.
2	Hill, N. 2003. Floerkea proserpinacoides at Heatherdale, Antigonish Co. 2002. , Pers. comm. to C.S. Blaney. 2 recs.
2	Klymko, J.J.D. 2012. Insect field work & submissions. Atlantic Canada Conservation Data Centre, 852 recs.
2	Lock, A.R., Brown, R.G.B. & Gerriets, S.H. 1994. Gazetteer of Marine Birds in Atlantic Canada. Canadian Wildlife Service, Atlantic Region, 137 pp.
2	Munden, C. 2018. Email communication on Cypripedium parviflorum. Amateur naturalist, 2.
2	Neily, T.H. & Pepper, C.; Toms, B. 2018. Nova Scotia lichen database Update. Mersey Tobeatic Research Institute.
2	O'Neil, S. 1998. Atlantic Salmon: Northumberland Strait Nova Scotia part of SFA 18. Dept of Fisheries & Oceans, Atlantic Region, Science. Stock Status Report D3-08. 9 recs.
2	Quigley, E.J. 2006. Plant records, Mabou & Port Hood. Pers. comm. to S.P. Basquill, Jun. 12. 4 recs, 4 recs.
2	Selva, S.B. 2002. Status Report on frosted glass-whiskers, Sclerophora peronella. Committee on the Status of Endangered Wildlife in Canada, Draft Revision, May 2002. 2 recs.
2	Sollows, M.C,. 2009. NBM Science Collections databases: molluscs. New Brunswick Museum, Saint John NB, download Jan. 2009, 6951 recs (2957 in Atlantic Canada).
1	Anderson, D.G. 2011. New site for showy ladyslipper on Cape Breton. Nova Scotia Department of Natural Resources, pers.comm. to R. Lautenschlager, Jul 5, 2011.
1	Basquill, S.P. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre, Sackville NB, 69 recs.
1	Beaulieu-Bouchard, M. 2014. Email to S. Blaney regarding Salix reticulata & vestita in NS. Canadian Museum of Nature, 1 obs.
1	Benjamin, L.K. 2009. NSDNR Fieldwork & Consultants Reports. Nova Scotia Dept Natural Resources, 143 recs.
1	Crowell, M. 2013. email to Sean Blaney regarding Listera australis at Bear Head and Mill Cove Canadian Forces Station. Jacques Whitford Environmental Ltd., 2.
1	Curley, F.R. 2005. PEF&W Collection 2003-04. PEI Fish & Wildlife Div., 716 recs.
1	Doucet, D.A. 2009. Census of Globally Rare, Endemic Butterflies of Nova Scotia Gulf of St Lawrence Salt Marshes. Nova Scotia Dept of Natural Resources, Species at Risk, 155 recs.
1	Gilman, A.; Testo, W. 2015. Use of Gemma Characters to Identify North American Huperzia (Lycopodiaceae). American Fern Journal, 105(3):145-161.
1	Hinds, H.R. 1984. Additions to the flora of Cape Breton Highlands National Park, Nova Scotia. Rhodora, 86:67-72.
1	Kelly, Glen 2004. Botanical records from 2004 PEI Forestry fieldwork. Dept of Environment, Energy & Forestry, 71 recs.
1	Klymko, J.J.D. 2018. 2017 field data. Atlantic Canada Conservation Data Centre.
1	Lautenschlager, R.A. 2010. Miscellaneous observations reported to ACCDC (zoology). Pers. comm. from various persons, 2 recs.
1	McKendry, Karen. 2016. Rare species observations, 2016. Nova Scotia Nature Trust, 19 recs.
1	Munro, Marian K. Nova Scotia Provincial Museum of Natural History Herbarium Database. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia. 2014.
1	New York Botanical Garden. 2006. Virtual Plant Herbarium - Vascular Plant Types Catalog. Sylva, S.; Kallunki, J. (ed.) International Plant Science Centre, Web site: http://sciweb.nybg.org/science2/vii2.asp. 4 recs.
1	Newell, R.B.; Sam, D. 2014. 2014 Bloodroot personal communication report, Antigonish, NS. NS Department of Natural Resources.
1	Schori, M. 2003. Hieracium robinsonii locations in Atlantic Canada. Pers. comm. to C.S. Blaney. Gray Herbarium, Harvard University, 1 rec.
1	Spicer, C.D. 2004. Specimens from CWS Herbarium, Mount Allison Herbarium Database. Mount Allison University, 5939 recs.

DATA REPORT 6327: Whycocomagh Bay 2, NS

Prepared 8 February 2019
by J. Churchill, Data Manager

CONTENTS OF REPORT

1.0 Preface
- 1.1 Data List
- 1.2 Restrictions
- 1.3 Additional Information
- Map 1: Buffered Study Area

2.0 Rare and Endangered Species
- 2.1 Flora
- 2.2 Fauna
- Map 2: Flora and Fauna

3.0 Special Areas
- 3.1 Managed Areas
- 3.2 Significant Areas
- Map 3: Special Areas

4.0 Rare Species Lists
- 4.1 Fauna
- 4.2 Flora
- 4.3 Location Sensitive Species
- 4.4 Source Bibliography

5.0 Rare Species within 100 km
- 5.1 Source Bibliography



Map 1. A 100 km buffer around the study area

1.0 PREFACE

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

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

1.1 DATA LIST

Included datasets:

Filename	Contents
WhycocomaghBNS_6327ob.xls	All Rare and legally protected *Flora and Fauna* in your study area
WhycocomaghBNS_6327ob100km.xls	A list of Rare and legally protected *Flora and Fauna* within 100 km of your study area
WhycocomaghBNS_6327ma.xls	All *Managed Areas* in your study area
WhycocomaghBNS_6327sa.xls	All *Significant Natural Areas* in your study area
WhycocomaghBNS_6327ff.xls	Rare and common *Freshwater Fish* in your study area (DFO database)

1.2 RESTRICTIONS

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

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

1.3 ADDITIONAL INFORMATION

The accompanying Data Dictionary provides metadata for the data provided.

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

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

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

Plant Communities
Sarah Robinson, Community Ecologist
Tel: (506) 364-2664
sarah.robinson@accdc.ca

Data Management, GIS
James Churchill, Data Manager
Tel: (902) 679-6146
james.churchill@accdc.ca

Billing
Jean Breau
Tel: (506) 364-2657
jean.breau@accdc.ca

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

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

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

Western: Duncan Bayne
(902) 648-3536
Duncan.Bayne@novascotia.ca

Western: Sarah Spencer
(902) 634-7555
Sarah.Spencer@novascotia.ca

Central: Shavonne Meyer
(902) 893-6350
Shavonne.Meyer@novascotia.ca

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

Eastern: Lisa Doucette
(902) 863-4513
Lisa.Doucette@novascotia.ca

Eastern: Terry Power
(902) 563-3370
Terrance.Power@novascotia.ca

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

2.0 RARE AND ENDANGERED SPECIES

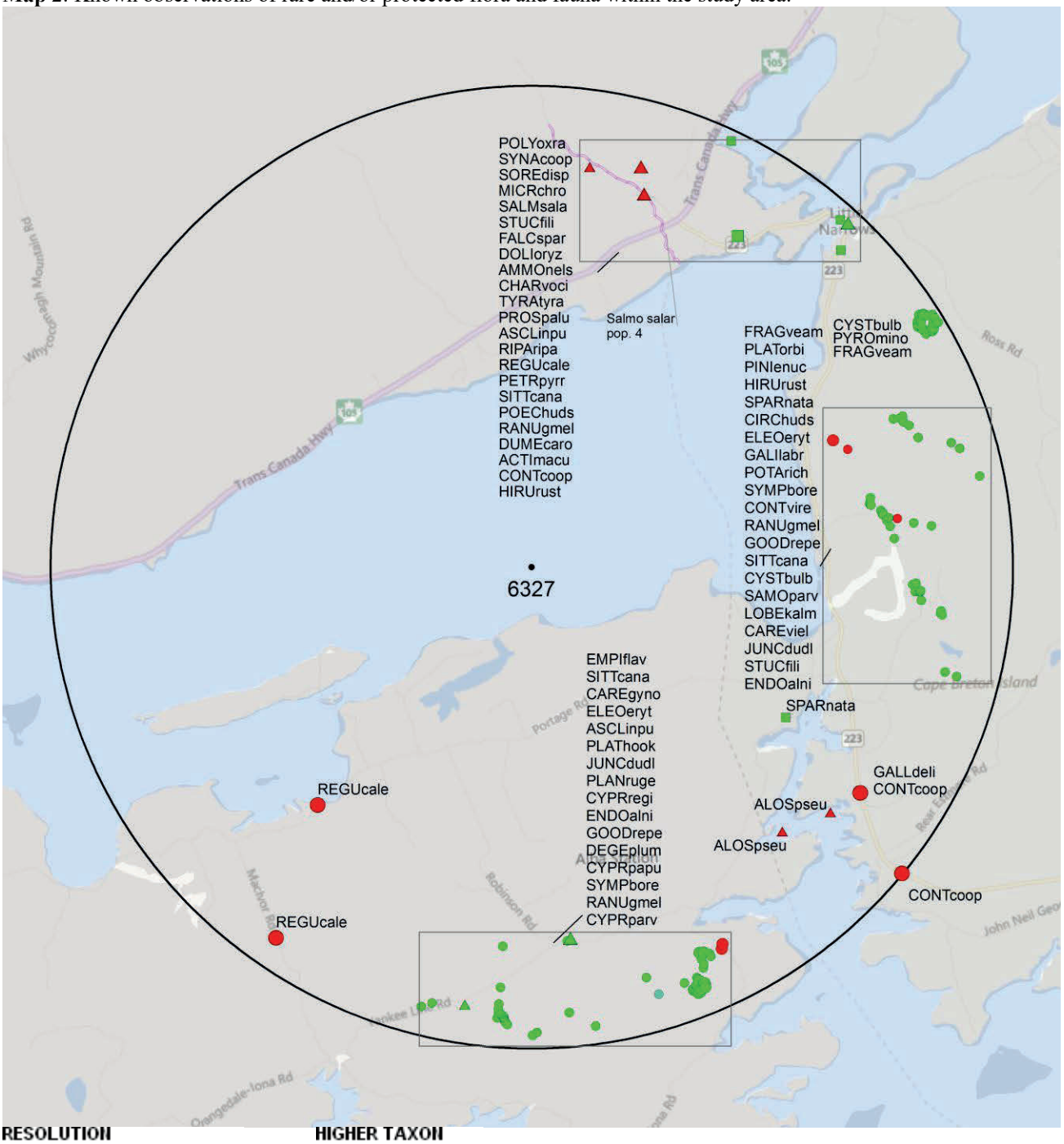
2.1 FLORA

The study area contains 122 records of 26 vascular, 2 records of 1 nonvascular flora (Map 2 and attached: *ob.xls).

2.2 FAUNA

The study area contains 43 records of 24 vertebrate, no records of invertebrate fauna (Map 2 and attached data files - see 1.1 Data List). Please see section 4.3 to determine if 'location-sensitive' species occur near your study site.

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



RESOLUTION
- 4.7 within 50s of kilometers
- 4.0 within 10s of kilometers
- 3.7 within 5s of kilometers
- 3.0 within kilometers
- 2.7 within 500s of meters
- 2.0 within 100s of meters
- 1.7 within 10s of meters

HIGHER TAXON
- vertebrate fauna
- invertebrate fauna
- vascular flora
- nonvascular flora

3.0 SPECIAL AREAS

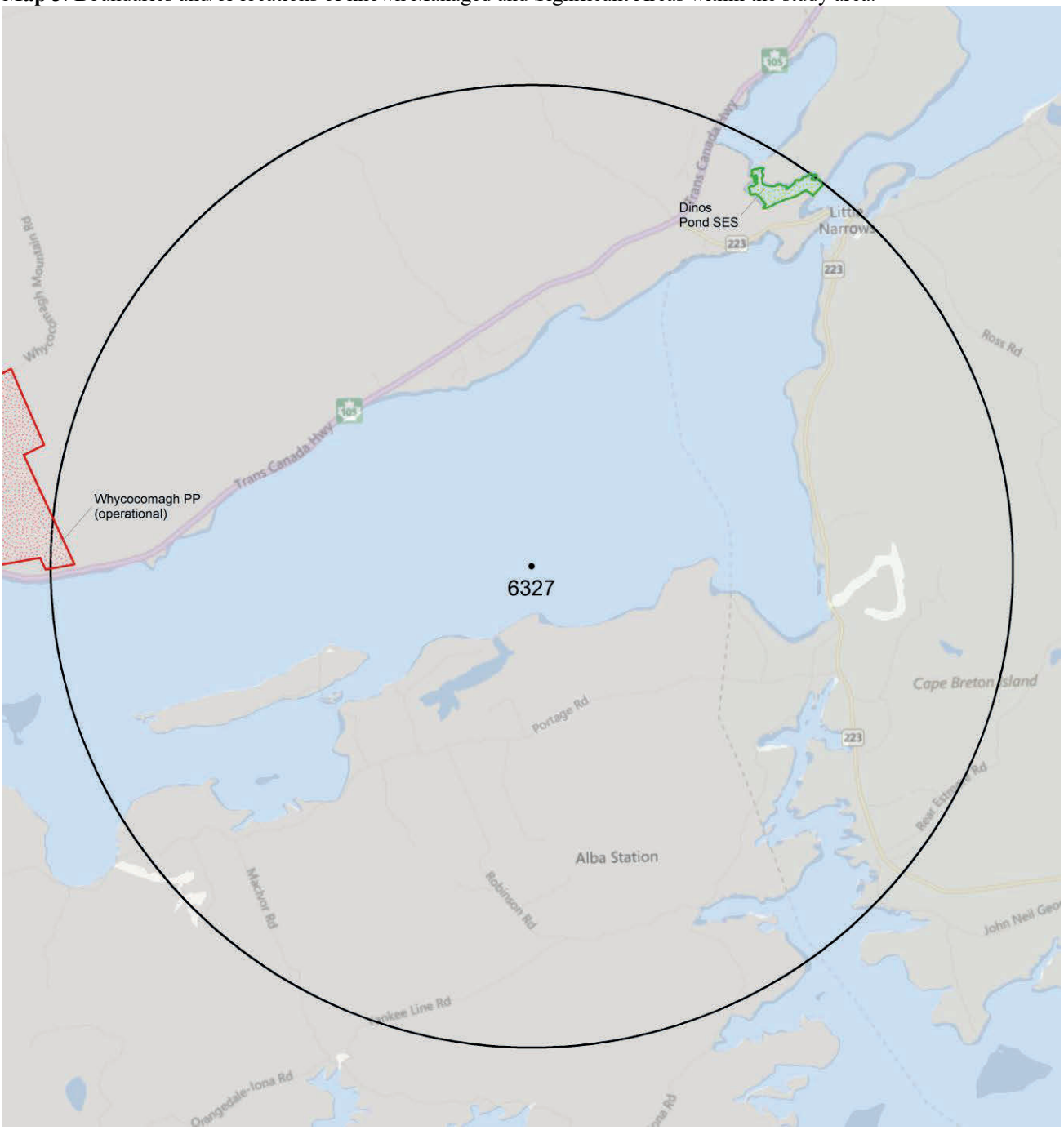
3.1 MANAGED AREAS

The GIS scan identified 1 managed area in the vicinity of the study area (Map 3 and attached file: *ma*.xls).

3.2 SIGNIFICANT AREAS

The GIS scan identified 1 biologically significant site in the vicinity of the study area (Map 3 and attached file: *sa*.xls).

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



MANAGED AREAS **SIGNIFIGANT AREAS**

boundary boundary

approximate approximate

point location

4.0 RARE SPECIES LISTS

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

4.1 FLORA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
N	*Degelia plumbea*	Blue Felt Lichen	Special Concern	Special Concern	Vulnerable	S3	4 Secure	2	4.6 ± 0.0
P	*Carex gynocrates*	Northern Bog Sedge				S1	2 May Be At Risk	6	4.7 ± 0.0
P	*Carex viridula var. elatior*	Greenish Sedge				S1	2 May Be At Risk	3	4.0 ± 0.0
P	*Eleocharis erythropoda*	Red-stemmed Spikerush				S1	2 May Be At Risk	2	4.7 ± 0.0
P	*Lobelia kalmii*	Brook Lobelia				S2	2 May Be At Risk	2	4.0 ± 0.0
P	*Galium labradoricum*	Labrador Bedstraw				S2	3 Sensitive	4	3.6 ± 0.0
P	*Cypripedium parviflorum var. pubescens*	Yellow Lady's-slipper				S2	3 Sensitive	1	4.7 ± 0.0
P	*Cypripedium reginae*	Showy Lady's-Slipper				S2	2 May Be At Risk	2	4.6 ± 0.0
P	*Potamogeton richardsonii*	Richardson's Pondweed				S2	2 May Be At Risk	1	3.7 ± 0.0
P	*Symphyotrichum boreale*	Boreal Aster				S2?	3 Sensitive	10	3.6 ± 0.0
P	*Polygonum oxyspermum ssp. raii*	Ray's Knotweed				S2S3	5 Undetermined	1	4.9 ± 5.0
P	*Cypripedium parviflorum*	Yellow Lady's-slipper				S2S3	3 Sensitive	2	4.6 ± 0.0
P	*Stuckenia filiformis*	Thread-leaved Pondweed				S2S3	3 Sensitive	3	4.1 ± 7.0
P	*Proserpinaca palustris*	Marsh Mermaidweed				S3	4 Secure	1	4.8 ± 5.0
P	*Plantago rugelii*	Rugel's Plantain				S3	4 Secure	1	3.9 ± 0.0
P	*Samolus parviflorus*	Seaside Brookweed				S3	3 Sensitive	1	3.8 ± 0.0
P	*Pyrola minor*	Lesser Pyrola				S3	3 Sensitive	1	4.8 ± 0.0
P	*Ranunculus gmelinii*	Gmelin's Water Buttercup				S3	4 Secure	15	3.7 ± 0.0
P	*Endotropis alnifolia*	alder-leaved buckthorn				S3	4 Secure	31	4.4 ± 0.0
P	*Juncus dudleyi*	Dudley's Rush				S3	4 Secure	2	4.1 ± 0.0
P	*Goodyera repens*	Lesser Rattlesnake-plantain				S3	3 Sensitive	2	4.2 ± 0.0
P	*Platanthera hookeri*	Hooker's Orchid				S3	4 Secure	1	3.9 ± 0.0
P	*Platanthera orbiculata*	Small Round-leaved Orchid				S3	4 Secure	1	4.5 ± 0.0
P	*Sparganium natans*	Small Burreed				S3	4 Secure	2	3.1 ± 5.0
P	*Asclepias incarnata ssp. pulchra*	Swamp Milkweed				S3?	5 Undetermined	2	3.9 ± 1.0
P	*Fragaria vesca ssp. americana*	Woodland Strawberry				S3S4	4 Secure	5	4.2 ± 0.0
P	*Cystopteris bulbifera*	Bulblet Bladder Fern				S3S4	4 Secure	20	4.0 ± 0.0

4.2 FAUNA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
A	*Riparia riparia*	Bank Swallow	Threatened	Threatened	Endangered	S2S3B	2 May Be At Risk	1	4.1 ± 7.0
A	*Hirundo rustica*	Barn Swallow	Threatened	Threatened	Endangered	S2S3B	1 At Risk	3	3.4 ± 0.0
A	*Dolichonyx oryzivorus*	Bobolink	Threatened	Threatened	Vulnerable	S3S4B	3 Sensitive	1	4.1 ± 7.0
A	*Contopus cooperi*	Olive-sided Flycatcher	Special Concern	Threatened	Threatened	S2B	1 At Risk	4	4.1 ± 0.0
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern	Special Concern	Vulnerable	S3S4B	3 Sensitive	1	3.8 ± 0.0
A	*Sorex dispar*	Long-tailed Shrew	Not At Risk	Special Concern		S2	3 Sensitive	2	4.2 ± 0.0
A	*Circus hudsonius*	Northern Harrier	Not At Risk			S3S4B	4 Secure	1	3.5 ± 0.0
A	*Ammospiza nelsoni*	Nelson's Sparrow	Not At Risk			S3S4B	4 Secure	1	4.1 ± 7.0
A	*Salmo salar*	Atlantic Salmon				S1	2 May Be At Risk	1	4.0 ± 1.0
A	*Microtus chrotorrhinus*	Rock Vole				S2	4 Secure	5	4.2 ± 0.0
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S2S3B	2 May Be At Risk	2	4.1 ± 7.0
A	*Pinicola enucleator*	Pine Grosbeak				S2S3B,S5N	2 May Be At Risk	1	4.6 ± 0.0
A	*Poecile hudsonicus*	Boreal Chickadee				S3	3 Sensitive	1	4.1 ± 7.0
A	*Sitta canadensis*	Red-breasted Nuthatch				S3	4 Secure	3	3.7 ± 0.0

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
A	*Alosa pseudoharengus*	Alewife				S3	3 Sensitive	2	3.8 ± 0.0
A	*Synaptomys cooperi*	Southern Bog Lemming				S3	4 Secure	2	4.2 ± 0.0
A	*Falco sparverius*	American Kestrel				S3B	4 Secure	1	4.1 ± 7.0
A	*Charadrius vociferus*	Killdeer				S3B	3 Sensitive	1	4.1 ± 7.0
A	*Gallinago delicata*	Wilson's Snipe				S3B	3 Sensitive	1	4.1 ± 0.0
A	*Tyrannus tyrannus*	Eastern Kingbird				S3B	3 Sensitive	2	4.1 ± 7.0
A	*Dumetella carolinensis*	Gray Catbird				S3B	2 May Be At Risk	1	4.1 ± 7.0
A	*Actitis macularius*	Spotted Sandpiper				S3S4B	3 Sensitive	1	4.1 ± 7.0
A	*Empidonax flaviventris*	Yellow-bellied Flycatcher				S3S4B	3 Sensitive	1	4.4 ± 0.0
A	*Regulus calendula*	Ruby-crowned Kinglet				S3S4B	3 Sensitive	4	3.3 ± 0.0

4.3 LOCATION SENSITIVE SPECIES

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

Nova Scotia

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

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

4.4 SOURCE BIBLIOGRAPHY

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

# recs	CITATION
75	Blaney, C.S.; Mazerolle, D.M.; Belliveau, A.B. 2015. Atlantic Canada Conservation Data Centre Fieldwork 2015. Atlantic Canada Conservation Data Centre, # recs.
26	Blaney, C.S.; Mazerolle, D.M.; Belliveau, A.B. 2014. Atlantic Canada Conservation Data Centre Fieldwork 2014. Atlantic Canada Conservation Data Centre, # recs.
23	Lepage, D. 2014. Maritime Breeding Bird Atlas Database. Bird Studies Canada, Sackville NB, 407,838 recs.
14	Belliveau, A.G. 2016. Atlantic Canada Conservation Data Centre Fieldwork 2016. Atlantic Canada Conservation Data Centre, 10695 recs.
8	Benjamin, L.K. (compiler). 2001. Significant Habitat & Species Database. Nova Scotia Dept of Natural Resources, 15 spp, 224 recs.
6	Blaney, C.S.; Mazerolle, D.M. 2012. Fieldwork 2012. Atlantic Canada Conservation Data Centre, 13,278 recs.
5	Benjamin, L.K. (compiler). 2007. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 8439 recs.
3	Newell, R.E. 2000. E.C. Smith Herbarium Database. Acadia University, Wolfville NS, 7139 recs.
3	Newell, R.E. 2005. E.C. Smith Digital Herbarium. E.C. Smith Herbarium, Irving Biodiversity Collection, Acadia University, Web site: http://luxor.acadiau.ca/library/Herbarium/project/. 582 recs.
1	Benjamin, L.K. (compiler) 2012. Significant Habitat & Species Database. NS Dept of Natural Resources.
1	Erskine, A.J. 1992. Maritime Breeding Bird Atlas Database. NS Museum & Nimbus Publ., Halifax, 82,125 recs.
1	Munro, Marian K. Nova Scotia Provincial Museum of Natural History Herbarium Database. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia. 2013.
1	Pronych, G. & Wilson, A. 1993. Atlas of Rare Vascular Plants in Nova Scotia. Nova Scotia Museum, Halifax NS, I:1-168, II:169-331. 1446 recs.
1	Roland, A.E. & Smith, E.C. 1969. The Flora of Nova Scotia, 1st Ed. Nova Scotia Museum, Halifax, 743pp.
1	Scott, F.W. 1988. Status Report on the Gaspé Shrew (Sorex gaspensis) in Canada. Committee on the Status of Endangered Wildlife in Canada, 12 recs.
1	Staff, DNR 2007. Restricted & Limited Use Land Database (RLUL).

5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 17566 records of 133 vertebrate and 480 records of 47 invertebrate fauna; 6337 records of 281 vascular, 1170 records of 104 nonvascular flora (attached: *ob100km.xls).

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

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	*Myotis lucifugus*	Little Brown Myotis	Endangered	Endangered	Endangered	S1	1 At Risk	36	27.8 ± 0.0	NS
A	*Myotis septentrionalis*	Northern Long-eared Myotis	Endangered	Endangered	Endangered	S1	1 At Risk	5	96.2 ± 0.0	PE
A	*Charadrius melodus melodus*	Piping Plover melodus ssp	Endangered	Endangered	Endangered	S1B	1 At Risk	589	32.7 ± 0.0	NS
A	*Sterna dougallii*	Roseate Tern	Endangered	Endangered	Endangered	S1B	1 At Risk	12	78.6 ± 7.0	NS
A	*Calidris canutus rufa*	Red Knot rufa ssp	Endangered	Endangered	Endangered	S2M	1 At Risk	135	41.5 ± 0.0	NS
A	*Rangifer tarandus pop. 2*	Woodland Caribou (Atlantic-Gasp├⌐sie pop.)	Endangered	Endangered	Extirpated	SX	0.1 Extirpated	1	91.1 ± 0.0	NS
A	*Antrostomus vociferus*	Eastern Whip-Poor-Will	Threatened	Threatened	Threatened	S1?B	1 At Risk	3	38.3 ± 0.0	NS
A	*Catharus bicknelli*	Bicknell's Thrush	Threatened	Special Concern	Endangered	S1S2B	1 At Risk	223	23.1 ± 7.0	NS
A	*Glyptemys insculpta*	Wood Turtle	Threatened	Threatened	Threatened	S2	3 Sensitive	71	8.2 ± 0.0	NS
A	*Acipenser oxyrinchus*	Atlantic Sturgeon	Threatened			S2	2 May Be At Risk	1	57.3 ± 0.0	NS
A	*Anguilla rostrata*	American Eel	Threatened			S2	4 Secure	2	6.7 ± 0.0	NS
A	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Endangered	S2B,S1M	1 At Risk	64	21.4 ± 0.0	NS
A	*Riparia riparia*	Bank Swallow	Threatened	Threatened	Endangered	S2S3B	2 May Be At Risk	227	4.1 ± 7.0	NS
A	*Hirundo rustica*	Barn Swallow	Threatened	Threatened	Endangered	S2S3B	1 At Risk	402	3.4 ± 0.0	NS
A	*Cardellina canadensis*	Canada Warbler	Threatened	Threatened	Endangered	S3B	1 At Risk	214	6.9 ± 7.0	NS
A	*Dolichonyx oryzivorus*	Bobolink	Threatened	Threatened	Vulnerable	S3S4B	3 Sensitive	210	4.1 ± 7.0	NS
A	*Sturnella magna*	Eastern Meadowlark	Threatened	Threatened		SHB	3 Sensitive	2	78.6 ± 7.0	NS
A	*Hylocichla mustelina*	Wood Thrush	Threatened	Threatened		SUB	5 Undetermined	7	74.1 ± 7.0	NS
A	*Falco peregrinus pop. 1*	Peregrine Falcon - anatum/tundrius	Special Concern	Special Concern	Vulnerable	S1B,SNAM	3 Sensitive	4	46.0 ± 7.0	NS
A	*Bucephala islandica (Eastern pop.)*	Barrow's Goldeneye - Eastern pop.	Special Concern	Special Concern		S1N	1 At Risk	1	70.4 ± 16.0	NS
A	*Asio flammeus*	Short-eared Owl	Special Concern	Special Concern		S1S2B	2 May Be At Risk	7	25.8 ± 0.0	NS
A	*Euphagus carolinus*	Rusty Blackbird	Special Concern	Special Concern	Endangered	S2B	2 May Be At Risk	156	6.7 ± 0.0	NS
A	*Chordeiles minor*	Common Nighthawk	Special Concern	Threatened	Threatened	S2B	1 At Risk	77	6.6 ± 0.0	NS
A	*Contopus cooperi*	Olive-sided Flycatcher	Special Concern	Threatened	Threatened	S2B	1 At Risk	535	4.1 ± 7.0	NS
A	*Histrionicus histrionicus pop. 1*	Harlequin Duck - Eastern pop.	Special Concern	Special Concern	Endangered	S2N	1 At Risk	11	53.5 ± 7.0	NS
A	*Phalaropus lobatus*	Red-necked Phalarope	Special Concern			S2S3M	3 Sensitive	1	90.0 ± 0.0	NS
A	*Morone saxatilis pop. 1*	Striped Bass- Southern Gulf of St Lawrence pop.	Special Concern			S2S3N	2 May Be At Risk	1	78.3 ± 1.0	NS
A	*Chelydra serpentina*	Snapping Turtle	Special Concern	Special Concern	Vulnerable	S3	3 Sensitive	8	42.3 ± 10.0	NS
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern	Special Concern	Vulnerable	S3S4B	3 Sensitive	175	3.8 ± 0.0	NS
A	*Coccothraustes vespertinus*	Evening Grosbeak	Special Concern		Vulnerable	S3S4B,S3N	4 Secure	206	6.9 ± 7.0	NS
A	*Chrysemys picta picta*	Eastern Painted Turtle	Special Concern			S4S5	4 Secure	1	95.9 ± 1.0	NS
A	*Lynx canadensis*	Canadian Lynx	Not At Risk		Endangered	S1	1 At Risk	153	20.2 ± 1.0	NS
A	*Accipiter cooperii*	Cooper's Hawk	Not At Risk			S1?B	5 Undetermined	1	63.6 ± 7.0	NS
A	*Fulica americana*	American Coot	Not At Risk			S1B	5 Undetermined	2	94.1 ± 0.0	PE
A	*Sorex dispar*	Long-tailed Shrew	Not At Risk	Special Concern		S2	3 Sensitive	18	4.2 ± 0.0	NS
A	*Aegolius funereus*	Boreal Owl	Not At Risk			S2?B	5 Undetermined	14	32.2 ± 7.0	NS
A	*Globicephala melas*	Long-finned Pilot Whale	Not At Risk			S2S3		6	74.8 ± 1.0	NS
A	*Hemidactylium scutatum*	Four-toed Salamander	Not At Risk			S3	4 Secure	18	31.4 ± 1.0	NS
A	*Sterna hirundo*	Common Tern	Not At Risk			S3B	3 Sensitive	408	6.9 ± 7.0	NS
A	*Sialia sialis*	Eastern Bluebird	Not At Risk			S3B	3 Sensitive	12	27.7 ± 7.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	*Buteo lagopus*	Rough-legged Hawk	Not At Risk			S3N	4 Secure	2	69.9 ± 4.0	NS
A	*Accipiter gentilis*	Northern Goshawk	Not At Risk			S3S4	4 Secure	76	12.6 ± 7.0	NS
A	*Circus hudsonius*	Northern Harrier	Not At Risk			S3S4B	4 Secure	220	3.5 ± 0.0	NS
A	*Ammospiza nelsoni*	Nelson's Sparrow	Not At Risk			S3S4B	4 Secure	79	4.1 ± 7.0	NS
A	*Morone saxatilis*	Striped Bass	E,E,SC			S2S3	2 May Be At Risk	4	49.1 ± 0.0	NS
A	*Martes americana*	American Marten			Endangered	S1	1 At Risk	29	13.2 ± 1.0	NS
A	*Alces americanus*	Moose			Endangered	S1	1 At Risk	13	28.7 ± 0.0	NS
A	*Salmo salar*	Atlantic Salmon				S1	2 May Be At Risk	88	4.0 ± 1.0	NS
A	*Picoides dorsalis*	American Three-toed Woodpecker				S1?	5 Undetermined	7	11.0 ± 0.0	NS
A	*Passerina cyanea*	Indigo Bunting				S1?B	5 Undetermined	3	68.2 ± 7.0	NS
A	*Uria aalge*	Common Murre				S1?B,S5N	4 Secure	3	68.9 ± 0.0	NS
A	*Nycticorax nycticorax*	Black-crowned Night-heron				S1B	2 May Be At Risk	1	72.9 ± 7.0	NS
A	*Anas acuta*	Northern Pintail				S1B	2 May Be At Risk	7	63.1 ± 0.0	NS
A	*Oxyura jamaicensis*	Ruddy Duck				S1B	4 Secure	2	88.0 ± 0.0	NS
A	*Haematopus palliatus*	American Oystercatcher				S1B	5 Undetermined	7	66.6 ± 7.0	NS
A	*Mimus polyglottos*	Northern Mockingbird				S1B	4 Secure	17	25.9 ± 7.0	NS
A	*Toxostoma rufum*	Brown Thrasher				S1B	5 Undetermined	3	66.7 ± 0.0	NS
A	*Vireo gilvus*	Warbling Vireo				S1B	5 Undetermined	7	32.0 ± 7.0	NS
A	*Calidris minutilla*	Least Sandpiper				S1B,S3M	4 Secure	224	41.5 ± 0.0	NS
A	*Charadrius semipalmatus*	Semipalmated Plover				S1B,S3S4M	4 Secure	334	37.6 ± 0.0	NS
A	*Pluvialis dominica*	American Golden-Plover				S1S2M	3 Sensitive	80	50.3 ± 0.0	NS
A	*Limosa haemastica*	Hudsonian Godwit				S1S2M	3 Sensitive	95	50.3 ± 0.0	NS
A	*Microtus chrotorrhinus*	Rock Vole				S2	4 Secure	26	4.2 ± 0.0	NS
A	*Vireo philadelphicus*	Philadelphia Vireo				S2?B	5 Undetermined	9	44.2 ± 7.0	NS
A	*Spatula clypeata*	Northern Shoveler				S2B	2 May Be At Risk	5	67.2 ± 0.0	NS
A	*Mareca strepera*	Gadwall				S2B	2 May Be At Risk	7	67.7 ± 0.0	NS
A	*Empidonax traillii*	Willow Flycatcher				S2B	3 Sensitive	4	60.6 ± 0.0	NS
A	*Setophaga tigrina*	Cape May Warbler				S2B	3 Sensitive	59	22.3 ± 7.0	NS
A	*Piranga olivacea*	Scarlet Tanager				S2B	5 Undetermined	4	6.9 ± 7.0	NS
A	*Pooecetes gramineus*	Vesper Sparrow				S2B	2 May Be At Risk	11	32.0 ± 7.0	NS
A	*Molothrus ater*	Brown-headed Cowbird				S2B	4 Secure	30	36.4 ± 7.0	NS
A	*Alca torda*	Razorbill				S2B,S4N	3 Sensitive	50	47.4 ± 7.0	NS
A	*Bucephala clangula*	Common Goldeneye				S2B,S5N	4 Secure	95	8.6 ± 7.0	NS
A	*Branta bernicla*	Brant				S2M	3 Sensitive	1	67.2 ± 16.0	NS
A	*Phalacrocorax carbo*	Great Cormorant				S2S3	3 Sensitive	322	30.0 ± 0.0	NS
A	*Asio otus*	Long-eared Owl				S2S3	2 May Be At Risk	21	32.2 ± 7.0	NS
A	*Spinus pinus*	Pine Siskin				S2S3	3 Sensitive	254	8.6 ± 7.0	NS
A	*Cathartes aura*	Turkey Vulture				S2S3B	3 Sensitive	2	94.4 ± 7.0	PE
A	*Rallus limicola*	Virginia Rail				S2S3B	5 Undetermined	6	44.1 ± 7.0	NS
A	*Tringa semipalmata*	Willet				S2S3B	2 May Be At Risk	510	6.9 ± 7.0	NS
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S2S3B	2 May Be At Risk	112	4.1 ± 7.0	NS
A	*Pheucticus ludovicianus*	Rose-breasted Grosbeak				S2S3B	3 Sensitive	132	6.9 ± 7.0	NS
A	*Icterus galbula*	Baltimore Oriole				S2S3B	2 May Be At Risk	4	46.0 ± 7.0	NS
A	*Pinicola enucleator*	Pine Grosbeak				S2S3B,S5N	2 May Be At Risk	162	4.6 ± 0.0	NS
A	*Numenius phaeopus hudsonicus*	Hudsonian Whimbrel				S2S3M	3 Sensitive	155	37.6 ± 0.0	NS
A	*Calidris melanotos*	Pectoral Sandpiper				S2S3M	4 Secure	75	50.3 ± 0.0	NS
A	*Phalaropus fulicarius*	Red Phalarope				S2S3M	3 Sensitive	1	70.0 ± 0.0	NS
A	*Perisoreus canadensis*	Canada Jay				S3	3 Sensitive	334	5.4 ± 0.0	NS
A	*Poecile hudsonicus*	Boreal Chickadee				S3	3 Sensitive	668	4.1 ± 7.0	NS
A	*Sitta canadensis*	Red-breasted Nuthatch				S3	4 Secure	485	3.7 ± 0.0	NS
A	*Alosa pseudoharengus*	Alewife				S3	3 Sensitive	44	3.8 ± 0.0	NS
A	*Salvelinus fontinalis*	Brook Trout				S3	3 Sensitive	61	12.3 ± 0.0	NS
A	*Synaptomys cooperi*	Southern Bog Lemming				S3	4 Secure	10	4.2 ± 0.0	NS
A	*Pekania pennanti*	Fisher				S3	3 Sensitive	1	37.7 ± 0.0	NS
A	*Calidris maritima*	Purple Sandpiper				S3?N	3 Sensitive	26	45.9 ± 10.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	*Falco sparverius*	American Kestrel				S3B	4 Secure	221	4.1 ± 7.0	NS
A	*Charadrius vociferus*	Killdeer				S3B	3 Sensitive	185	4.1 ± 7.0	NS
A	*Gallinago delicata*	Wilson's Snipe				S3B	3 Sensitive	366	4.1 ± 0.0	NS
A	*Sterna paradisaea*	Arctic Tern				S3B	2 May Be At Risk	92	22.1 ± 0.0	NS
A	*Coccyzus erythropthalmus*	Black-billed Cuckoo				S3B	2 May Be At Risk	19	19.0 ± 7.0	NS
A	*Tyrannus tyrannus*	Eastern Kingbird				S3B	3 Sensitive	69	4.1 ± 7.0	NS
A	*Dumetella carolinensis*	Gray Catbird				S3B	2 May Be At Risk	125	4.1 ± 7.0	NS
A	*Cardellina pusilla*	Wilson's Warbler				S3B	3 Sensitive	89	8.6 ± 7.0	NS
A	*Tringa melanoleuca*	Greater Yellowlegs				S3B,S3S4M	3 Sensitive	476	6.2 ± 0.0	NS
A	*Rissa tridactyla*	Black-legged Kittiwake				S3B,S5N	3 Sensitive	76	65.5 ± 7.0	NS
A	*Fratercula arctica*	Atlantic Puffin				S3B,S5N	3 Sensitive	34	65.7 ± 0.0	NS
A	*Pluvialis squatarola*	Black-bellied Plover				S3M	4 Secure	344	37.6 ± 0.0	NS
A	*Tringa flavipes*	Lesser Yellowlegs				S3M	4 Secure	233	50.3 ± 0.0	NS
A	*Arenaria interpres*	Ruddy Turnstone				S3M	4 Secure	156	41.5 ± 0.0	NS
A	*Calidris pusilla*	Semipalmated Sandpiper				S3M	3 Sensitive	282	37.6 ± 0.0	NS
A	*Calidris fuscicollis*	White-rumped Sandpiper				S3M	4 Secure	160	41.5 ± 0.0	NS
A	*Limnodromus griseus*	Short-billed Dowitcher				S3M	4 Secure	162	50.3 ± 0.0	NS
A	*Calidris alba*	Sanderling				S3M,S2N	4 Secure	180	41.5 ± 0.0	NS
A	*Somateria mollissima*	Common Eider				S3S4	4 Secure	257	36.6 ± 7.0	NS
A	*Picoides arcticus*	Black-backed Woodpecker				S3S4	3 Sensitive	61	28.1 ± 7.0	NS
A	*Loxia curvirostra*	Red Crossbill				S3S4	4 Secure	31	23.7 ± 0.0	NS
A	*Sorex palustris*	American Water Shrew				S3S4	4 Secure	7	78.7 ± 1.0	NS
A	*Botaurus lentiginosus*	American Bittern				S3S4B	3 Sensitive	108	24.4 ± 7.0	NS
A	*Spatula discors*	Blue-winged Teal				S3S4B	2 May Be At Risk	89	8.6 ± 7.0	NS
A	*Actitis macularius*	Spotted Sandpiper				S3S4B	3 Sensitive	612	4.1 ± 7.0	NS
A	*Empidonax flaviventris*	Yellow-bellied Flycatcher				S3S4B	3 Sensitive	584	4.4 ± 0.0	NS
A	*Regulus calendula*	Ruby-crowned Kinglet				S3S4B	3 Sensitive	1457	3.3 ± 0.0	NS
A	*Catharus fuscescens*	Veery				S3S4B	4 Secure	152	5.7 ± 0.0	NS
A	*Catharus ustulatus*	Swainson's Thrush				S3S4B	4 Secure	960	5.4 ± 0.0	NS
A	*Oreothlypis peregrina*	Tennessee Warbler				S3S4B	3 Sensitive	139	15.6 ± 0.0	NS
A	*Setophaga castanea*	Bay-breasted Warbler				S3S4B	3 Sensitive	177	13.6 ± 7.0	NS
A	*Setophaga striata*	Blackpoll Warbler				S3S4B	3 Sensitive	192	18.1 ± 7.0	NS
A	*Passerella iliaca*	Fox Sparrow				S3S4B	4 Secure	264	13.6 ± 7.0	NS
A	*Mergus serrator*	Red-breasted Merganser				S3S4B,S5N	4 Secure	141	6.9 ± 7.0	NS
A	*Bucephala albeola*	Bufflehead				S3S4N	4 Secure	18	63.0 ± 11.0	NS
A	*Eremophila alpestris*	Horned Lark				SHB,S4S5N	4 Secure	2	75.9 ± 7.0	NS
A	*Morus bassanus*	Northern Gannet				SHB,S5M	4 Secure	38	38.9 ± 0.0	NS
A	*Aythya americana*	Redhead				SHB,SNAM	4 Secure	2	88.2 ± 15.0	NS
I	*Danaus plexippus*	Monarch	Endangered	Special Concern	Endangered	S2B	3 Sensitive	15	6.3 ± 0.0	NS
I	*Lampsilis cariosa*	Yellow Lampmussel	Special Concern	Special Concern	Threatened	S1	1 At Risk	37	56.3 ± 0.0	NS
I	*Alasmidonta varicosa*	Brook Floater	Special Concern		Threatened	S1S2	3 Sensitive	3	76.4 ± 0.0	NS
I	*Bombus terricola*	Yellow-banded Bumblebee	Special Concern		Vulnerable	S3	3 Sensitive	3	37.1 ± 0.0	NS
I	*Quedius spelaeus*	Spelean Rove Beetle				S1		1	62.0 ± 1.0	NS
I	*Papilio brevicauda bretonensis*	Short-tailed Swallowtail				S1	1 At Risk	15	26.5 ± 1.0	NS
I	*Somatochlora albicincta*	Ringed Emerald				S1	2 May Be At Risk	7	66.4 ± 0.0	NS
I	*Somatochlora brevicincta*	Quebec Emerald				S1	2 May Be At Risk	7	97.5 ± 0.0	NS
I	*Leucorrhinia patricia*	Canada Whiteface				S1	2 May Be At Risk	1	69.8 ± 0.0	NS
I	*Coenagrion interrogatum*	Subarctic Bluet				S1	2 May Be At Risk	2	45.6 ± 0.0	NS
I	*Leptodea ochracea*	Tidewater Mucket				S1	3 Sensitive	17	55.0 ± 1.0	NS
I	*Lycaena dorcas*	Dorcas Copper				S1?	6 Not Assessed	24	11.9 ± 0.0	NS
I	*Polygonia satyrus*	Satyr Comma				S1?	3 Sensitive	1	68.6 ± 1.0	NS
I	*Strymon melinus*	Grey Hairstreak				S1S2	4 Secure	1	37.0 ± 0.0	NS
I	*Nymphalis l-album*	Compton Tortoiseshell				S1S2	4 Secure	1	33.9 ± 1.0	NS
I	*Haematopota rara*	Shy Cleg				S1S3	5 Undetermined	2	48.3 ± 0.0	NS
I	*Lycaena dospassosi*	Salt Marsh Copper				S2	1 At Risk	1	32.3 ± 0.0	NS
I	*Boloria chariclea grandis*	Purple Lesser Fritillary				S2	3 Sensitive	7	33.3 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
I	*Aglais milberti milberti*	Milbert's Tortoise Shell				S2	4 Secure	1	26.5 ± 1.0	NS
I	*Somatochlora septentrionalis*	Muskeg Emerald				S2	3 Sensitive	26	30.4 ± 0.0	NS
I	*Somatochlora williamsoni*	Williamson's Emerald				S2	2 May Be At Risk	10	30.3 ± 0.0	NS
I	*Margaritifera margaritifera*	Eastern Pearlshell				S2	3 Sensitive	97	18.6 ± 0.0	NS
I	*Pantala hymenaea*	Spot-Winged Glider				S2?B	3 Sensitive	2	33.4 ± 0.0	NS
I	*Thorybes pylades*	Northern Cloudywing				S2S3	3 Sensitive	4	22.8 ± 0.0	NS
I	*Euphydryas phaeton*	Baltimore Checkerspot				S2S3	4 Secure	9	17.6 ± 1.0	NS
I	*Gomphus descriptus*	Harpoon Clubtail				S2S3	3 Sensitive	16	13.0 ± 0.0	NS
I	*Ophiogomphus aspersus*	Brook Snaketail				S2S3	2 May Be At Risk	5	20.3 ± 0.0	NS
I	*Ophiogomphus mainensis*	Maine Snaketail				S2S3	2 May Be At Risk	1	97.2 ± 0.0	NS
I	*Somatochlora forcipata*	Forcipate Emerald				S2S3	2 May Be At Risk	9	18.9 ± 1.0	NS
I	*Alasmidonta undulata*	Triangle Floater				S2S3	4 Secure	5	47.9 ± 0.0	NS
I	*Iphthiminus opacus*	a Darkling Beetle				S3		1	13.6 ± 0.0	NS
I	*Speyeria aphrodite*	Aphrodite Fritillary				S3	4 Secure	2	73.7 ± 1.0	NS
I	*Polygonia faunus*	Green Comma				S3	4 Secure	13	20.7 ± 0.0	NS
I	*Oeneis jutta*	Jutta Arctic				S3	2 May Be At Risk	10	18.7 ± 0.0	NS
I	*Aeshna clepsydra*	Mottled Darner				S3	4 Secure	1	42.0 ± 0.0	NS
I	*Boyeria grafiana*	Ocellated Darner				S3	3 Sensitive	1	67.7 ± 1.0	NS
I	*Gomphaeschna furcillata*	Harlequin Darner				S3	3 Sensitive	3	13.0 ± 0.0	NS
I	*Somatochlora tenebrosa*	Clamp-Tipped Emerald				S3	4 Secure	2	40.3 ± 0.0	NS
I	*Nannothemis bella*	Elfin Skimmer				S3	4 Secure	3	34.6 ± 0.0	NS
I	*Sympetrum danae*	Black Meadowhawk				S3	3 Sensitive	15	31.6 ± 1.0	NS
I	*Enallagma vernale*	Vernal Bluet				S3	5 Undetermined	8	13.0 ± 0.0	NS
I	*Amphiagrion saucium*	Eastern Red Damsel				S3	4 Secure	23	8.0 ± 1.0	NS
I	*Polygonia interrogationis*	Question Mark				S3B	4 Secure	16	26.5 ± 1.0	NS
I	*Erynnis juvenalis*	Juvenal's Duskywing				S3S4	4 Secure	1	83.1 ± 1.0	NS
I	*Polygonia progne*	Grey Comma				S3S4	4 Secure	15	19.2 ± 0.0	NS
I	*Lanthus parvulus*	Northern Pygmy Clubtail				S3S4	4 Secure	22	18.9 ± 1.0	NS
I	*Lampsilis radiata*	Eastern Lampmussel				S3S4	3 Sensitive	14	23.0 ± 0.0	NS
N	*Erioderma pedicellatum (Atlantic pop.)*	Boreal Felt Lichen - Atlantic pop.	Endangered	Endangered	Endangered	S1	1 At Risk	280	8.9 ± 0.0	NS
N	*Pannaria lurida*	Wrinkled Shingle Lichen	Threatened		Threatened	S1S2	2 May Be At Risk	1	41.3 ± 0.0	NS
N	*Sclerophora peronella (Nova Scotia pop.)*	Frosted Glass-whiskers Lichen - Nova Scotia pop.	Special Concern	Special Concern		S1?		5	46.6 ± 0.0	NS
N	*Degelia plumbea*	Blue Felt Lichen	Special Concern	Special Concern	Vulnerable	S3	4 Secure	73	4.6 ± 0.0	NS
N	*Cladonia brevis*	Short Peg Lichen				S1		1	49.4 ± 0.0	NS
N	*Peltigera lepidophora*	Scaly Pelt Lichen				S1	2 May Be At Risk	2	12.8 ± 0.0	NS
N	*Gowardia nigricans*	Gray Witch's Beard Lichen				S1	6 Not Assessed	1	83.9 ± 1.0	NS
N	*Cavernularia hultenii*	Powdered Honeycomb Lichen				S1	2 May Be At Risk	1	94.3 ± 1.0	NS
N	*Metacalypogeia schusterana*	Schuster's Pouchwort				S1?	5 Undetermined	1	32.6 ± 0.0	NS
N	*Moerckia hibernica*	Irish Ruffwort				S1?		1	32.6 ± 0.0	NS
N	*Brachythecium erythrorrhizon*	Taiga Ragged Moss				S1?		2	32.6 ± 0.0	NS
N	*Calliergon richardsonii*	Richardson's Spear Moss				S1?		1	89.7 ± 0.0	NS
N	*Conardia compacta*	Coast Creeping Moss				S1?	3 Sensitive	2	26.0 ± 2.0	NS
N	*Entodon concinnus*	Lime Entodon Moss				S1?	3 Sensitive	2	84.6 ± 0.0	NS
N	*Grimmia laevigata*	a Moss				S1?	3 Sensitive	2	79.5 ± 0.0	NS
N	*Grimmia pilifera*	a Moss				S1?	3 Sensitive	2	84.6 ± 0.0	NS
N	*Hygrohypnum smithii*	Smith's Brook Moss				S1?	3 Sensitive	1	84.8 ± 0.0	NS
N	*Orthothecium strictum*	Shiny Erect-capsule Moss				S1?	3 Sensitive	2	84.6 ± 0.0	NS
N	*Paludella squarrosa*	Tufted Fen Moss				S1?	3 Sensitive	1	26.9 ± 5.0	NS
N	*Seligeria recurvata*	a Moss				S1?	3 Sensitive	1	98.0 ± 1.0	NS
N	*Seligeria tristichoides*	a Moss				S1?	3 Sensitive	1	98.0 ± 1.0	NS
N	*Timmia norvegica*	a moss				S1?	3 Sensitive	1	91.1 ± 50.0	NS
N	*Syntrichia ruralis*	a Moss				S1?	3 Sensitive	1	56.2 ± 1.0	NS
N	*Ulota curvifolia*	a Moss				S1?	3 Sensitive	1	79.5 ± 0.0	NS
N	*Plagiomnium ellipticum*	Marsh Leafy Moss				S1?	2 May Be At Risk	1	84.5 ± 2.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
N	*Flavocetraria nivalis*	Crinkled Snow Lichen				S1?	3 Sensitive	1	67.0 ± 0.0	NS
N	*Parmeliella parvula*	Poor-man's Shingles Lichen				S1?	2 May Be At Risk	6	49.1 ± 0.0	NS
N	*Buxbaumia minakatae*	Hump-Backed Elves				S1S2	3 Sensitive	1	31.4 ± 100.0	NS
N	*Ctenidium molluscum*	Mollusc Ctenidium moss				S1S2		1	77.5 ± 1.0	NS
N	*Dicranodontium denudatum*	Beaked Bow Moss				S1S2	3 Sensitive	2	84.6 ± 0.0	NS
N	*Dicranoweisia crispula*	Mountain Thatch Moss				S1S2	3 Sensitive	1	75.6 ± 0.0	NS
N	*Didymodon ferrugineus*	a moss				S1S2	3 Sensitive	2	96.3 ± 0.0	NS
N	*Mnium thomsonii*	Thomson's Leafy Moss				S1S2	3 Sensitive	2	96.3 ± 0.0	NS
N	*Plagiobryum zieri*	a Moss				S1S2	3 Sensitive	6	84.6 ± 0.0	NS
N	*Platydictya confervoides*	a Moss				S1S2	3 Sensitive	1	56.6 ± 3.0	NS
N	*Seligeria calcarea*	Chalk Brittle Moss				S1S2	3 Sensitive	2	96.3 ± 0.0	NS
N	*Sphagnum platyphyllum*	Flat-leaved Peat Moss				S1S2		2	15.5 ± 0.0	NS
N	*Hamatocaulis vernicosus*	a Moss				S1S2	3 Sensitive	2	12.1 ± 0.0	NS
N	*Schistidium trichodon*	a Moss				S1S2	3 Sensitive	2	96.3 ± 0.0	NS
N	*Anacamptodon splachnoides*	a Moss				S2?	3 Sensitive	1	97.0 ± 1.0	NS
N	*Anomodon viticulosus*	a Moss				S2?	3 Sensitive	7	96.3 ± 0.0	NS
N	*Atrichum angustatum*	Lesser Smoothcap Moss				S2?	3 Sensitive	3	36.5 ± 30.0	NS
N	*Campylium polygamum*	a Moss				S2?	5 Undetermined	1	95.1 ± 2.0	NS
N	*Campylium radicale*	Long-stalked Fine Wet Moss				S2?	5 Undetermined	1	15.4 ± 0.0	NS
N	*Dicranum condensatum*	Condensed Broom Moss				S2?	5 Undetermined	1	96.3 ± 0.0	PE
N	*Fontinalis hypnoides*	a moss				S2?	5 Undetermined	2	86.2 ± 1.0	NS
N	*Fontinalis sullivantii*	a Moss				S2?	3 Sensitive	1	31.4 ± 100.0	NS
N	*Grimmia anomala*	Mountain Forest Grimmia				S2?	3 Sensitive	3	52.9 ± 0.0	NS
N	*Hygrohypnum bestii*	Best's Brook Moss				S2?	3 Sensitive	2	99.7 ± 0.0	NS
N	*Kiaeria starkei*	Starke's Fork Moss				S2?	3 Sensitive	1	98.0 ± 1.0	NS
N	*Orthotrichum anomalum*	Anomalous Bristle Moss				S2?	3 Sensitive	1	79.5 ± 0.0	NS
N	*Philonotis marchica*	a Moss				S2?	5 Undetermined	2	96.8 ± 5.0	NS
N	*Platydictya jungermannioides*	False Willow Moss				S2?	3 Sensitive	4	30.8 ± 0.0	NS
N	*Pseudoleskea patens*	Patent Leskea Moss				S2?	3 Sensitive	4	91.2 ± 0.0	NS
N	*Pseudoleskea stenophylla*	Narrow-leaved Leskea Moss				S2?	3 Sensitive	6	94.0 ± 1.0	NS
N	*Rhytidium rugosum*	Wrinkle-leaved Moss				S2?	3 Sensitive	4	83.8 ± 0.0	NS
N	*Scorpidium scorpioides*	Hooked Scorpion Moss				S2?	3 Sensitive	9	6.7 ± 0.0	NS
N	*Seligeria donniana*	Donian Beardless Moss				S2?	3 Sensitive	3	95.1 ± 2.0	NS
N	*Sematophyllum marylandicum*	a Moss				S2?	3 Sensitive	4	84.5 ± 0.0	NS
N	*Tetraplodon angustatus*	Toothed-leaved Nitrogen Moss				S2?	3 Sensitive	2	88.8 ± 0.0	NS
N	*Tortella fragilis*	Fragile Twisted Moss				S2?	3 Sensitive	6	32.4 ± 0.0	NS
N	*Anomobryum filiforme*	a moss				S2?		5	83.8 ± 0.0	NS
N	*Cyrtomnium hymenophylloides*	Short-pointed Lantern Moss				S2?	3 Sensitive	6	33.4 ± 0.0	NS
N	*Platylomella lescurii*	a Moss				S2?	3 Sensitive	2	84.6 ± 1.0	NS
N	*Nephroma arcticum*	Arctic Kidney Lichen				S2?	2 May Be At Risk	1	32.2 ± 0.0	NS
N	*Peltigera collina*	Tree Pelt Lichen				S2?	3 Sensitive	17	15.8 ± 0.0	NS
N	*Platydictya subtilis*	Bark Willow Moss				S2S3	3 Sensitive	1	91.2 ± 0.0	NS
N	*Tetraplodon mnioides*	Entire-leaved Nitrogen Moss				S2S3	4 Secure	9	84.5 ± 0.0	NS
N	*Limprichtia revolvens*	a Moss				S2S3	3 Sensitive	6	11.9 ± 0.0	NS
N	*Cetraria muricata*	Spiny Heath Lichen				S2S3	5 Undetermined	4	83.9 ± 1.0	NS
N	*Fuscopannaria leucosticta*	Rimmed Shingles Lichen				S2S3	2 May Be At Risk	1	53.1 ± 0.0	NS
N	*Leptogium tenuissimum*	Birdnest Jellyskin Lichen				S2S3	6 Not Assessed	2	12.8 ± 0.0	NS
N	*Racodium rupestre*	Rockhair Lichen				S2S3	5 Undetermined	1	88.3 ± 0.0	NS
N	*Usnea mutabilis*	Bloody Beard Lichen				S2S3	3 Sensitive	1	18.6 ± 0.0	NS
N	*Collema tenax*	Soil Tarpaper Lichen				S3		2	12.7 ± 0.0	NS
N	*Sticta fuliginosa*	Peppered Moon Lichen				S3	3 Sensitive	3	45.1 ± 0.0	NS
N	*Fuscopannaria ahlneri*	Corrugated Shingles Lichen				S3	4 Secure	36	16.8 ± 0.0	NS
N	*Heterodermia speciosa*	Powdered Fringe Lichen				S3	4 Secure	1	50.8 ± 0.0	NS
N	*Leptogium corticola*	Blistered Jellyskin Lichen				S3	3 Sensitive	1	48.8 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
N	*Leptogium lichenoides*	Tattered Jellyskin Lichen				S3	2 May Be At Risk	2	12.8 ± 0.0	NS
N	*Nephroma bellum*	Naked Kidney Lichen				S3	3 Sensitive	1	32.2 ± 0.0	NS
N	*Platismatia norvegica*	Oldgrowth Rag Lichen				S3	4 Secure	128	43.1 ± 0.0	NS
N	*Moelleropsis nebulosa*	Blue-gray Moss Shingle Lichen				S3	4 Secure	10	40.5 ± 0.0	NS
N	*Calliergon giganteum*	Giant Spear Moss				S3?	3 Sensitive	1	6.8 ± 0.0	NS
N	*Drummondia prorepens*	a Moss				S3?	3 Sensitive	5	74.9 ± 2.0	NS
N	*Anomodon tristis*	a Moss				S3?	3 Sensitive	2	75.3 ± 0.0	NS
N	*Mnium stellare*	Star Leafy Moss				S3?	5 Undetermined	2	32.6 ± 0.0	NS
N	*Anomodon rugelii*	Rugel's Anomodon Moss				S3S4	3 Sensitive	1	96.5 ± 0.0	NS
N	*Dicranella varia*	a Moss				S3S4	5 Undetermined	2	15.7 ± 0.0	NS
N	*Dicranum leioneuron*	a Dicranum Moss				S3S4	4 Secure	9	84.5 ± 0.0	NS
N	*Encalypta procera*	Slender Extinguisher Moss				S3S4	4 Secure	5	31.7 ± 0.0	NS
N	*Myurella julacea*	Small Mouse-tail Moss				S3S4	3 Sensitive	2	84.6 ± 0.0	NS
N	*Sphagnum lindbergii*	Lindberg's Peat Moss				S3S4	4 Secure	1	90.0 ± 0.0	NS
N	*Splachnum ampullaceum*	Cruet Dung Moss				S3S4	4 Secure	2	88.8 ± 0.0	NS
N	*Thamnobryum alleghaniense*	a Moss				S3S4	3 Sensitive	6	77.5 ± 1.0	NS
N	*Schistidium agassizii*	Elf Bloom Moss				S3S4	4 Secure	4	75.6 ± 0.0	NS
N	*Hylocomiastrum pyrenaicum*	a Feather Moss				S3S4	3 Sensitive	1	26.2 ± 3.0	NS
N	*Arctoparmelia incurva*	Finger Ring Lichen				S3S4	4 Secure	3	83.9 ± 1.0	NS
N	*Hypogymnia vittata*	Slender Monk's Hood Lichen				S3S4	4 Secure	72	44.3 ± 0.0	NS
N	*Cladonia floerkeana*	Gritty British Soldiers Lichen				S3S4	5 Undetermined	3	49.5 ± 0.0	NS
N	*Leptogium acadiense*	Acadian Jellyskin Lichen				S3S4		1	44.6 ± 0.0	NS
N	*Coccocarpia palmicola*	Salted Shell Lichen				S3S4	4 Secure	309	32.4 ± 0.0	NS
N	*Anaptychia palmulata*	Shaggy Fringed Lichen				S3S4	4 Secure	5	84.2 ± 0.0	NS
N	*Heterodermia neglecta*	Fringe Lichen				S3S4	4 Secure	8	12.7 ± 2.0	NS
P	*Juncus caesariensis*	New Jersey Rush	Special Concern	Special Concern	Vulnerable	S2	3 Sensitive	239	45.1 ± 5.0	NS
P	*Isoetes prototypus*	Prototype Quillwort	Special Concern	Special Concern	Vulnerable	S2	3 Sensitive	13	60.0 ± 0.0	NS
P	*Floerkea proserpinacoides*	False Mermaidweed	Not At Risk			S2	3 Sensitive	21	25.9 ± 1.0	NS
P	*Salix candida*	Sage Willow			Endangered	S1	2 May Be At Risk	42	28.4 ± 0.0	NS
P	*Thuja occidentalis*	Eastern White Cedar			Vulnerable	S1	1 At Risk	3	86.0 ± 7.0	NS
P	*Acer saccharinum*	Silver Maple				S1	5 Undetermined	1	65.6 ± 0.0	NS
P	*Sanicula odorata*	Clustered Sanicle				S1	2 May Be At Risk	6	26.4 ± 1.0	NS
P	*Zizia aurea*	Golden Alexanders				S1	2 May Be At Risk	7	75.7 ± 5.0	NS
P	*Arnica lonchophylla*	Northern Arnica				S1	2 May Be At Risk	11	36.6 ± 7.0	NS
P	*Bidens hyperborea*	Estuary Beggarticks				S1	2 May Be At Risk	3	44.1 ± 7.0	NS
P	*Nabalus racemosus*	Glaucous Rattlesnakeroot				S1	2 May Be At Risk	1	69.5 ± 3.0	NS
P	*Ageratina altissima*	White Snakeroot				S1	2 May Be At Risk	2	75.4 ± 1.0	NS
P	*Betula glandulosa*	Glandular Birch				S1	2 May Be At Risk	5	80.2 ± 7.0	NS
P	*Cardamine dentata*	Toothed Bittercress				S1	2 May Be At Risk	5	16.3 ± 0.0	NS
P	*Cochlearia tridactylites*	Limestone Scurvy-grass				S1	2 May Be At Risk	4	81.6 ± 0.0	NS
P	*Draba glabella*	Rock Whitlow-Grass				S1	2 May Be At Risk	3	79.5 ± 0.0	NS
P	*Draba norvegica*	Norwegian Whitlow-Grass				S1	2 May Be At Risk	8	52.5 ± 2.0	NS
P	*Stellaria crassifolia*	Fleshy Stitchwort				S1	2 May Be At Risk	2	8.4 ± 2.0	NS
P	*Hudsonia tomentosa*	Woolly Beach-heath				S1	2 May Be At Risk	7	70.0 ± 1.0	NS
P	*Diapensia lapponica*	Diapensia				S1	2 May Be At Risk	1	76.3 ± 0.0	NS
P	*Pinguicula vulgaris*	Common Butterwort				S1	2 May Be At Risk	6	76.3 ± 1.0	NS
P	*Utricularia ochroleuca*	Yellowish-white Bladderwort				S1	5 Undetermined	1	59.7 ± 1.0	NS
P	*Oxyria digyna*	Mountain Sorrel				S1	2 May Be At Risk	8	93.0 ± 0.0	NS
P	*Bistorta vivipara*	Alpine Bistort				S1	2 May Be At Risk	1	36.0 ± 1.0	NS
P	*Montia fontana*	Water Blinks				S1	2 May Be At Risk	2	46.2 ± 1.0	NS
P	*Anemone multifida*	Cut-leaved Anemone				S1	2 May Be At Risk	4	78.7 ± 1.0	NS
P	*Potentilla litoralis*	Coastal Cinquefoil				S1	0.1 Extirpated	4	83.8 ± 1.0	NS
P	*Salix vestita*	Hairy Willow				S1	2 May Be At Risk	1	84.8 ± 0.0	NS
P	*Saxifraga aizoides*	Yellow Mountain Saxifrage				S1	2 May Be At Risk	8	84.8 ± 0.0	NS
P	*Saxifraga oppositifolia*	Purple Mountain Saxifrage				S1	2 May Be At Risk	2	84.2 ± 1.0	NS
P	*Agalinis purpurea var.*	Small-flowered Purple False				S1		1	14.8 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
	parviflora	Foxglove								
P	*Pedicularis palustris*	Marsh Lousewort				S1	2 May Be At Risk	3	93.2 ± 0.0	NS
P	*Scrophularia lanceolata*	Lance-leaved Figwort				S1	5 Undetermined	2	31.6 ± 1.0	NS
P	*Carex alopecoidea*	Foxtail Sedge				S1	2 May Be At Risk	2	69.1 ± 0.0	NS
P	*Carex granularis*	Limestone Meadow Sedge				S1	2 May Be At Risk	21	5.2 ± 0.0	NS
P	*Carex gynocrates*	Northern Bog Sedge				S1	2 May Be At Risk	16	4.7 ± 0.0	NS
P	*Carex haydenii*	Hayden's Sedge				S1	2 May Be At Risk	2	15.1 ± 0.0	NS
P	*Carex rariflora*	Loose-flowered Alpine Sedge				S1	2 May Be At Risk	9	82.2 ± 5.0	NS
P	*Carex tenuiflora*	Sparse-Flowered Sedge				S1	2 May Be At Risk	3	48.0 ± 0.0	NS
P	*Carex tincta*	Tinged Sedge				S1	2 May Be At Risk	1	69.1 ± 1.0	NS
P	*Carex viridula var. elatior*	Greenish Sedge				S1	2 May Be At Risk	54	4.0 ± 0.0	NS
P	*Carex grisea*	Inflated Narrow-leaved Sedge				S1	2 May Be At Risk	6	79.6 ± 0.0	NS
P	*Carex saxatilis*	Russet Sedge				S1	2 May Be At Risk	7	93.5 ± 7.0	NS
P	*Cyperus lupulinus*	Hop Flatsedge				S1	2 May Be At Risk	5	69.3 ± 0.0	NS
P	*Cyperus lupulinus ssp. macilentus*	Hop Flatsedge				S1	2 May Be At Risk	8	70.0 ± 1.0	NS
P	*Eleocharis erythropoda*	Red-stemmed Spikerush				S1	2 May Be At Risk	6	4.7 ± 0.0	NS
P	*Rhynchospora capillacea*	Slender Beakrush				S1	2 May Be At Risk	8	12.2 ± 10.0	NS
P	*Blysmopsis rufa*	Red Bulrush				S1	2 May Be At Risk	1	71.2 ± 1.0	NS
P	*Iris prismatica*	Slender Blue Flag				S1	2 May Be At Risk	2	31.4 ± 0.0	NS
P	*Triantha glutinosa*	Sticky False-Asphodel				S1	2 May Be At Risk	15	28.4 ± 0.0	NS
P	*Malaxis monophyllos*	White Adder's-mouth				S1	2 May Be At Risk	1	60.0 ± 7.0	NS
P	*Bromus latiglumis*	Broad-Glumed Brome				S1	2 May Be At Risk	11	33.0 ± 0.0	NS
P	*Elymus wiegandii*	Wiegand's Wild Rye				S1	2 May Be At Risk	9	33.2 ± 0.0	NS
P	*Elymus hystrix*	Spreading Wild Rye				S1	2 May Be At Risk	1	88.5 ± 4.0	NS
P	*Hordeum brachyantherum*	Meadow Barley				S1	2 May Be At Risk	1	58.8 ± 0.0	NS
P	*Phleum alpinum*	Alpine Timothy				S1	2 May Be At Risk	7	57.3 ± 0.0	NS
P	*Torreyochloa pallida var. pallida*	Pale False Manna Grass				S1	0.1 Extirpated	2	67.2 ± 1.0	NS
P	*Graphephorum melicoides*	Purple False Oats				S1	2 May Be At Risk	4	46.6 ± 0.0	NS
P	*Sparganium androcladum*	Branching Bur-Reed				S1	2 May Be At Risk	2	15.3 ± 0.0	NS
P	*Equisetum palustre*	Marsh Horsetail				S1	2 May Be At Risk	8	33.1 ± 0.0	NS
P	*Botrychium lunaria*	Common Moonwort				S1	2 May Be At Risk	2	59.5 ± 1.0	NS
P	*Epilobium lactiflorum*	White-flowered Willowherb				S1?	2 May Be At Risk	1	92.3 ± 5.0	NS
P	*Bolboschoenus robustus*	Sturdy Bulrush				S1?	5 Undetermined	2	26.0 ± 5.0	NS
P	*Dichanthelium lindheimeri*	Lindheimer's Panicgrass				S1?	5 Undetermined	1	92.8 ± 1.0	NS
P	*Huperzia selago*	Northern Firmoss				S1?	2 May Be At Risk	2	66.2 ± 2.0	NS
P	*Fraxinus nigra*	Black Ash			Threatened	S1S2	1 At Risk	96	4.1 ± 0.0	NS
P	*Rudbeckia laciniata*	Cut-Leaved Coneflower				S1S2	2 May Be At Risk	1	77.1 ± 7.0	NS
P	*Arabis pycnocarpa*	Cream-flowered Rockcress				S1S2	2 May Be At Risk	7	58.4 ± 0.0	NS
P	*Cornus suecica*	Swedish Bunchberry				S1S2	3 Sensitive	22	70.7 ± 6.0	NS
P	*Anemone virginiana var. alba*	Virginia Anemone				S1S2	3 Sensitive	8	6.9 ± 1.0	NS
P	*Ranunculus sceleratus*	Cursed Buttercup				S1S2	2 May Be At Risk	6	34.3 ± 7.0	NS
P	*Parnassia parviflora*	Small-flowered Grass-of-Parnassus				S1S2	2 May Be At Risk	17	34.5 ± 3.0	NS
P	*Carex livida*	Livid Sedge				S1S2	2 May Be At Risk	27	40.0 ± 5.0	NS
P	*Juncus greenei*	Greene's Rush				S1S2	2 May Be At Risk	1	70.0 ± 1.0	NS
P	*Juncus alpinoarticulatus ssp. Rariflorus*					S1S2	2 May Be At Risk	13	16.3 ± 0.0	NS
P	*Juncus bulbosus*	Bulbous Rush				S1S2	5 Undetermined	12	74.7 ± 0.0	NS
P	*Platanthera huronensis*	Fragrant Green Orchid				S1S2	5 Undetermined	5	11.9 ± 0.0	NS
P	*Calamagrostis stricta ssp. stricta*	Slim-stemmed Reed Grass				S1S2	3 Sensitive	2	27.0 ± 1.0	NS
P	*Cinna arundinacea*	Sweet Wood Reed Grass				S1S2	2 May Be At Risk	24	31.4 ± 0.0	NS
P	*Festuca prolifera*	Proliferous Fescue				S1S2	3 Sensitive	6	75.2 ± 1.0	NS
P	*Sparganium hyperboreum*	Northern Burreed				S1S2	3 Sensitive	14	30.9 ± 1.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	*Cryptogramma stelleri*	Steller's Rockbrake				S1S2	2 May Be At Risk	17	9.1 ± 0.0	NS
P	*Woodsia alpina*	Alpine Cliff Fern				S1S2	2 May Be At Risk	10	61.3 ± 2.0	NS
P	*Selaginella selaginoides*	Low Spikemoss				S1S2	2 May Be At Risk	5	42.9 ± 0.0	NS
P	*Carex vacillans*	Estuarine Sedge				S1S3	5 Undetermined	2	69.1 ± 0.0	NS
P	*Conioselinum chinense*	Chinese Hemlock-parsley				S2	3 Sensitive	3	84.6 ± 0.0	NS
P	*Osmorhiza longistylis*	Smooth Sweet Cicely				S2	2 May Be At Risk	21	7.9 ± 10.0	NS
P	*Erigeron philadelphicus*	Philadelphia Fleabane				S2	3 Sensitive	8	6.9 ± 7.0	NS
P	*Solidago multiradiata*	Multi-rayed Goldenrod				S2	2 May Be At Risk	11	68.1 ± 2.0	NS
P	*Symphyotrichum ciliolatum*	Fringed Blue Aster				S2	3 Sensitive	1	53.5 ± 7.0	NS
P	*Impatiens pallida*	Pale Jewelweed				S2	3 Sensitive	10	8.6 ± 7.0	NS
P	*Caulophyllum thalictroides*	Blue Cohosh				S2	2 May Be At Risk	19	19.9 ± 0.0	NS
P	*Boechera stricta*	Drummond's Rockcress				S2	3 Sensitive	6	53.5 ± 1.0	NS
P	*Cardamine parviflora*	Small-flowered Bittercress				S2	3 Sensitive	9	64.0 ± 1.0	NS
P	*Draba arabisans*	Rock Whitlow-Grass				S2	3 Sensitive	14	15.3 ± 1.0	NS
P	*Lobelia kalmii*	Brook Lobelia				S2	2 May Be At Risk	95	4.0 ± 0.0	NS
P	*Stellaria humifusa*	Saltmarsh Starwort				S2	3 Sensitive	5	82.7 ± 0.0	NS
P	*Stellaria longifolia*	Long-leaved Starwort				S2	3 Sensitive	1	33.0 ± 0.0	NS
P	*Oxybasis rubra*	Red Goosefoot				S2	2 May Be At Risk	4	41.0 ± 2.0	NS
P	*Hudsonia ericoides*	Pinebarren Golden Heather				S2	3 Sensitive	11	85.9 ± 1.0	NS
P	*Hypericum majus*	Large St John's-wort				S2	3 Sensitive	2	13.6 ± 1.0	NS
P	*Crassula aquatica*	Water Pygmyweed				S2	3 Sensitive	6	38.5 ± 7.0	NS
P	*Oxytropis campestris var. johannensis*	Field Locoweed				S2	2 May Be At Risk	5	79.5 ± 0.0	NS
P	*Myriophyllum farwellii*	Farwell's Water Milfoil				S2	3 Sensitive	1	52.6 ± 7.0	NS
P	*Myriophyllum verticillatum*	Whorled Water Milfoil				S2	3 Sensitive	6	6.2 ± 0.0	NS
P	*Utricularia resupinata*	Inverted Bladderwort				S2	3 Sensitive	1	44.3 ± 0.0	NS
P	*Oenothera fruticosa ssp. tetragona*	Narrow-leaved Evening Primrose				S2	5 Undetermined	1	28.9 ± 1.0	NS
P	*Rumex triangulivalvis*	Triangular-valve Dock				S2	3 Sensitive	10	8.6 ± 7.0	NS
P	*Primula mistassinica*	Mistassini Primrose				S2	3 Sensitive	10	75.5 ± 1.0	NS
P	*Anemonastrum canadense*	Canada Anemone				S2	2 May Be At Risk	10	49.9 ± 3.0	NS
P	*Anemone quinquefolia*	Wood Anemone				S2	3 Sensitive	4	24.7 ± 1.0	NS
P	*Anemone virginiana*	Virginia Anemone				S2	3 Sensitive	23	25.3 ± 0.0	NS
P	*Caltha palustris*	Yellow Marsh Marigold				S2	3 Sensitive	34	22.2 ± 0.0	NS
P	*Galium labradoricum*	Labrador Bedstraw				S2	3 Sensitive	93	3.6 ± 0.0	NS
P	*Salix pedicellaris*	Bog Willow				S2	3 Sensitive	12	16.8 ± 0.0	NS
P	*Comandra umbellata*	Bastard's Toadflax				S2	2 May Be At Risk	28	12.6 ± 7.0	NS
P	*Saxifraga paniculata ssp. Laestadii*	Laestadius' Saxifrage				S2	3 Sensitive	16	18.2 ± 7.0	NS
P	*Viola nephrophylla*	Northern Bog Violet				S2	3 Sensitive	11	13.1 ± 0.0	NS
P	*Carex bebbii*	Bebb's Sedge				S2	3 Sensitive	30	5.4 ± 0.0	NS
P	*Carex capillaris*	Hairlike Sedge				S2	3 Sensitive	14	76.5 ± 1.0	NS
P	*Carex castanea*	Chestnut Sedge				S2	2 May Be At Risk	24	11.6 ± 0.0	NS
P	*Carex comosa*	Bearded Sedge				S2	3 Sensitive	1	38.9 ± 1.0	NS
P	*Carex hystericina*	Porcupine Sedge				S2	2 May Be At Risk	37	12.1 ± 5.0	NS
P	*Carex scirpoidea*	Scirpuslike Sedge				S2	3 Sensitive	13	55.0 ± 4.0	NS
P	*Carex tenera*	Tender Sedge				S2	3 Sensitive	3	54.6 ± 1.0	NS
P	*Carex tuckermanii*	Tuckerman's Sedge				S2	3 Sensitive	2	30.5 ± 0.0	NS
P	*Carex atratiformis*	Scabrous Black Sedge				S2	3 Sensitive	19	8.6 ± 7.0	NS
P	*Eleocharis quinqueflora*	Few-flowered Spikerush				S2	3 Sensitive	30	6.7 ± 0.0	NS
P	*Vallisneria americana*	Wild Celery				S2	2 May Be At Risk	2	62.3 ± 10.0	NS
P	*Juncus stygius ssp. americanus*	Moor Rush				S2	3 Sensitive	37	37.9 ± 7.0	NS
P	*Allium schoenoprasum*	Wild Chives				S2	2 May Be At Risk	1	65.8 ± 0.0	NS
P	*Allium schoenoprasum var. sibiricum*	Wild Chives				S2	2 May Be At Risk	8	46.6 ± 7.0	NS
P	*Lilium canadense*	Canada Lily				S2	2 May Be At Risk	20	8.6 ± 1.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	*Cypripedium parviflorum var. pubescens*	Yellow Lady's-slipper				S2	3 Sensitive	12	4.7 ± 0.0	NS
P	*Cypripedium parviflorum var. makasin*	Small Yellow Lady's-Slipper				S2	3 Sensitive	18	5.5 ± 0.0	NS
P	*Cypripedium reginae*	Showy Lady's-Slipper				S2	2 May Be At Risk	360	4.6 ± 0.0	NS
P	*Platanthera macrophylla*	Large Round-Leaved Orchid				S2	3 Sensitive	1	98.4 ± 0.0	NS
P	*Spiranthes lucida*	Shining Ladies'-Tresses				S2	2 May Be At Risk	26	25.2 ± 0.0	NS
P	*Calamagrostis stricta*	Slim-stemmed Reed Grass				S2	3 Sensitive	5	94.0 ± 0.0	PE
P	*Piptatheropsis canadensis*	Canada Ricegrass				S2	3 Sensitive	1	69.7 ± 0.0	NS
P	*Piptatheropsis pungens*	Slender Ricegrass				S2	3 Sensitive	1	82.3 ± 10.0	NS
P	*Potamogeton friesii*	Fries' Pondweed				S2	2 May Be At Risk	8	29.8 ± 0.0	NS
P	*Potamogeton richardsonii*	Richardson's Pondweed				S2	2 May Be At Risk	9	3.7 ± 0.0	NS
P	*Cystopteris laurentiana*	Laurentian Bladder Fern				S2	2 May Be At Risk	23	8.6 ± 10.0	NS
P	*Dryopteris fragrans*	Fragrant Wood Fern				S2	3 Sensitive	11	48.8 ± 7.0	NS
P	*Polystichum lonchitis*	Northern Holly Fern				S2	3 Sensitive	21	6.9 ± 7.0	NS
P	*Woodsia glabella*	Smooth Cliff Fern				S2	3 Sensitive	24	8.6 ± 7.0	NS
P	*Symphyotrichum boreale*	Boreal Aster				S2?	3 Sensitive	59	3.6 ± 0.0	NS
P	*Cuscuta cephalanthi*	Buttonbush Dodder				S2?	5 Undetermined	3	68.4 ± 7.0	NS
P	*Epilobium coloratum*	Purple-veined Willowherb				S2?	3 Sensitive	2	75.7 ± 0.0	NS
P	*Rumex persicarioides*	Peach-leaved Dock				S2?	2 May Be At Risk	1	15.4 ± 0.0	NS
P	*Crataegus submollis*	Quebec Hawthorn				S2?	5 Undetermined	1	95.2 ± 7.0	NS
P	*Eleocharis ovata*	Ovate Spikerush				S2?	3 Sensitive	2	63.5 ± 0.0	NS
P	*Scirpus pedicellatus*	Stalked Bulrush				S2?	3 Sensitive	4	32.4 ± 0.0	NS
P	*Hieracium robinsonii*	Robinson's Hawkweed				S2S3	3 Sensitive	41	48.7 ± 1.0	NS
P	*Iva frutescens*	Big-leaved Marsh-elder				S2S3	3 Sensitive	1	88.1 ± 4.0	NS
P	*Senecio pseudoarnica*	Seabeach Ragwort				S2S3	3 Sensitive	13	31.9 ± 0.0	NS
P	*Betula michauxii*	Michaux's Dwarf Birch				S2S3	3 Sensitive	10	88.2 ± 0.0	NS
P	*Sagina nodosa*	Knotted Pearlwort				S2S3	4 Secure	1	69.4 ± 5.0	NS
P	*Sagina nodosa ssp. borealis*	Knotted Pearlwort				S2S3	4 Secure	1	94.8 ± 5.0	PE
P	*Hypericum x dissimulatum*	Disguised St. John's-wort				S2S3	3 Sensitive	2	46.0 ± 2.0	NS
P	*Triosteum aurantiacum*	Orange-fruited Tinker's Weed				S2S3	3 Sensitive	123	8.1 ± 1.0	NS
P	*Shepherdia canadensis*	Soapberry				S2S3	3 Sensitive	140	30.0 ± 0.0	NS
P	*Empetrum atropurpureum*	Purple Crowberry				S2S3	3 Sensitive	9	69.6 ± 3.0	NS
P	*Euphorbia polygonifolia*	Seaside Spurge				S2S3	3 Sensitive	13	16.9 ± 1.0	NS
P	*Halenia deflexa*	Spurred Gentian				S2S3	3 Sensitive	43	20.0 ± 0.0	NS
P	*Hedeoma pulegioides*	American False Pennyroyal				S2S3	3 Sensitive	2	65.8 ± 1.0	NS
P	*Polygonum aviculare ssp. buxiforme*	Box Knotweed				S2S3	5 Undetermined	1	54.0 ± 7.0	NS
P	*Polygonum oxyspermum ssp. raii*	Ray's Knotweed				S2S3	5 Undetermined	16	4.9 ± 5.0	NS
P	*Amelanchier fernaldii*	Fernald's Serviceberry				S2S3	5 Undetermined	7	25.0 ± 1.0	NS
P	*Potentilla canadensis*	Canada Cinquefoil				S2S3	3 Sensitive	2	48.6 ± 2.0	NS
P	*Galium aparine*	Common Bedstraw				S2S3	3 Sensitive	1	79.7 ± 0.0	NS
P	*Salix pellita*	Satiny Willow				S2S3	3 Sensitive	5	20.2 ± 2.0	NS
P	*Carex adusta*	Lesser Brown Sedge				S2S3	3 Sensitive	3	93.5 ± 7.0	NS
P	*Carex hirtifolia*	Pubescent Sedge				S2S3	3 Sensitive	9	18.3 ± 0.0	NS
P	*Eleocharis flavescens*	Pale Spikerush				S2S3	3 Sensitive	3	83.6 ± 5.0	NS
P	*Eriophorum gracile*	Slender Cottongrass				S2S3	3 Sensitive	8	16.8 ± 0.0	NS
P	*Oreojuncus trifidus*	Highland Rush				S2S3	3 Sensitive	16	7.4 ± 0.0	NS
P	*Coeloglossum viride*	Long-bracted Frog Orchid				S2S3	2 May Be At Risk	16	93.2 ± 1.0	NS
P	*Cypripedium parviflorum*	Yellow Lady's-slipper				S2S3	3 Sensitive	99	4.6 ± 0.0	NS
P	*Poa glauca*	Glaucous Blue Grass				S2S3	3 Sensitive	19	9.1 ± 0.0	NS
P	*Stuckenia filiformis*	Thread-leaved Pondweed				S2S3	3 Sensitive	46	4.1 ± 7.0	NS
P	*Botrychium lanceolatum ssp. angustisegmentum*	Narrow Triangle Moonwort				S2S3	3 Sensitive	9	8.6 ± 7.0	NS
P	*Botrychium simplex*	Least Moonwort				S2S3	3 Sensitive	8	24.8 ± 5.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	*Ophioglossum pusillum*	Northern Adder's-tongue				S2S3	3 Sensitive	1	53.4 ± 5.0	NS
P	*Angelica atropurpurea*	Purple-stemmed Angelica				S3	4 Secure	30	27.8 ± 0.0	NS
P	*Erigeron hyssopifolius*	Hyssop-leaved Fleabane				S3	3 Sensitive	100	5.5 ± 0.0	NS
P	*Bidens beckii*	Water Beggarticks				S3	4 Secure	7	22.8 ± 0.0	NS
P	*Packera paupercula*	Balsam Groundsel				S3	4 Secure	142	5.5 ± 0.0	NS
P	*Betula pumila var. pumila*	Bog Birch				S3	3 Sensitive	13	22.3 ± 7.0	NS
P	*Betula pumila*	Bog Birch				S3	3 Sensitive	25	16.0 ± 0.0	NS
P	*Campanula aparinoides*	Marsh Bellflower				S3	3 Sensitive	2	7.5 ± 5.0	NS
P	*Mononeuria groenlandica*	Greenland Stitchwort				S3	3 Sensitive	1	84.5 ± 0.0	NS
P	*Viburnum edule*	Squashberry				S3	3 Sensitive	63	53.5 ± 7.0	NS
P	*Empetrum eamesii*	Pink Crowberry				S3	3 Sensitive	19	47.8 ± 0.0	NS
P	*Vaccinium boreale*	Northern Blueberry				S3	3 Sensitive	47	18.2 ± 7.0	NS
P	*Vaccinium cespitosum*	dwarf bilberry				S3	4 Secure	28	40.1 ± 7.0	NS
P	*Vaccinium uliginosum*	Alpine Bilberry				S3	3 Sensitive	20	61.0 ± 0.0	NS
P	*Bartonia virginica*	Yellow Bartonia				S3	4 Secure	1	35.2 ± 0.0	NS
P	*Proserpinaca palustris*	Marsh Mermaidweed				S3	4 Secure	49	4.8 ± 5.0	NS
P	*Teucrium canadense*	Canada Germander				S3	3 Sensitive	55	6.0 ± 0.0	NS
P	*Decodon verticillatus*	Swamp Loosestrife				S3	4 Secure	4	15.3 ± 7.0	NS
P	*Epilobium hornemannii*	Hornemann's Willowherb				S3	4 Secure	27	34.2 ± 2.0	NS
P	*Epilobium strictum*	Downy Willowherb				S3	3 Sensitive	20	6.8 ± 0.0	NS
P	*Polygala sanguinea*	Blood Milkwort				S3	3 Sensitive	1	62.4 ± 7.0	NS
P	*Persicaria pensylvanica*	Pennsylvania Smartweed				S3	4 Secure	11	7.9 ± 3.0	NS
P	*Fallopia scandens*	Climbing False Buckwheat				S3	3 Sensitive	12	31.9 ± 0.0	NS
P	*Plantago rugelii*	Rugel's Plantain				S3	4 Secure	1	3.9 ± 0.0	NS
P	*Primula laurentiana*	Laurentian Primrose				S3	4 Secure	1	45.1 ± 7.0	NS
P	*Samolus parviflorus*	Seaside Brookweed				S3	3 Sensitive	16	3.8 ± 0.0	NS
P	*Pyrola asarifolia*	Pink Pyrola				S3	4 Secure	32	18.8 ± 0.0	NS
P	*Pyrola minor*	Lesser Pyrola				S3	3 Sensitive	21	4.8 ± 0.0	NS
P	*Ranunculus gmelinii*	Gmelin's Water Buttercup				S3	4 Secure	96	3.7 ± 0.0	NS
P	*Endotropis alnifolia*	alder-leaved buckthorn				S3	4 Secure	459	4.4 ± 0.0	NS
P	*Agrimonia gryposepala*	Hooked Agrimony				S3	4 Secure	220	5.3 ± 0.0	NS
P	*Amelanchier spicata*	Running Serviceberry				S3	4 Secure	6	42.3 ± 0.0	NS
P	*Galium kamtschaticum*	Northern Wild Licorice				S3	4 Secure	54	14.7 ± 1.0	NS
P	*Geocaulon lividum*	Northern Comandra				S3	4 Secure	18	49.5 ± 0.0	NS
P	*Limosella australis*	Southern Mudwort				S3	4 Secure	9	43.8 ± 5.0	NS
P	*Lindernia dubia*	Yellow-seeded False Pimperel				S3	4 Secure	2	33.2 ± 0.0	NS
P	*Laportea canadensis*	Canada Wood Nettle				S3	3 Sensitive	17	26.9 ± 2.0	NS
P	*Verbena hastata*	Blue Vervain				S3	4 Secure	20	7.9 ± 0.0	NS
P	*Carex cryptolepis*	Hidden-scaled Sedge				S3	4 Secure	17	6.7 ± 0.0	NS
P	*Carex eburnea*	Bristle-leaved Sedge				S3	3 Sensitive	164	5.0 ± 0.0	NS
P	*Carex lupulina*	Hop Sedge				S3	4 Secure	6	75.8 ± 0.0	NS
P	*Carex rosea*	Rosy Sedge				S3	4 Secure	4	27.4 ± 5.0	NS
P	*Carex tribuloides*	Blunt Broom Sedge				S3	4 Secure	9	30.8 ± 0.0	NS
P	*Carex wiegandii*	Wiegand's Sedge				S3	3 Sensitive	47	17.3 ± 0.0	NS
P	*Carex foenea*	Fernald's Hay Sedge				S3	4 Secure	3	88.0 ± 0.0	NS
P	*Eleocharis nitida*	Quill Spikerush				S3	4 Secure	2	99.6 ± 0.0	NS
P	*Elodea canadensis*	Canada Waterweed				S3	4 Secure	8	26.1 ± 0.0	NS
P	*Juncus subcaudatus*	Woods-Rush				S3	3 Sensitive	10	44.5 ± 0.0	NS
P	*Juncus dudleyi*	Dudley's Rush				S3	4 Secure	63	4.1 ± 0.0	NS
P	*Goodyera oblongifolia*	Menzies' Rattlesnake-plantain				S3	3 Sensitive	27	34.2 ± 3.0	NS
P	*Goodyera repens*	Lesser Rattlesnake-plantain				S3	3 Sensitive	31	4.2 ± 0.0	NS
P	*Neottia bifolia*	Southern Twayblade				S3	4 Secure	51	8.6 ± 7.0	NS
P	*Platanthera grandiflora*	Large Purple Fringed Orchid				S3	4 Secure	23	7.5 ± 5.0	NS
P	*Platanthera hookeri*	Hooker's Orchid				S3	4 Secure	6	3.9 ± 0.0	NS
P	*Platanthera orbiculata*	Small Round-leaved Orchid				S3	4 Secure	13	4.5 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	*Spiranthes ochroleuca*	Yellow Ladies'-tresses				S3	4 Secure	6	11.3 ± 0.0	NS
P	*Alopecurus aequalis*	Short-awned Foxtail				S3	4 Secure	19	29.9 ± 0.0	NS
P	*Potamogeton obtusifolius*	Blunt-leaved Pondweed				S3	4 Secure	22	18.7 ± 1.0	NS
P	*Potamogeton praelongus*	White-stemmed Pondweed				S3	3 Sensitive	17	13.6 ± 0.0	NS
P	*Potamogeton zosteriformis*	Flat-stemmed Pondweed				S3	3 Sensitive	12	15.6 ± 7.0	NS
P	*Sparganium natans*	Small Burreed				S3	4 Secure	18	3.1 ± 5.0	NS
P	*Asplenium trichomanes*	Maidenhair Spleenwort				S3	4 Secure	27	18.8 ± 0.0	NS
P	*Asplenium viride*	Green Spleenwort				S3	3 Sensitive	35	9.1 ± 0.0	NS
P	*Equisetum pratense*	Meadow Horsetail				S3	3 Sensitive	22	17.3 ± 0.0	NS
P	*Equisetum variegatum*	Variegated Horsetail				S3	4 Secure	38	16.4 ± 0.0	NS
P	*Isoetes acadiensis*	Acadian Quillwort				S3	3 Sensitive	10	59.9 ± 1.0	NS
P	*Diphasiastrum sitchense*	Sitka Ground-cedar				S3	4 Secure	10	26.4 ± 5.0	NS
P	*Huperzia appressa*	Mountain Firmoss				S3	3 Sensitive	23	27.2 ± 1.0	NS
P	*Sceptridium dissectum*	Dissected Moonwort				S3	4 Secure	3	53.4 ± 5.0	NS
P	*Polypodium appalachianum*	Appalachian Polypody				S3	5 Undetermined	5	5.9 ± 0.0	NS
P	*Asclepias incarnata ssp. pulchra*	Swamp Milkweed				S3?	5 Undetermined	57	3.9 ± 1.0	NS
P	*Diphasiastrum x sabinifolium*	Savin-leaved Ground-cedar				S3?	4 Secure	9	15.1 ± 1.0	NS
P	*Atriplex glabriuscula var. franktonii*	Frankton's Saltbush				S3S4	4 Secure	9	21.8 ± 2.0	NS
P	*Suaeda calceoliformis*	Horned Sea-blite				S3S4	4 Secure	5	42.4 ± 1.0	NS
P	*Myriophyllum sibiricum*	Siberian Water Milfoil				S3S4	4 Secure	17	6.4 ± 0.0	NS
P	*Sanguinaria canadensis*	Bloodroot				S3S4	4 Secure	148	14.9 ± 0.0	NS
P	*Polygonum fowleri*	Fowler's Knotweed				S3S4	4 Secure	1	76.6 ± 0.0	NS
P	*Rumex fueginus*	Tierra del Fuego Dock				S3S4	4 Secure	2	94.4 ± 0.0	PE
P	*Fragaria vesca ssp. americana*	Woodland Strawberry				S3S4	4 Secure	72	4.2 ± 0.0	NS
P	*Salix petiolaris*	Meadow Willow				S3S4	4 Secure	8	16.7 ± 0.0	NS
P	*Carex argyrantha*	Silvery-flowered Sedge				S3S4	4 Secure	3	18.7 ± 0.0	NS
P	*Eriophorum russeolum*	Russet Cottongrass				S3S4	4 Secure	4	15.9 ± 0.0	NS
P	*Triglochin gaspensis*	Gasp ├⌐ Arrowgrass				S3S4	5 Undetermined	8	16.7 ± 0.0	NS
P	*Juncus acuminatus*	Sharp-Fruit Rush				S3S4	4 Secure	4	5.0 ± 4.0	NS
P	*Luzula parviflora*	Small-flowered Woodrush				S3S4	4 Secure	44	27.1 ± 5.0	NS
P	*Liparis loeselii*	Loesel's Twayblade				S3S4	4 Secure	16	10.9 ± 1.0	NS
P	*Panicum philadelphicum*	Philadelphia Panicgrass				S3S4	4 Secure	1	20.2 ± 0.0	NS
P	*Trisetum spicatum*	Narrow False Oats				S3S4	4 Secure	20	7.4 ± 0.0	NS
P	*Cystopteris bulbifera*	Bulblet Bladder Fern				S3S4	4 Secure	418	4.0 ± 0.0	NS
P	*Equisetum hyemale ssp. affine*	common scouring-rush				S3S4	4 Secure	36	8.6 ± 10.0	NS
P	*Equisetum scirpoides*	Dwarf Scouring-Rush				S3S4	4 Secure	76	7.0 ± 0.0	NS
P	*Diphasiastrum complanatum*	Northern Ground-cedar				S3S4	4 Secure	6	15.3 ± 5.0	NS
P	*Schizaea pusilla*	Little Curlygrass Fern				S3S4	4 Secure	34	31.2 ± 0.0	NS
P	*Viola canadensis*	Canada Violet				SH	0.1 Extirpated	1	25.8 ± 0.0	NS
P	*Poa alpina*	Alpine Blue Grass				SH	0.1 Extirpated	2	65.7 ± 0.0	NS
P	*Botrychium minganense*	Mingan Moonwort				SH	0.1 Extirpated	1	60.1 ± 1.0	NS
P	*Solidago randii*	Rand's Goldenrod				SNA		1	73.4 ± 5.0	NS

5.1 SOURCE BIBLIOGRAPHY (100 km)

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

# recs	CITATION
9649	Lepage, D. 2014. Maritime Breeding Bird Atlas Database. Bird Studies Canada, Sackville NB, 407,838 recs.
3412	Morrison, Guy. 2011. Maritime Shorebird Survey (MSS) database. Canadian Wildlife Service, Ottawa, 15939 surveys. 86171 recs.
2027	Erskine, A.J. 1992. Maritime Breeding Bird Atlas Database. NS Museum & Nimbus Publ., Halifax, 82,125 recs.
998	Blaney, C.S.; Mazerolle, D.M.; Belliveau, A.B. 2014. Atlantic Canada Conservation Data Centre Fieldwork 2014. Atlantic Canada Conservation Data Centre, # recs.
958	Blaney, C.S.; Mazerolle, D.M.; Belliveau, A.B. 2015. Atlantic Canada Conservation Data Centre Fieldwork 2015. Atlantic Canada Conservation Data Centre, # recs.
696	Blaney, C.S.; Mazerolle, D.M. 2010. Fieldwork 2010. Atlantic Canada Conservation Data Centre. Sackville NB, 15508 recs.
557	Newell, R.E. 2000. E.C. Smith Herbarium Database. Acadia University, Wolfville NS, 7139 recs.
526	Benjamin, L.K. (compiler). 2012. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 4965 recs.
514	Benjamin, L.K. (compiler). 2007. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 8439 recs.
461	Blaney, C.S.; Mazerolle, D.M. 2012. Fieldwork 2012. Atlantic Canada Conservation Data Centre, 13,278 recs.
460	Blaney, C.S.; Mazerolle, D.M. 2009. Fieldwork 2009. Atlantic Canada Conservation Data Centre. Sackville NB, 13395 recs.
367	Belliveau, A.G. 2016. Atlantic Canada Conservation Data Centre Fieldwork 2016. Atlantic Canada Conservation Data Centre, 10695 recs.
270	Pronych, G. & Wilson, A. 1993. Atlas of Rare Vascular Plants in Nova Scotia. Nova Scotia Museum, Halifax NS, I:1-168, II:169-331. 1446 recs.
266	Newell, R.E. 2005. E.C. Smith Digital Herbarium. E.C. Smith Herbarium, Irving Biodiversity Collection, Acadia University, Web site: http://luxor.acadiau.ca/library/Herbarium/project/. 582 recs.
249	Wilhelm, S.I. et al. 2011. Colonial Waterbird Database. Canadian Wildlife Service, Sackville, 2698 sites, 9718 recs (8192 obs).
247	Amirault, D.L. & Stewart, J. 2007. Piping Plover Database 1894-2006. Canadian Wildlife Service, Sackville, 3344 recs, 1228 new.
203	Neily, T.H. & Pepper, C.; Toms, B. 2018. Nova Scotia lichen database [as of 2018-03]. Mersey Tobeatic Research Institute.
199	Hicks, Andrew. 2009. Coastal Waterfowl Surveys Database, 2000-08. Canadian Wildlife Service, Sackville, 46488 recs (11149 non-zero).
170	Belliveau, A.G. 2018. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
165	Neily, T.H. & Pepper, C.; Toms, B. 2013. Nova Scotia lichen location database. Mersey Tobeatic Research Institute, 1301 records.
159	Klymko, J.J.D.; Robinson, S.L. 2012. 2012 field data. Atlantic Canada Conservation Data Centre, 447 recs.
149	Neily, T.H. 2017. Nova Scotia lichen records. Mersey Tobeatic Research Institute.
143	Belland, R.J. Maritimes moss records from various herbarium databases. 2014.
140	Quigley, E.J. & Neily, P.D,. 2012. Botanical Discoveries in Inverness County, NS. Nova Scotia Dept Natural Resources. Pers. comm. to C.S. Blaney, Nov. 29, 141 rec.
127	Cameron, R.P. 2011. Lichen observations, 2011. Nova Scotia Environment & Labour, 731 recs.
122	Blaney, C.S. 2016. Atlantic Canada Conservation Data Centre Fieldwork 2016. Atlantic Canada Conservation Data Centre, 6719 recs.
106	Munro, Marian K. Nova Scotia Provincial Museum of Natural History Herbarium Database. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia. 2013.
102	WIlliams, M. Cape Breton University Digital Herbarium. Cape Breton University Digital Herbarium. 2013.
98	Bridgland, J. 2006. Cape Breton Highlands National Park Digital Database. Parks Canada, 190 recs.
94	Mazerolle, D.M. 2016. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
87	Zinck, M. & Roland, A.E. 1998. Roland's Flora of Nova Scotia. Nova Scotia Museum, 3rd ed., rev. M. Zinck; 2 Vol., 1297 pp.
86	Campbell, G. 2017. Maritimes Bicknell's Thrush database 2002-2015. Bird Studies Canada, Sackville NB, 609 recs.
79	Benjamin, L.K. 2009. D. Anderson Odonata Records for Cape Breton, 1997-2004. Nova Scotia Dept Natural Resources, 1316 recs.
68	Benjamin, L.K. 2012. NSDNR fieldwork & consultant reports 2008-2012. Nova Scotia Dept Natural Resources, 196 recs.
62	Blaney, C.S.; Spicer, C.D. 2001. Fieldwork 2001. Atlantic Canada Conservation Data Centre. Sackville NB, 981 recs.
62	Brunelle, P.-M. (compiler). 2009. ADIP/MDDS Odonata Database: data to 2006 inclusive. Atlantic Dragonfly Inventory Program (ADIP), 24200 recs.
61	Benjamin, L.K. (compiler). 2001. Significant Habitat & Species Database. Nova Scotia Dept of Natural Resources, 15 spp, 224 recs.
59	Roland, A.E. & Smith, E.C. 1969. The Flora of Nova Scotia, 1st Ed. Nova Scotia Museum, Halifax, 743pp.
57	Knapton, R. & Power, T.; Williams, M. 2001. SAR Inventory: Fortress Louisbourg NP. Parks Canada, Atlantic, SARINV01-13. 157 recs.
57	Mazerolle, D.M. 2017. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
54	Busby, D.G. 1999. 1997-1999 Bicknell's Thrush data, unpublished files. Canadian Wildlife Service, Sackville, 17 recs.
53	Amirault, D.L. & McKnight, J. 2003. Piping Plover Database 1991-2003. Canadian Wildlife Service, Sackville, unpublished data. 7 recs.
50	Canadian Wildlife Service, Dartmouth. 2010. Piping Plover censuses 2007-09, 304 recs.
50	LaPaix, R.W.; Crowell, M.J.; MacDonald, M. 2011. Stantec rare plant records, 2010-11. Stantec Consulting, 334 recs.
44	anon. 2001. S.. H.. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 76 recs.
41	Klymko, J.J.D. 2014. Maritimes Butterfly Atlas, 2012 submissions. Atlantic Canada Conservation Data Centre, 8552 records.
40	Layberry, R.A. & Hall, P.W., LaFontaine, J.D. 1998. The Butterflies of Canada. University of Toronto Press. 280 pp+plates.
40	Scott, F.W. 2002. Nova Scotia Herpetofauna Atlas Database. Acadia University, Wolfville NS, 8856 recs.
38	Parker, G.R., Maxwell, J.W., Morton, L.D. & Smith,G.E.J. 1983. The ecology of Lynx , Lynx canadensis, on Cape Breton Island. Canadian Journal of Zoology, 61:770-786. 51 recs.
35	Pulsifer, M.D. 2002. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 369 recs.
33	Neily, T.H. 2010. Erioderma Pedicellatum records 2005-09. Mersey Tobiatic Research Institute, 67 recs.
33	Sollows, M.C,. 2008. NBM Science Collections databases: mammals. New Brunswick Museum, Saint John NB, download Jan. 2008, 4983 recs.
27	Neily, T.H. 2017. Maritmes Lichen and Bryophyte records. Atlantic Canada Conservation Data Centre.

# recs	CITATION
26	Parks Canada. 2010. Specimens in or near National Parks in Atlantic Canada. Canadian National Museum, 3925 recs.
24	Klymko, J.J.D. 2012. Maritimes Butterfly Atlas, 2010 and 2011 records. Atlantic Canada Conservation Data Centre, 6318 recs.
24	Neily, T.H. 2013. Email communication to Sean Blaney regarding Listera australis observations made from 2007 to 2011 in Nova Scotia. , 50.
22	Benjamin, L.K. 2009. Boreal Felt Lichen, Mountain Avens, Orchid and other recent records. Nova Scotia Dept Natural Resources, 105 recs.
21	Belland, R.J. & W.B. Schofield. 1993. Salix vestita Pursh & Saxifraga oppositifolia L.: arctic-alpine species new to Nova Scotia. Rhodora, 95: 76-78.
21	Blaney, C.S.; Spicer, C.D.; Mazerolle, D.M. 2005. Fieldwork 2005. Atlantic Canada Conservation Data Centre. Sackville NB, 2333 recs.
21	Hill, N.M. 1994. Status report on the Long's bulrush Scirpus longii in Canada. Committee on the Status of Endangered Wildlife in Canada, 7 recs.
20	Cameron, R.P. 2012. Rob Cameron 2012 vascular plant data. NS Department of Environment, 30 recs.
20	Gillis, J. 2015. Rare plant records from Cape Breton gypsum sites. Pers. comm., 25 rare plant records.
20	Klymko, J.J.D. 2016. 2015 field data. Atlantic Canada Conservation Data Centre.
19	Cameron, R.P. 2013. 2013 rare species field data. Nova Scotia Department of Environment, 71 recs.
18	Benjamin, L.K. 2011. NSDNR fieldwork & consultant reports 1997, 2009-10. Nova Scotia Dept Natural Resources, 85 recs.
18	Manthorne, A. 2014. MaritimesSwiftwatch Project database 2013-2014. Bird Studies Canada, Sackville NB, 326 recs.
18	Misc. rare species records gathered by NSDNR staff or communicated to NSDNR and forwared to ACCDC
18	Pepper, C. 2013. 2013 rare bird and plant observations in Nova Scotia. , 181 records.
17	Adams, J. & Herman, T.B. 1998. Thesis, Unpublished map of C. insculpta sightings. Acadia University, Wolfville NS, 88 recs.
17	Whittam, R.M. 2006. Bicknell's Thrush in CBHNP, BSC database. Bird Studies Canada, 21 recs.
16	Basquill, S.P. 2012. 2012 rare vascular plant field data. Nova Scotia Department of Natural Resources, 37 recs.
15	Catling, P.M., Erskine, D.S. & MacLaren, R.B. 1985. The Plants of Prince Edward Island with new records, nomenclatural changes & corrections & deletions, 1st Ed. Research Branch, Agriculture Canada, Ottawa, Publication 1798. 22pp.
15	Newell, R.E. 2004. Assessment and update status report on the New Jersey Rush (Juncus caesariensis) in Canada. Committee on the Status of Endangered Wildlife in Canada, 15 recs.
14	Basquill, S.P. 2012. 2012 Bryophyte specimen data. Nova Scotia Department of Natural Resources, 37 recs.
14	Blaney, C.S. 2000. Fieldwork 2000. Atlantic Canada Conservation Data Centre. Sackville NB, 1265 recs.
14	Downes, C. 1998-2000. Breeding Bird Survey Data. Canadian Wildlife Service, Ottawa, 111 recs.
12	Robinson, S.L. 2011. 2011 ND dune survey field data. Atlantic Canada Conservation Data Centre, 2715 recs.
11	Burns, L. 2013. Personal communication concerning bat occurrence on PEI. Winter 2013. Pers. comm.
11	Klymko, J.J.D. 2012. Insect fieldwork & submissions, 2011. Atlantic Canada Conservation Data Centre. Sackville NB, 760 recs.
11	Neily, T.H. 2012. 2012 Erioderma pedicellatum records in Nova Scotia.
10	Murphy, S. 2006. Juncus caesariensis data from Yava Technologies In Situ Leach Mining Environmental Assessment. Jacques Whitford Inc., 10 recs.
10	Porter, K. 2013. 2013 rare and non-rare vascular plant field data. St. Mary's University, 57 recs.
9	Goltz, J.P. & Bishop, G. 2005. Confidential supplement to Status Report on Prototype Quillwort (Isoetes prototypus). Committee on the Status of Endangered Wildlife in Canada, 111 recs.
8	Oldham, M.J. 2000. Oldham database records from Maritime provinces. Oldham, M.J; ONHIC, 487 recs.
7	Chaput, G. 2002. Atlantic Salmon: Maritime Provinces Overview for 2001. Dept of Fisheries & Oceans, Atlantic Region, Science Stock Status Report D3-14. 39 recs.
7	NS DNR. 2017. Black Ash records from NS DNR Permanent Sample Plots (PSPs), 1965-2016. NS Dept of Natural Resources.
7	Robinson, S.L. 2014. 2013 Field Data. Atlantic Canada Conservation Data Centre.
7	Taylor, B.R., and Tam, J.C. 2012. Local distribution of the rare plant Triosteum aurantiacum in northeastern Nova Scotia, Canada. Rhodora, 114(960): 366-382.
6	Cameron, R.P. 2009. Erioderma pedicellatum database, 1979-2008. Dept Environment & Labour, 103 recs.
6	Cameron, R.P. 2009. Nova Scotia nonvascular plant observations, 1995-2007. Nova Scotia Dept Natural Resources, 27 recs.
6	Olsen, R. Herbarium Specimens. Nova Scotia Agricultural College, Truro. 2003.
6	Scott, F.W. 1988. Status Report on the Gaspé Shrew (Sorex gaspensis) in Canada. Committee on the Status of Endangered Wildlife in Canada, 12 recs.
5	Blaney, C.S.; Mazerolle, D.M.; Klymko, J; Spicer, C.D. 2006. Fieldwork 2006. Atlantic Canada Conservation Data Centre. Sackville NB, 8399 recs.
5	Cameron, R.P. 2009. Cyanolichen database. Nova Scotia Environment & Labour, 1724 recs.
5	MacDonald, M. 2008. PEI Power Corridor Floral Surveys, 2004-08. Jacques Whitford Ltd, 2238 recs (979 rare).
5	Marshall, L. 1998. Atlantic Salmon: Cape Breton SFA 18 (part) & SFA 19. Dept of Fisheries & Oceans, Atlantic Region, Science. Stock Status Report D3-09. 5 recs.
5	Plissner, J.H. & Haig, S.M. 1997. 1996 International piping plover census. US Geological Survey, Corvallis OR, 231 pp.
4	Bagnell, B.A. 2001. New Brunswick Bryophyte Occurrences. B&B Botanical, Sussex, 478 recs.
4	Blaney, C.S.; Mazerolle, D.M. 2008. Fieldwork 2008. Atlantic Canada Conservation Data Centre. Sackville NB, 13343 recs.
4	Blaney, C.S.; Mazerolle, D.M. 2011. Fieldwork 2011. Atlantic Canada Conservation Data Centre. Sackville NB.
4	Blaney, C.S.; Mazerolle, D.M.; Oberndorfer, E. 2007. Fieldwork 2007. Atlantic Canada Conservation Data Centre. Sackville NB, 13770 recs.
4	Clayden, S.R. 2007. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, download Mar. 2007, 6914 recs.
4	Erskine, D. 1960. The plants of Prince Edward Island, 1st Ed. Research Branch, Agriculture Canada, Ottawa., Publication 1088. 1238 recs.
4	Neily, T.H. & Pepper, C.; Toms, B. 2015. Nova Scotia lichen location database [as of 2015-02-15]. Mersey Tobeatic Research Institute, 1691 records.
4	Newell, R.E. 2001. Fortress Louisbourg Species at Risk Survey 2001. Parks Canada, 4 recs.
4	Popma, T.M. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre. Sackville NB, 113 recs.
4	Porter, C.J.M. 2014. Field work data 2007-2014. Nova Scotia Nature Trust, 96 recs.
4	Rousseau, J. 1938. Notes Floristiques sur l'est de la Nouvelle-Ecosse in Contributions de l'Institut Botanique de l'Universite de Montreal. Universite de Montreal, 32, 13-62. 11 recs.
3	Baechler, Lynn. 2012. Plant observations & photos, 2012. Pers. comm. to S. Blaney, July 2012, 4 recs.

# recs	CITATION
3	Gilhen, J. 1984. Amphibians & Reptiles of Nova Scotia, 1st Ed. Nova Scotia Museum, 164pp.
3	Layberry, R.A. 2012. Lepidopteran records for the Maritimes, 1974-2008. Layberry Collection, 1060 recs.
3	Whittam, R.M. 1999. Status Report on the Roseate Tern (update) in Canada. Committee on the Status of Endangered Wildlife in Canada, 36 recs.
2	Amirault, D.L. 1997-2000. Unpublished files. Canadian Wildlife Service, Sackville, 470 recs.
2	Benedict, B. Connell Herbarium Specimens (Data) . University New Brunswick, Fredericton. 2003.
2	Blaney, C.S.; Spicer, C.D.; Rothfels, C. 2004. Fieldwork 2004. Atlantic Canada Conservation Data Centre. Sackville NB, 1343 recs.
2	Christie, D.S. 2000. Christmas Bird Count Data, 1997-2000. Nature NB, 54 recs.
2	Clayden, S.R. 1998. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, 19759 recs.
2	Dibblee, R.L. 1999. PEI Cormorant Survey. Prince Edward Island Fisheries, Aquaculture & Environment, 1p. 21 recs.
2	Doucet, D.A. 2007. Lepidopteran Records, 1988-2006. Doucet, 700 recs.
2	Edsall, J. 2007. Personal Butterfly Collection: specimens collected in the Canadian Maritimes, 1961-2007. J. Edsall, unpubl. report, 137 recs.
2	Gillis, J. 2007. Botanical observations from bog on Skye Mountain, NS. Pers. comm., 8 recs.
2	Hall, R.A. 2001. S.. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 178 recs.
2	Hill, N. 2003. Floerkea proserpinacoides at Heatherdale, Antigonish Co. 2002. , Pers. comm. to C.S. Blaney. 2 recs.
2	Klymko, J.J.D. 2012. Insect field work & submissions. Atlantic Canada Conservation Data Centre, 852 recs.
2	Lock, A.R., Brown, R.G.B. & Gerriets, S.H. 1994. Gazetteer of Marine Birds in Atlantic Canada. Canadian Wildlife Service, Atlantic Region, 137 pp.
2	Munden, C. 2018. Email communication on Cypripedium parviflorum. Amateur naturalist, 2.
2	Munro, Marian K. Nova Scotia Provincial Museum of Natural History Herbarium Database. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia. 2014.
2	Neily, T.H. & Pepper, C.; Toms, B. 2018. Nova Scotia lichen database Update. Mersey Tobeatic Research Institute.
2	O'Neil, S. 1998. Atlantic Salmon: Northumberland Strait Nova Scotia part of SFA 18. Dept of Fisheries & Oceans, Atlantic Region, Science. Stock Status Report D3-08. 9 recs.
2	Quigley, E.J. 2006. Plant records, Mabou & Port Hood. Pers. comm. to S.P. Basquill, Jun. 12. 4 recs, 4 recs.
2	Selva, S.B. 2002. Status Report on frosted glass-whiskers, Sclerophora peronella. Committee on the Status of Endangered Wildlife in Canada, Draft Revision, May 2002. 2 recs.
2	Sollows, M.C,. 2009. NBM Science Collections databases: molluscs. New Brunswick Museum, Saint John NB, download Jan. 2009, 6951 recs (2957 in Atlantic Canada).
1	Anderson, D.G. 2011. New site for showy ladyslipper on Cape Breton. Nova Scotia Department of Natural Resources, pers.comm. to R. Lautenschlager, Jul 5, 2011.
1	Basquill, S.P. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre, Sackville NB, 69 recs.
1	Beaulieu-Bouchard, M. 2014. Email to S. Blaney regarding Salix reticulata & vestita in NS. Canadian Museum of Nature, 1 obs.
1	Benjamin, L.K. 2009. NSDNR Fieldwork & Consultants Reports. Nova Scotia Dept Natural Resources, 143 recs.
1	Crowell, M. 2013. email to Sean Blaney regarding Listera australis at Bear Head and Mill Cove Canadian Forces Station. Jacques Whitford Environmental Ltd., 2.
1	Curley, F.R. 2005. PEF&W Collection 2003-04. PEI Fish & Wildlife Div., 716 recs.
1	Doucet, D.A. 2009. Census of Globally Rare, Endemic Butterflies of Nova Scotia Gulf of St Lawrence Salt Marshes. Nova Scotia Dept of Natural Resources, Species at Risk, 155 recs.
1	Gilman, A.; Testo, W. 2015. Use of Gemma Characters to Identify North American Huperzia (Lycopodiaceae). American Fern Journal, 105(3):145-161.
1	Hinds, H.R. 1984. Additions to the flora of Cape Breton Highlands National Park, Nova Scotia. Rhodora, 86:67-72.
1	Klymko, J.J.D. 2018. 2017 field data. Atlantic Canada Conservation Data Centre.
1	Lautenschlager, R.A. 2010. Miscellaneous observations reported to ACCDC (zoology). Pers. comm. from various persons, 2 recs.
1	McKendry, Karen. 2016. Rare species observations, 2016. Nova Scotia Nature Trust, 19 recs.
1	New York Botanical Garden. 2006. Virtual Plant Herbarium - Vascular Plant Types Catalog. Sylva, S.; Kallunki, J. (ed.) International Plant Science Centre, Web site: http://sciweb.nybg.org/science2/vii2.asp. 4 recs.
1	Newell, R.B.; Sam, D. 2014. 2014 Bloodroot personal communication report, Antigonish, NS. NS Department of Natural Resources.
1	Schori, M. 2003. Hieracium robinsonii locations in Atlantic Canada. Pers. comm. to C.S. Blaney. Gray Herbarium, Harvard University, 1 rec.
1	Spicer, C.D. 2004. Specimens from CWS Herbarium, Mount Allison Herbarium Database. Mount Allison University, 5939 recs.

A1.6 Appendix F – Wind and Wave Conditions Report 2021

Title	**Wind and Wave Conditions – Whycocomagh Bay – Marine Finfish Leases 0814x, 0814, 0600, 1431, 5010, 1430**
DSA Document	Report-DSA-CMAR-19EXM-Whycocomagh Bay Wind and Wave Conditions RevB.0.docx
Revision	B
Author	Meysam Karimi, Ph.D.
Co-authors	Dean Steinke, P.Eng.
Prepared for	CMAR
Client reference / project	N/A
DSA project	CMAR-19EXM
Last revised	2021-01-25
Pages (incl. Grove Br)	32

DSA Pacific Office
201-754 Broughton St
Victoria, BC V8W 1E1
+1.250.483.7207

DSA Atlantic office
210 – 3600 Kempt Road
Halifax, NS B3K 4X8
+1.902.407.3722

info@dsaocean.com
www.dsaocean.com

Title	Wind and Wave Conditions – Whycocomagh Bay – Marine Finfish Leases 0814x, 0814, 0600, 1431, 5010, 1430		
Revision	B	Date Last Revised	2021-01-25
DSA Project	CMAR-19EXM	Client Project / Reference	N/A

Revision history

Revision	Date last revised	Summary of changes / Comments	Revisions by	Checked by	Approved for release by	Issued to / Distribution	Engineering review status (IFI / IFR / IFC)
A	2020-12-07	Report Draft	MEK	DMS	DMS	CMAR	IFR
B	2021-01-25	Approved for public release	MEK	DMS	DMS	CMAR	IFR

List of authors / reviewers

Initials	Name
MEK	Meysam Karimi, Ph.D.
DMS	Dean M. Steinke, P.Eng.

Engineering Review Status Acronyms
IFI – Issued for information
IFR – Issued for review
IFC – Issued for construction

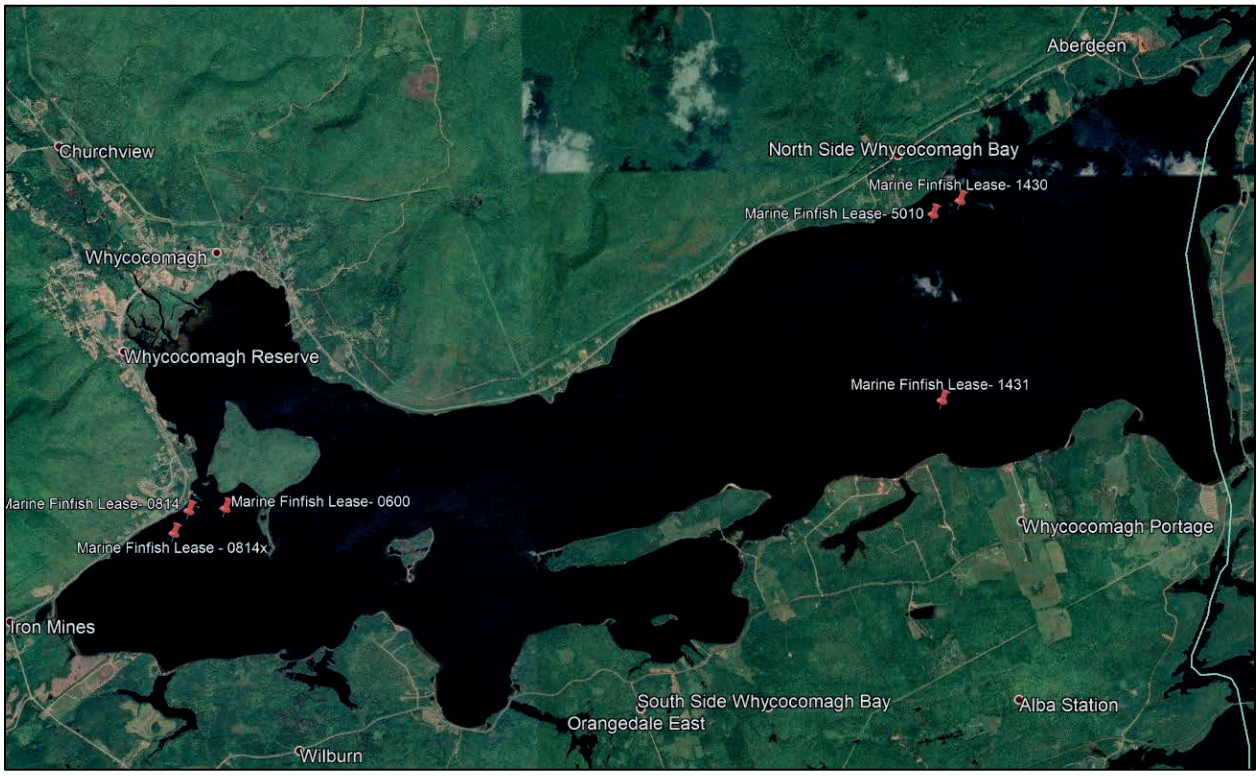
Title	Wind and Wave Conditions – Whycocomagh Bay – Marine Finfish Leases 0814x, 0814, 0600, 1431, 5010, 1430		
Revision	B	Date Last Revised	2021-01-25
DSA Project	CMAR-19EXM	Client Project / Reference	N/A

Executive Summary

In support of Centre for Marine Applied Research (CMAR), the following report presents wind and wave conditions at six marine finfish leases near Whycocomagh Bay in the Bras d'Or Lake on Cape Breton Island in Nova Scotia, Canada.

In this report, wave and wind conditions are presented for 6 locations:

- Proposed Marine Finfish Lease - 0814x: 45° 56.927'N, 61° 7.675'W.
- Marine Finfish Lease - 0814: 45° 57.050'N, 61° 7.555'W.
- Marine Finfish Lease - 0600: 45° 57.061'N, 61° 7.270'W.
- Marine Finfish Lease - 1431: 45° 57.611'N, 61° 1.630'W.
- Marine Finfish Lease - 5010: 45° 58.626'N, 61° 1.685'W.
- Marine Finfish Lease - 1430: 45° 58.699'N, 61° 1.472'W.



To determine the wave field evolution closer to shore at a specific site, and to determine more accurate 10- and 50- year return period wave data, near shore wave modelling can be used. For the Whycocomagh Bay sites, STWave was used to model the wind-driven wave conditions inside the area. The results are based on wind conditions from a weather station located near Eskasoni which is located outside of the Whycocomagh Bay area. The STWave model results are determined using only wind boundary condition. The extreme wind-driven waves at the lease locations are presented in this report.

Title	Wind and Wave Conditions – Whycocomagh Bay – Marine Finfish Leases 0814x, 0814, 0600, 1431, 5010, 1430		
Revision	B	Date Last Revised	2021-01-25
DSA Project	CMAR-19EXM	Client Project / Reference	N/A

Contents

Revision history 2

List of authors / reviewers 2

Executive Summary 3

Contents 4

Figures 4

Tables 5

1 Introduction 7

1.1 Overview 7

1.2 Objective(s) 8

2 Abbreviations and acronyms 8

3 Reference documents and drawings 9

4 Wave conditions 9

4.1 Overview 9

4.2 Wave Model Description 10

4.3 Boundary conditions – Wind and wave conditions 11

4.4 Wave modeling results 16

4.4.1 Wave/wind conditions for Whycocomagh Bay – Proposed Marine Finfish Lease – 0814x 18

4.4.2 Wave/wind conditions for Whycocomagh Bay - Marine Finfish Lease - 0814 20

4.4.3 Wave/wind conditions for Whycocomagh Bay - Marine Finfish Lease - 0600 23

4.4.4 Wave/wind conditions for Whycocomagh Bay - Marine Finfish Lease - 1431 25

4.4.5 Wave/wind conditions for Whycocomagh Bay - Marine Finfish Lease - 5010 28

4.4.6 Wave/wind conditions for Whycocomagh Bay - Marine Finfish Lease - 1430 30

Figures

Figure 1 Six (6) site locations near Whycocomagh Bay in the Bras d'Or Lake [4] 7

Figure 2 Whycocomagh Bay, Nova Scotia, Canada- Source Point is the closest weather station to Whycocomagh Bay with hourly wind data for 10 years 8

Figure 3 Bathymetry at site on hydrographic charts- Depth reported in meters 10

Figure 4 Bathymetry at site on STWave. Note the Source Point indicated at 45° 55.125'N, 60° 38.616'W Boundary conditions – wind conditions 11

Figure 5 Wind speed versus wind direction plot for the Source Point 12

Figure 6: Extreme value analysis on wind data – for the Source Point [1] 14
Figure 7 Maximum wind speed at 10- year return period and direction [from]- for Source location [1] .. 15
Figure 8 Maximum wind speed at 50- year return period and direction [from]- for Source Point location [1] 16
Figure 9 Wave modeling results for direction [From] 90 deg- E 17
Figure 10 Wave modeling results for direction [From] 135 deg- SE 17
Figure 11 Maximum wave height at 10- year return period and direction [from]- Whycocomagh Bay – Proposed Marine Finfish Lease - 0814x 19
Figure 12 Maximum wave height at 50- year return period and direction [from]- Whycocomagh Bay – Proposed Marine Finfish Lease - 0814x 20
Figure 13 Maximum wave height at 10- year return period and direction [from]- Whycocomagh Bay - Marine Finfish Lease – 0814 22
Figure 14 Maximum wave height at 50- year return period and direction [from]- Whycocomagh Bay - Marine Finfish Lease – 0814 22
Figure 15 Maximum wave height at 10- year return period and direction [from]- Whycocomagh Bay - Marine Finfish Lease – 0600 24
Figure 16 Maximum wave height at 50- year return period and direction [from]- Whycocomagh Bay - Marine Finfish Lease – 0600 25
Figure 17 Maximum wave height at 10- year return period and direction [from]- Whycocomagh Bay - Marine Finfish Lease – 1431 27
Figure 18 Maximum wave height at 50- year return period and direction [from]- Whycocomagh Bay - Marine Finfish Lease – 1431 27
Figure 19 Maximum wave height at 10- year return period and direction [from]- Whycocomagh Bay - Marine Finfish Lease – 5010 29
Figure 20 Maximum wave height at 50- year return period and direction [from]- Whycocomagh Bay - Marine Finfish Lease – 5010 30
Figure 21 Maximum wave height at 10- year return period and direction [from]- Whycocomagh Bay - Marine Finfish Lease – 1430 32
Figure 22 Maximum wave height at 50- year return period and direction [from]- Whycocomagh Bay - Marine Finfish Lease – 1430 32

Tables

Table 1 Results extreme value analysis for wind at the Source Point locations in Figure 4 15
Table 2 Estimated wave and wind design conditions for Whycocomagh Bay – Proposed Marine Finfish Lease - 0814x 18
Table 3 Estimated wave and wind design conditions for Whycocomagh Bay - Marine Finfish Lease - 0814 20
Table 4 Estimated wave and wind design conditions for Whycocomagh Bay - Marine Finfish Lease - 0600 23

Table 5 Estimated wave and wind design conditions for Whycocomagh Bay - Marine Finfish Lease - 1431 25
Table 6 Estimated wave and wind design conditions for Whycocomagh Bay - Marine Finfish Lease - 5010 28
Table 7 Estimated wave and wind design conditions for Whycocomagh Bay - Marine Finfish Lease - 1430 30

Title	Wind and Wave Conditions – Whycocomagh Bay – Marine Finfish Leases 0814x, 0814, 0600, 1431, 5010, 1430		
Revision	B	Date Last Revised	2021-01-25
DSA Project	CMAR-19EXM	Client Project / Reference	N/A

1 Introduction

1.1 Overview

For the finfish lease locations in the Whycocomagh Bay area in the Bras d'Or Lake shown in Figure 1, wind and wave conditions have been estimated. The following presents data on the predicted 10- and 50- year wind and wave conditions at six locations.

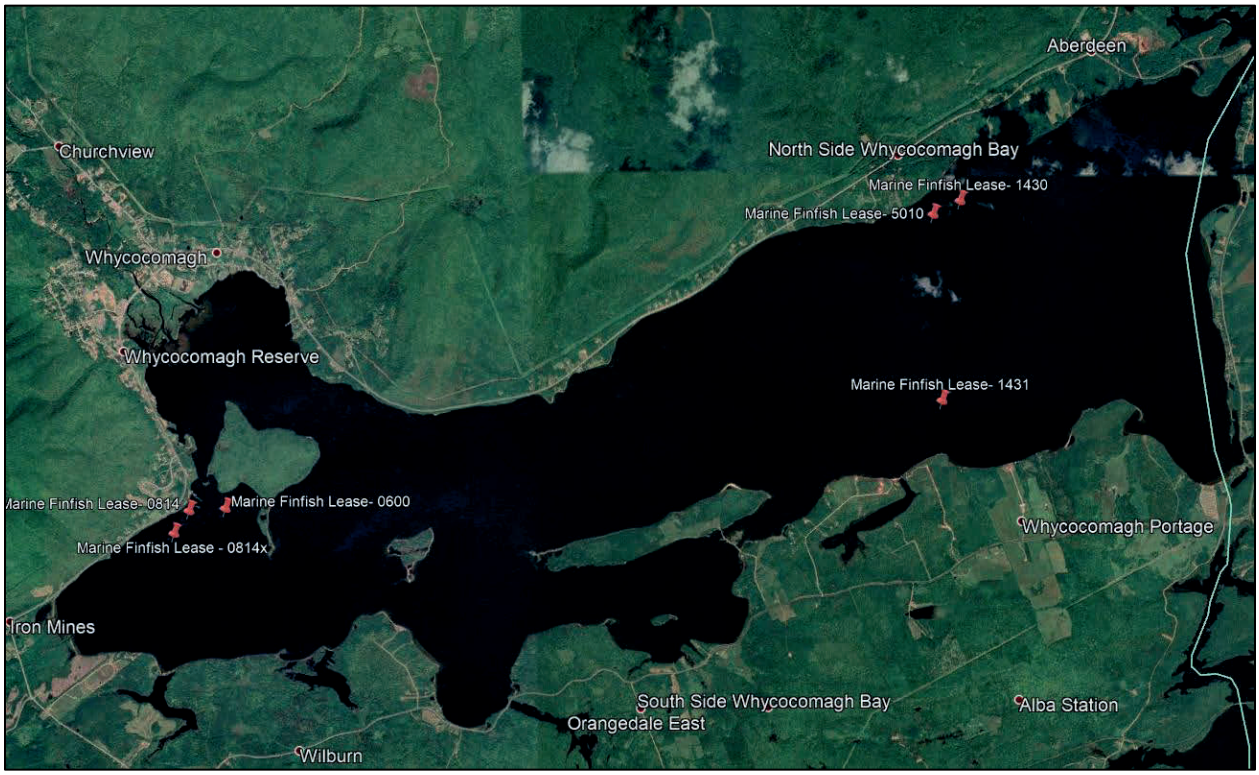


Figure 1 Six (6) site locations near Whycocomagh Bay in the Bras d'Or Lake [4]

The area is overall fully protected from offshore waves by surrounding lands as can be seen in Figure 2. Due to the nature of the region, wind-driven waves are calculated for the finfish leases in the bay. However, as waves will lose energy by travelling into shallower waters, detailed wave modelling is required to determine the amount of energy lost and wave height reduction.

Title	Wind and Wave Conditions – Whycocomagh Bay – Marine Finfish Leases 0814x, 0814, 0600, 1431, 5010, 1430		
Revision	B	Date Last Revised	2021-01-25
DSA Project	CMAR-19EXM	Client Project / Reference	N/A



Figure 2 Whycocomagh Bay, Nova Scotia, Canada- Source Point is the closest weather station to Whycocomagh Bay with hourly wind data for 10 years

The context of this project is that extreme wind and wave conditions are needed to select engineering load cases for those wishing to install finfish or shellfish farms in the area. For example, extreme environmental conditions with minimum 10- year and 50- year return periods are required for the design of a marine fish farm site, as per guidance in the Scottish technical standard [2] and NS9415 [3]. While the locations assessed as part of this modeling exercise are actual aquaculture site locations (with the exception of 0814x), the data produced for these locations is useful for understanding the approximate wave climate in the region and can be used to evaluate any proposals for sites in the area. Understanding the wind and wave climates at aquaculture sites is important for mitigating risks.

1.2 Objective(s)

- Determine wave/wind conditions at six locations near Whycocomagh Bay and find the conditions with 10- and 50- year return periods.

2 Abbreviations and acronyms

DSA	Dynamic Systems Analysis Ltd.
SMS	Surface-water Modeling System
CMAR	Centre for Marine Applied Research

CHS	Canadian Hydrographic Services

3 Reference documents and drawings

[1]	https://weather.gc.ca/
[2]	Marine Scotland. (2015). A Technical Standard for Scottish Finfish Aquaculture. Ministerial Group for Sustainable Aquaculture's Scottish Technical Standard Steering Group
[3]	Norge, S. (2009). Norwegian Standard NS 9415. E: 2009. Marine Fish Farms—Requirements for Site Survey, Risk Analyses, Design, Dimensioning, Production, Installation and Operation. *Standard Norge, Lysaker*.
[4]	CMAR approved sites -RevB.kmz

4 Wave conditions

4.1 Overview

SMS version 12.2.13 was used to setup the bathymetric and computational grid. This section provides a description of the grid size, mesh size and offshore environmental conditions. Site bathymetry is provided in Figure 3. Note that a CHS hydrographic chart is used to generate the bathymetric data for wave modeling.

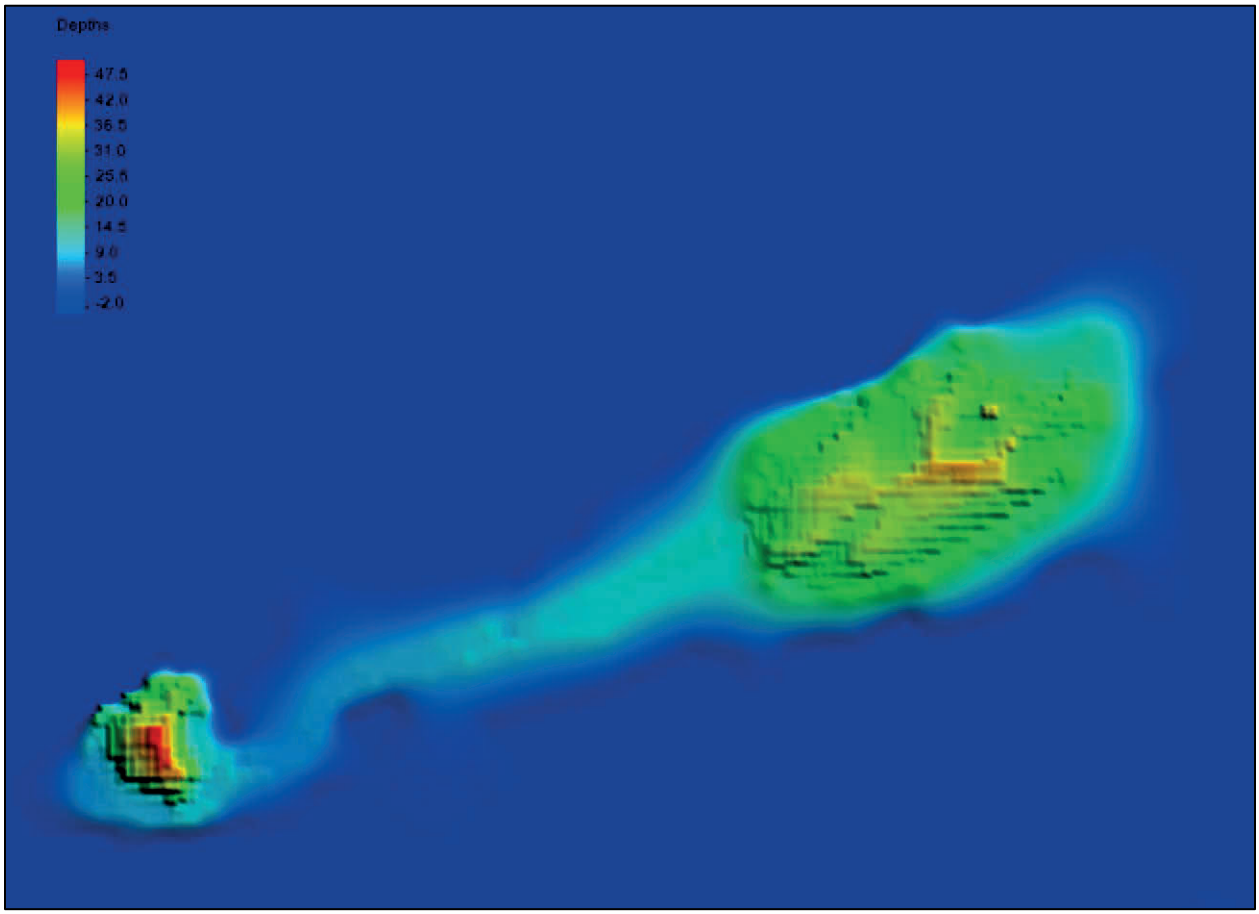


Figure 3 Bathymetry at site on hydrographic charts- Depth reported in meters

4.2 Wave Model Description

SMS, created by Aquaveo, is a modelling suite in which various water surface modelling tools, like wave and flow models, can be used. For this analysis SMS in combination with STWave is used. STWave is a nearshore spectral Hydraulics model, developed by U.S. Army Engineer Research and Development Center (ERDC) and Coastal and Hydraulics Laboratory (CHL). It is capable of modelling accurately wave transformation and propagation.

Two grids were setup, computational grid and spectral grid. The computational grid and its mesh sizes are mainly defined by the bathymetry. The bathymetry in SMS is presented in Figure 4. For this analysis, the computational grid size was 12.1 km x 6.7 km. The mesh size was 10 m x 10 m, resulting in 1211 x 668 = 808,948 grid cells. The spectral domain was divided into 72 directions and 50 frequencies, with a minimum frequency of 0.03 Hz and a maximum frequency of 1.01 Hz.

Title	Wind and Wave Conditions – Whycocomagh Bay – Marine Finfish Leases 0814x, 0814, 0600, 1431, 5010, 1430		
Revision	B	Date Last Revised	2021-01-25
DSA Project	CMAR-19EXM	Client Project / Reference	N/A

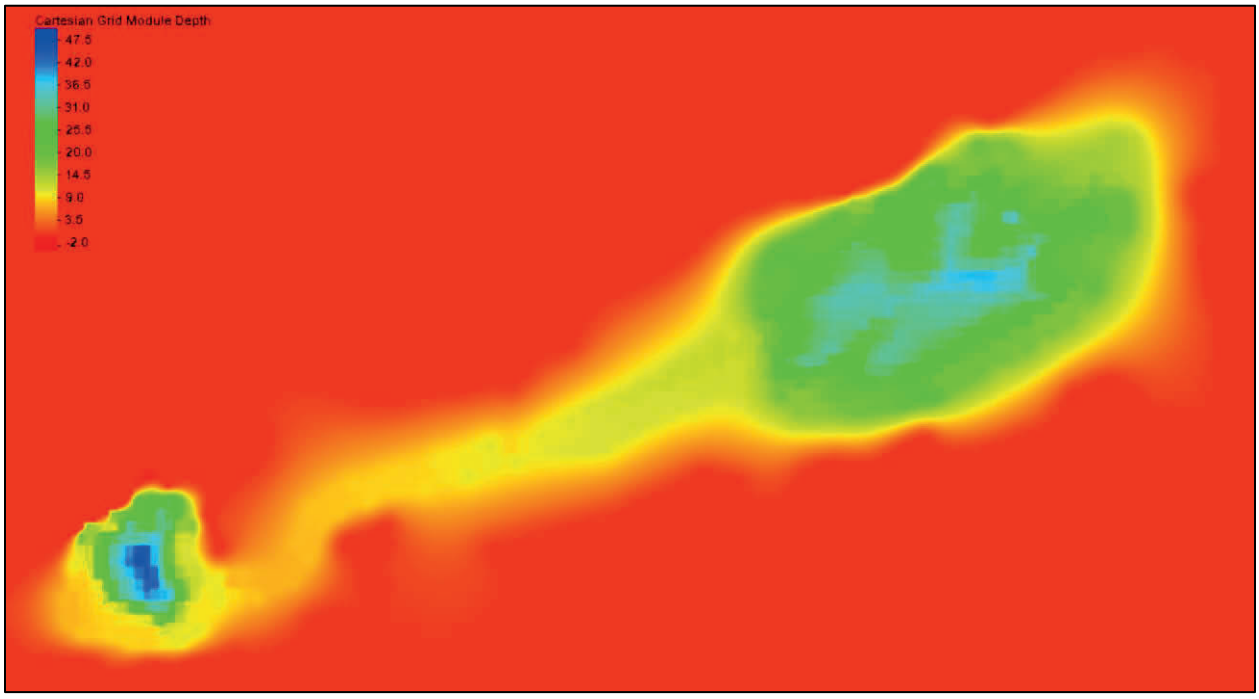


Figure 4 Bathymetry at site on STWave. Note the Source Point indicated at 45° 55.125'N, 60° 38.616'W Boundary conditions – wind conditions

4.3 Boundary conditions – Wind and wave conditions

Environment Canada wind data [1] from a weather station located near Eskasoni (45° 55.125'N, 60° 38.616'W) was used to determine the 10- and 50- year return periods for wind and wave of the Whycocomagh Bay fish farm sites. The scatter plot of wind speeds versus wind directions for the source point is also shown in Figure 5. Extreme winds at the source point appear to originate more frequently from the northeast and east.

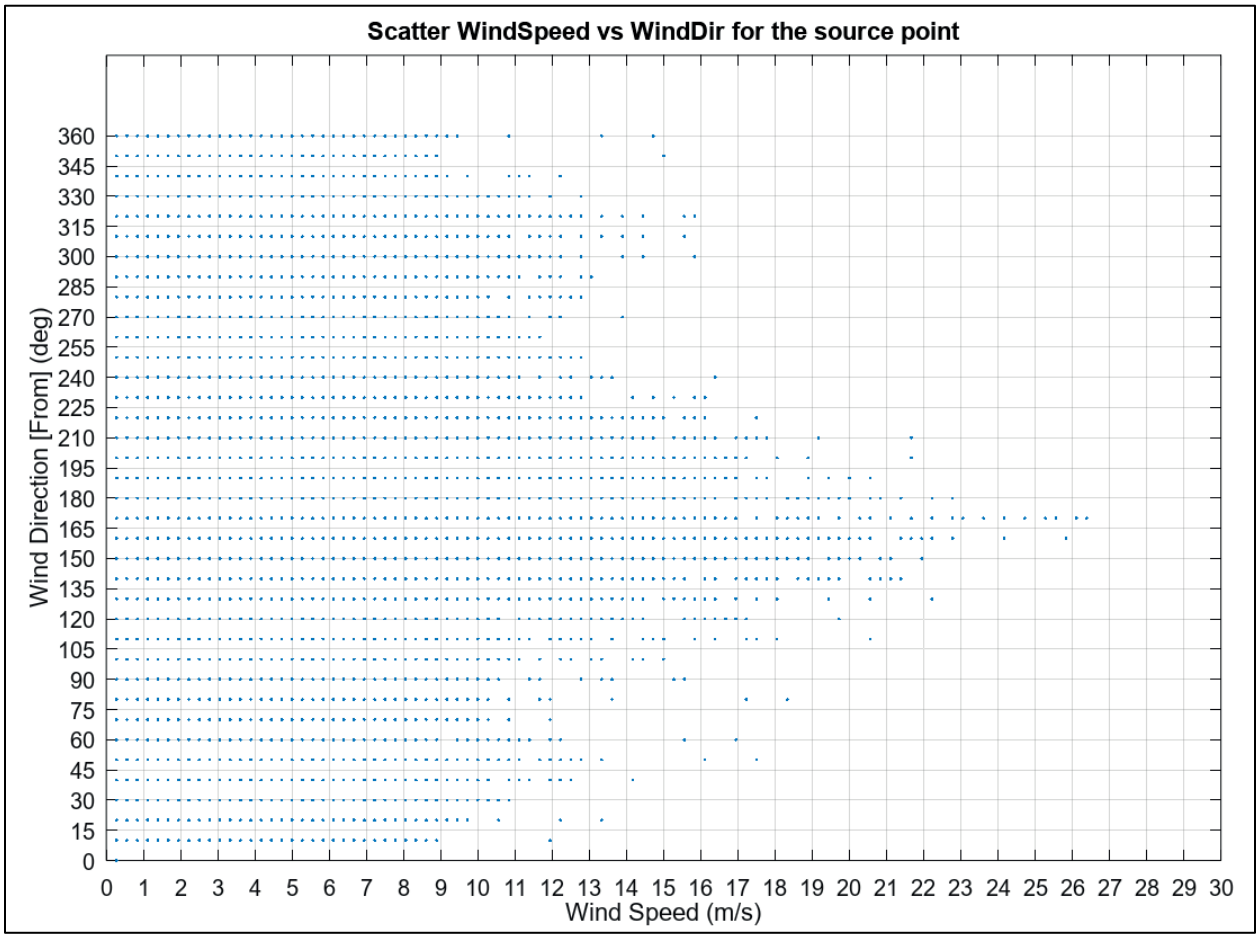


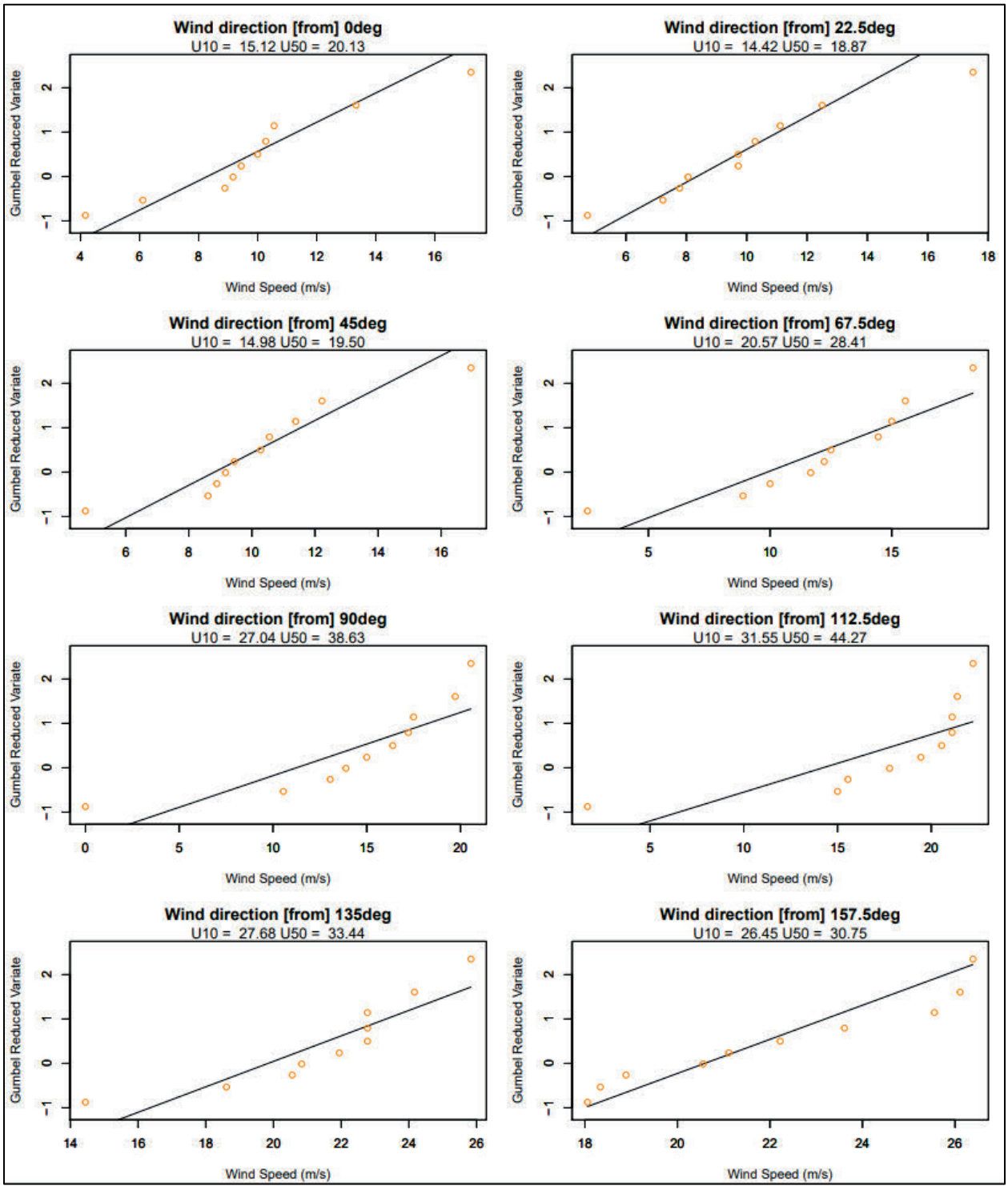
Figure 5 Wind speed versus wind direction plot for the Source Point

10- and 50- year return period conditions are in general achieved by:

- Obtaining measured or hindcast data for parameter in question
- For each parameter, bin data by direction
- Perform extreme value analysis.
    - Extract annual maxima
    - Fit Gumbel or Weibull distribution to this data
    - Use fitted distribution to calculate values corresponding to 10- and 50- year return period

The extreme value analysis of the wind velocities is presented in Figure 6. U10 and U50 represent the 10- and 50- year return period wind velocities, respectively.

Title	Wind and Wave Conditions – Whycocomagh Bay – Marine Finfish Leases 0814x, 0814, 0600, 1431, 5010, 1430		
Revision	B	Date Last Revised	2021-01-25
DSA Project	CMAR-19EXM	Client Project / Reference	N/A



Title	Wind and Wave Conditions – Whycocomagh Bay – Marine Finfish Leases 0814x, 0814, 0600, 1431, 5010, 1430		
Revision	B	Date Last Revised	2021-01-25
DSA Project	CMAR-19EXM	Client Project / Reference	N/A

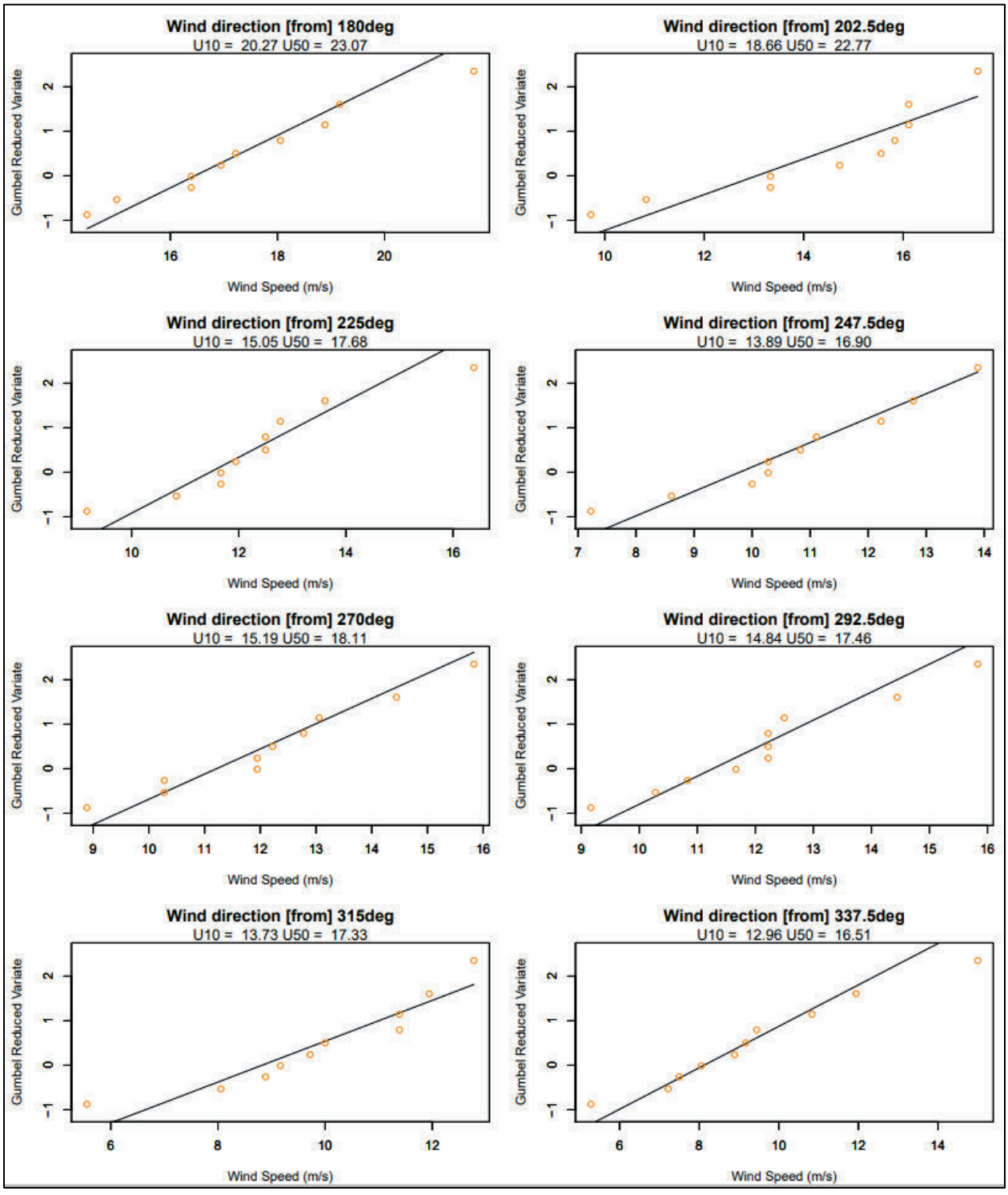


Figure 6: Extreme value analysis on wind data – for the Source Point [1]

In summary, the following data was obtained from the extreme value analysis:

Table 1 Results extreme value analysis for wind at the Source Point locations in Figure 4

Direction [from] [°]		$U_{wind,10year}$ [m/s]	$U_{wind,50year}$ [m/s]
0	N	15.12	20.13
23	NNE	14.42	18.87
45	NE	14.98	19.5
68	ENE	20.57	28.41
90	E	27.04	38.63
113	ESE	31.55	44.27
135	SE	27.68	33.44
158	SSE	26.45	30.75
180	S	20.27	23.07
203	SSW	18.66	22.77
225	SW	15.05	17.68
248	WSW	13.89	16.9
270	W	15.19	18.11
293	WNW	14.84	17.46
315	NW	13.73	17.33
338	NNW	12.96	16.51

Polar plots for maximum wind speeds at 10- year and 50- year return periods are shown in Figure 7 and Figure 8, respectively.

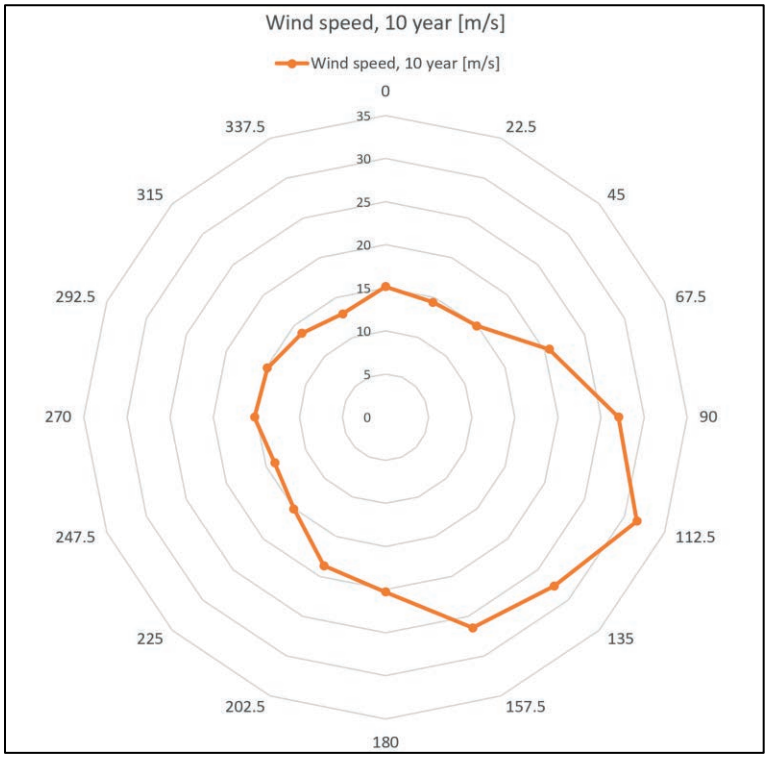


Figure 7 Maximum wind speed at 10- year return period and direction [from]- for Source location [1]

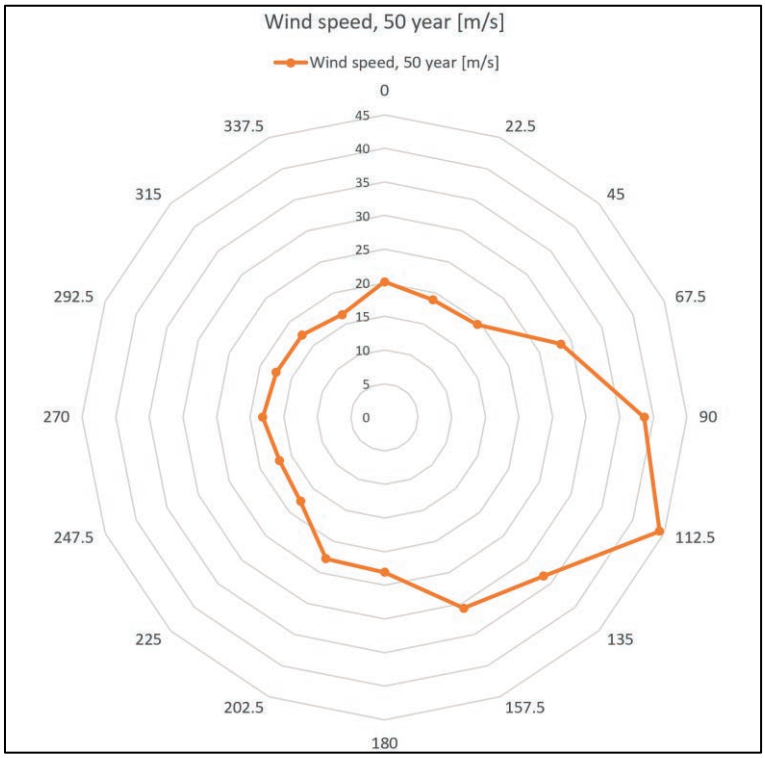


Figure 8 Maximum wind speed at 50- year return period and direction [from]- for Source Point location [1]

Only wind-driven waves considered for the wave modeling. Current-wave interaction was not included because local flow velocities are very small.

16 headings were used, the wind direction was kept constant within its directional bin.

In this method, wave design conditions for the project location are based on 10- and 50- year return period winds for a nearby weather station, which have subsequently been transferred to the project location. This will provide reasonable design conditions; however, they cannot be linked directly to a return period at the site.

4.4 Wave modeling results

The results of the wave modeling are presented in Figure 9 and Figure 10 for directions from East and Southeast, respectively for two key wave headings with the highest wave heights. As stated in the previous section, the wind conditions are assumed to stay constant for the region. The results from STWave represent the maximum significant wave height value at the region including its spectral peak period and wave direction.

The location of sites at the Whycocomagh Bay are presented in Figure 1. The estimated wave and wind conditions for each site based on the STWave modeling are presented in the following sections.

Title	Wind and Wave Conditions – Whycocomagh Bay – Marine Finfish Leases 0814x, 0814, 0600, 1431, 5010, 1430		
Revision	B	Date Last Revised	2021-01-25
DSA Project	CMAR-19EXM	Client Project / Reference	N/A

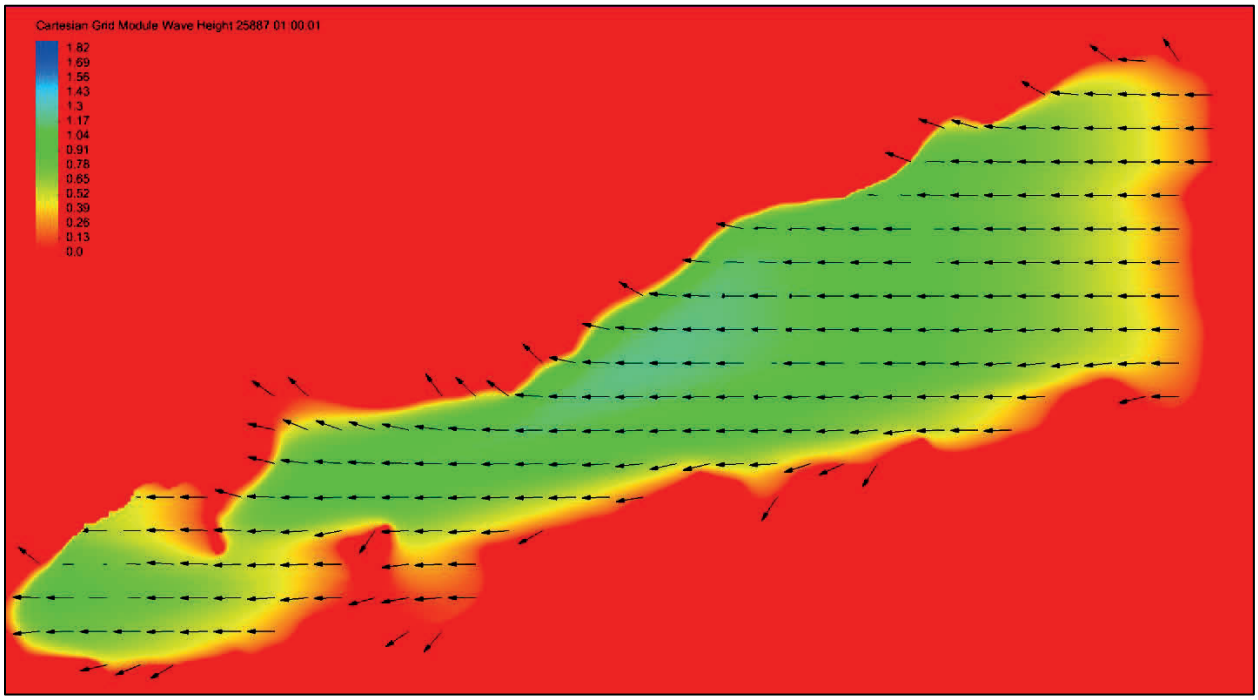


Figure 9 Wave modeling results for direction [From] 90 deg- E

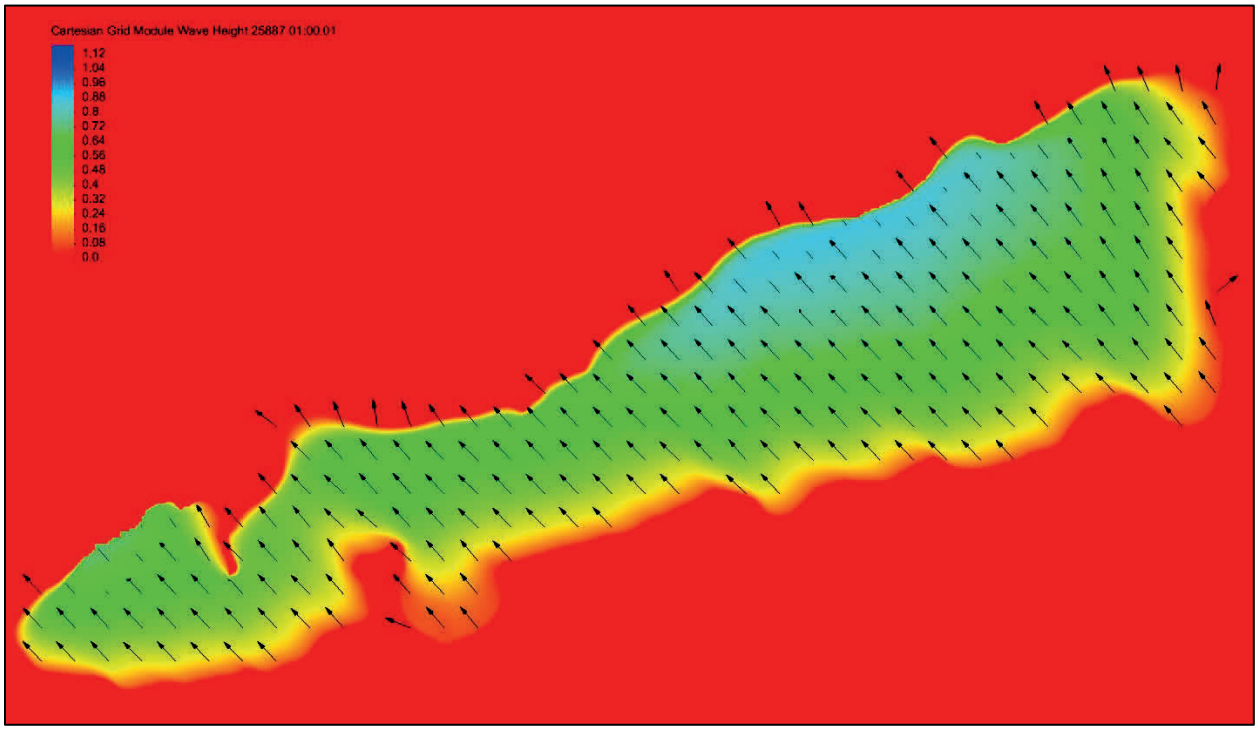


Figure 10 Wave modeling results for direction [From] 135 deg- SE

4.4.1 Wave/wind conditions for Whycocomagh Bay – Proposed Marine Finfish Lease – 0814x

The wave and wind results from the STWave model, for the proposed Marine Finfish Lease – 0814x at the Whycocomagh Bay, are summarized in Table 2. Note that the results in Table 2 indicate significant wave height (Hs) and peak period (T_P) for the selected site. These represent the extreme wave conditions at this coordinate: 45° 56.927'N, 61° 7.675'W.

Table 2 Estimated wave and wind design conditions for Whycocomagh Bay – Proposed Marine Finfish Lease - 0814x

Wave/Wind conditions	Direction [from] [°]		Wind (m/s)	Hs (m)	Tp (s)
10yr wave/wind	*0*	N	15.12	0.15	1.27
	23	NNE	14.42	0.1	1.22
	45	NE	14.98	0.21	1.83
	68	ENE	20.57	0.37	1.91
	90	E	27.04	0.61	2.15
	113	ESE	31.55	0.69	2.51
	135	SE	27.68	0.65	2.36
	158	SSE	26.45	0.61	2.17
	180	S	20.27	0.44	1.92
	203	SSW	18.66	0.27	1.8
	225	SW	15.05	0.28	1.65
	248	WSW	13.89	0.23	1.4
	270	W	15.19	0.18	1.4
	293	WNW	14.84	0.07	1.1
	315	NW	13.73	0.1	1.22
	338	NNW	12.96	0.1	1.2
50yr wave/wind	*0*	N	20.13	0.21	1.42
	23	NNE	18.87	0.16	1.41
	45	NE	19.5	0.29	2
	68	ENE	28.41	0.54	2.16
	90	E	38.63	0.91	2.51
	113	ESE	44.27	1.05	2.95
	135	SE	33.44	0.82	2.57
	158	SSE	30.75	0.73	2.32
	180	S	23.07	0.51	2.01
	203	SSW	22.77	0.37	1.92
	225	SW	17.68	0.34	1.73

	248	WSW	16.9	0.3	1.52
	270	W	18.11	0.23	1.5
	293	WNW	17.46	0.1	1.37
	315	NW	17.33	0.1	1.2
	338	NNW	16.51	0.15	1.32

It should be noted that the return periods indicated for each wave parameter in Table 2 are representative of the boundary condition used to derive that value, not the value itself. Polar plots for maximum wave heights are presented in Figure 11 and Figure 12.

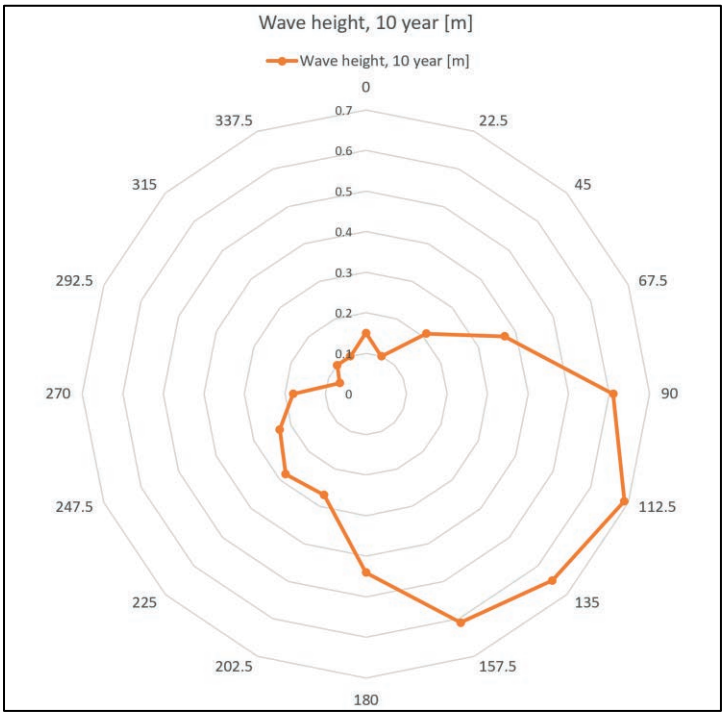


Figure 11 Maximum wave height at 10- year return period and direction [from]- Whycocomagh Bay – Proposed Marine Finfish Lease - 0814x

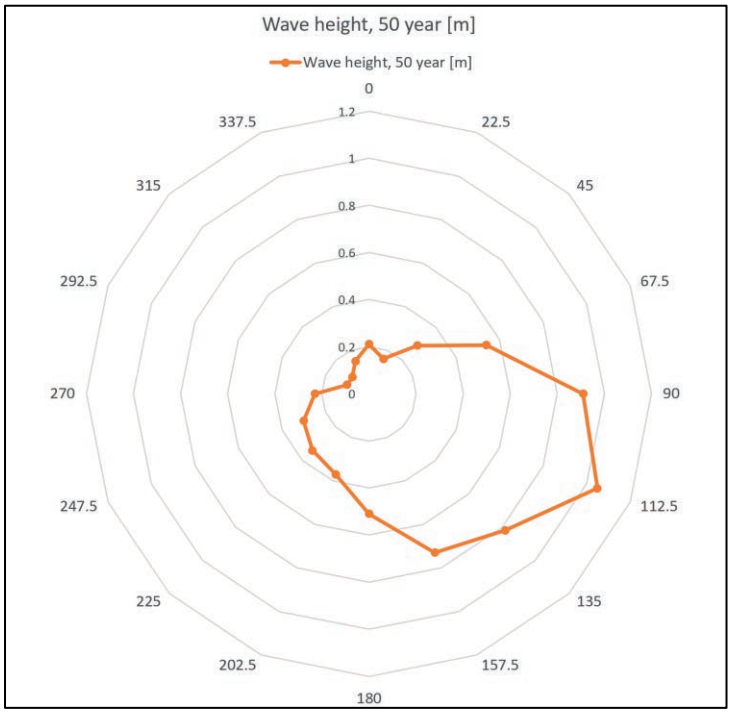


Figure 12 Maximum wave height at 50- year return period and direction [from]- Whycocomagh Bay – Proposed Marine Finfish Lease - 0814x

4.4.2 Wave/wind conditions for Whycocomagh Bay - Marine Finfish Lease - 0814

The wave and wind results from the STWave model, for the Whycocomagh Bay - Marine Finfish Lease - 0814, are summarized in Table 3. Note that the results in Table 3 indicate significant wave height (Hs) and peak period (T_P) for the selected site. These represent the extreme wave conditions at this coordinate: 45° 57.050'N, 61° 7.555'W.

Table 3 Estimated wave and wind design conditions for Whycocomagh Bay - Marine Finfish Lease - 0814

Wave/Wind conditions	Direction [from] [°]		Wind (m/s)	Hs (m)	Tp (s)
10yr wave/wind	*0*	N	15.12	0.11	1.16
	23	NNE	14.42	0.07	1.1
	45	NE	14.98	0.16	1.7
	68	ENE	20.57	0.32	1.79
	90	E	27.04	0.48	1.9
	113	ESE	31.55	0.6	2.54
	135	SE	27.68	0.66	2.47
	158	SSE	26.45	0.65	2.27
	180	S	20.27	0.48	2

	203	SSW	18.66	0.31	1.88
	225	SW	15.05	0.28	1.6
	248	WSW	13.89	0.2	1.31
	270	W	15.19	0.14	1.26
	293	WNW	14.84	0.03	1.1
	315	NW	13.73	0.06	1.12
	338	NNW	12.96	0.07	1.1
50yr wave/wind	*0*	N	20.13	0.16	1.28
	23	NNE	18.87	0.11	1.2
	45	NE	19.5	0.22	1.93
	68	ENE	28.41	0.47	1.97
	90	E	38.63	0.73	2.2
	113	ESE	44.27	0.91	2.99
	135	SE	33.44	0.83	2.7
	158	SSE	30.75	0.78	2.42
	180	S	23.07	0.56	2.1
	203	SSW	22.77	0.41	2.02
	225	SW	17.68	0.34	1.7
	248	WSW	16.9	0.25	1.42
	270	W	18.11	0.18	1.35
	293	WNW	17.46	0.05	1.1
	315	NW	17.33	0.05	1.11
	338	NNW	16.51	0.1	1.2

It should be noted that the return periods indicated for each wave parameter in Table 3 are representative of the boundary condition used to derive that value, not the value itself. Polar plots for maximum wave heights are presented in Figure 13 and Figure 14.

Title	Wind and Wave Conditions – Whycocomagh Bay – Marine Finfish Leases 0814x, 0814, 0600, 1431, 5010, 1430		
Revision	B	Date Last Revised	2021-01-25
DSA Project	CMAR-19EXM	Client Project / Reference	N/A

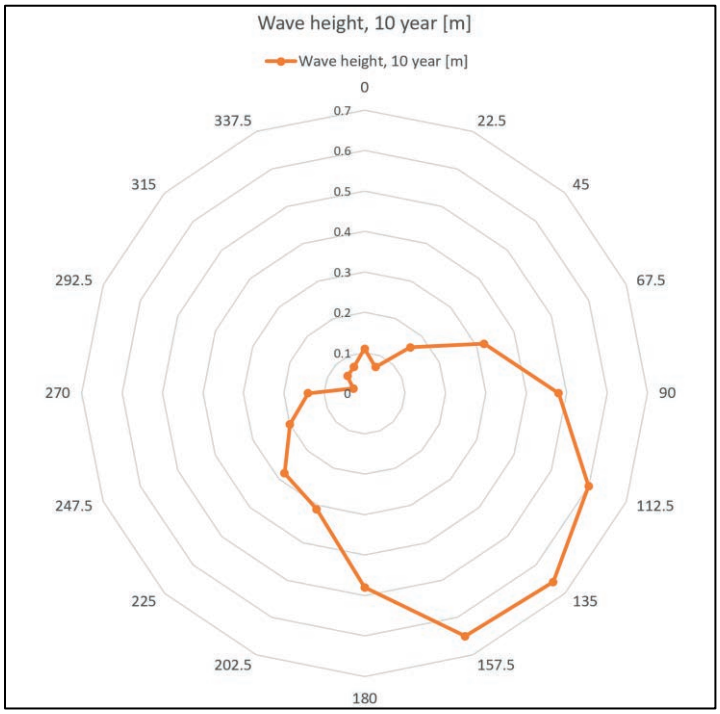


Figure 13 Maximum wave height at 10- year return period and direction [from]- Whycocomagh Bay - Marine Finfish Lease – 0814

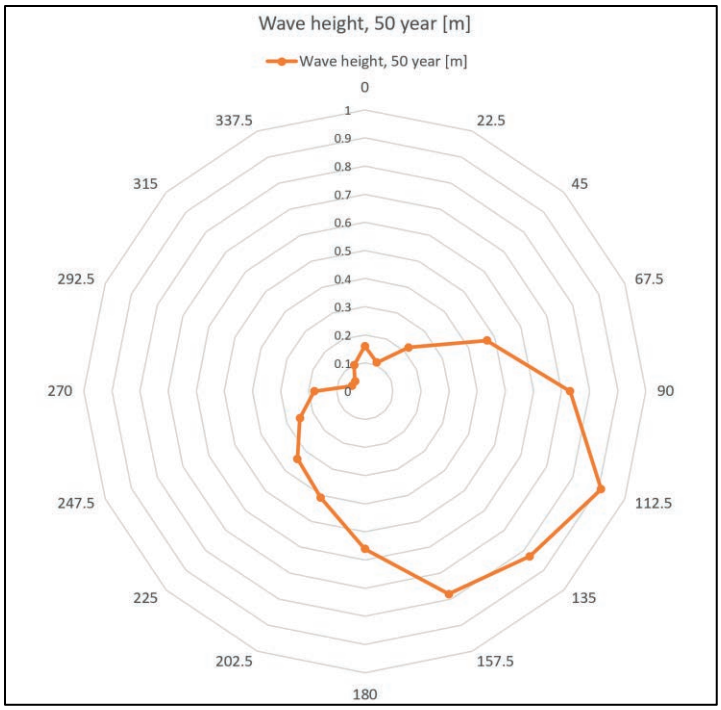


Figure 14 Maximum wave height at 50- year return period and direction [from]- Whycocomagh Bay - Marine Finfish Lease – 0814

4.4.3 Wave/wind conditions for Whycocomagh Bay - Marine Finfish Lease - 0600

The wave and wind results from the STWave model, for the Whycocomagh Bay - Marine Finfish Lease - 0600, are summarized in Table 4. Note that the results in Table 4 indicate significant wave height (Hs) and peak period (T_P) for the selected site. These represent the extreme wave conditions at this coordinate: 45° 57.061'N, 61° 7.270'W.

Table 4 Estimated wave and wind design conditions for Whycocomagh Bay - Marine Finfish Lease - 0600

Wave/Wind conditions	Direction [from] [°]		Wind (m/s)	Hs (m)	Tp (s)
10yr wave/wind	*0*	N	15.12	0.13	1.22
	23	NNE	14.42	0.07	1.1
	45	NE	14.98	0.14	1.34
	68	ENE	20.57	0.24	1.5
	90	E	27.04	0.33	1.65
	113	ESE	31.55	0.33	2.1
	135	SE	27.68	0.54	2.51
	158	SSE	26.45	0.62	2.28
	180	S	20.27	0.48	1.99
	203	SSW	18.66	0.31	1.9
	225	SW	15.05	0.32	1.78
	248	WSW	13.89	0.28	1.54
	270	W	15.19	0.21	1.5
	293	WNW	14.84	0.08	1.12
	315	NW	13.73	0.12	1.21
	338	NNW	12.96	0.12	1.16
50yr wave/wind	*0*	N	20.13	0.2	1.36
	23	NNE	18.87	0.11	1.18
	45	NE	19.5	0.2	1.56
	68	ENE	28.41	0.36	1.71
	90	E	38.63	0.52	1.84
	113	ESE	44.27	0.53	2.26
	135	SE	33.44	0.67	2.75
	158	SSE	30.75	0.75	2.43
	180	S	23.07	0.55	2.1
	203	SSW	22.77	0.41	2.1
	225	SW	17.68	0.38	1.84
	248	WSW	16.9	0.35	1.66

	270	W	18.11	0.26	1.6
	293	WNW	17.46	0.11	1.17
	315	NW	17.33	0.11	1.2
	338	NNW	16.51	0.16	1.27

It should be noted that the return periods indicated for each wave parameter in Table 4 are representative of the boundary condition used to derive that value, not the value itself. Polar plots for maximum wave heights are presented in Figure 15 and Figure 16.

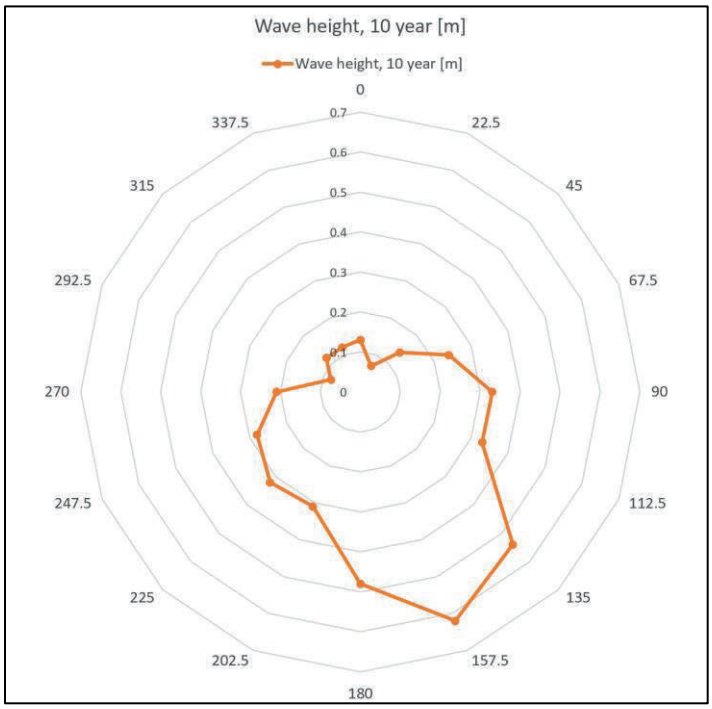


Figure 15 Maximum wave height at 10- year return period and direction [from]- Whycocomagh Bay - Marine Finfish Lease – 0600

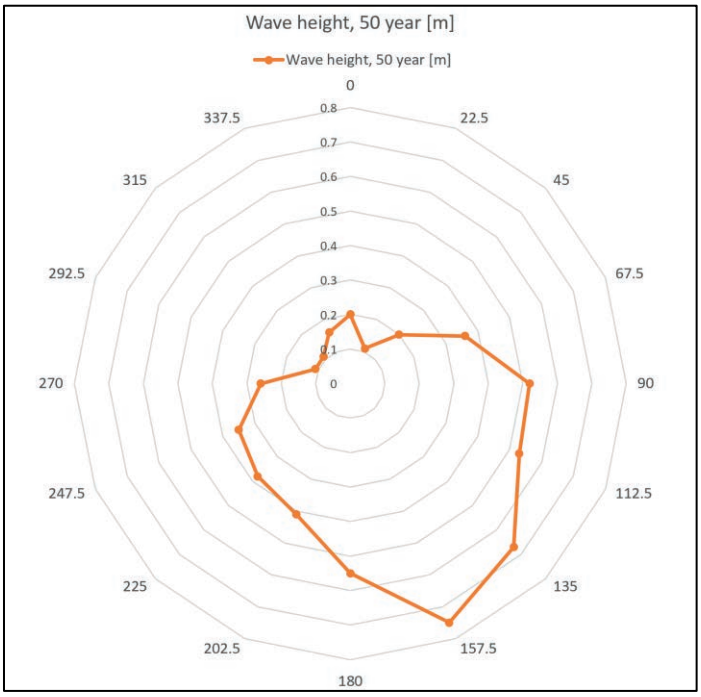


Figure 16 Maximum wave height at 50- year return period and direction [from]- Whycocomagh Bay - Marine Finfish Lease – 0600

4.4.4 Wave/wind conditions for Whycocomagh Bay - Marine Finfish Lease - 1431

The wave and wind results from the STWave model, for the Whycocomagh Bay - Marine Finfish Lease - 1431, are summarized in Table 5. Note that the results in Table 5 indicate significant wave height (Hs) and peak period (T_P) for the selected site. These represent the extreme wave conditions at this coordinate: 45° 57.611'N, 61° 1.630'W.

Table 5 Estimated wave and wind design conditions for Whycocomagh Bay - Marine Finfish Lease - 1431

Wave/Wind conditions	Direction [from] [°]		Wind (m/s)	Hs (m)	Tp (s)
10yr wave/wind	*0*	N	15.12	0.44	2.1
	23	NNE	14.42	0.35	2.1
	45	NE	14.98	0.48	2.17
	68	ENE	20.57	0.69	2.32
	90	E	27.04	0.75	2.35
	113	ESE	31.55	0.53	2.1
	135	SE	27.68	0.47	1.84
	158	SSE	26.45	0.4	1.73
	180	S	20.27	0.26	1.56
	203	SSW	18.66	0.16	1.44

	225	SW	15.05	0.25	2.82
	248	WSW	13.89	0.45	2.41
	270	W	15.19	0.56	2.4
	293	WNW	14.84	0.3	1.93
	315	NW	13.73	0.34	2.1
	338	NNW	12.96	0.33	1.91
50yr wave/wind	*0*	N	20.13	0.61	2.27
	23	NNE	18.87	0.49	2.33
	45	NE	19.5	0.65	2.42
	68	ENE	28.41	1	2.66
	90	E	38.63	1.36	2.75
	113	ESE	44.27	0.83	2.44
	135	SE	33.44	0.6	1.97
	158	SSE	30.75	0.49	1.81
	180	S	23.07	0.31	1.64
	203	SSW	22.77	0.23	1.67
	225	SW	17.68	0.3	3
	248	WSW	16.9	0.55	2.61
	270	W	18.11	0.68	2.58
	293	WNW	17.46	0.4	2.1
	315	NW	17.33	0.32	2
	338	NNW	16.51	0.44	2.1

It should be noted that the return periods indicated for each wave parameter in Table 5 are representative of the boundary condition used to derive that value, not the value itself. Polar plots for maximum wave heights are presented in Figure 17 and Figure 18.

Title	Wind and Wave Conditions – Whycocomagh Bay – Marine Finfish Leases 0814x, 0814, 0600, 1431, 5010, 1430		
Revision	B	Date Last Revised	2021-01-25
DSA Project	CMAR-19EXM	Client Project / Reference	N/A

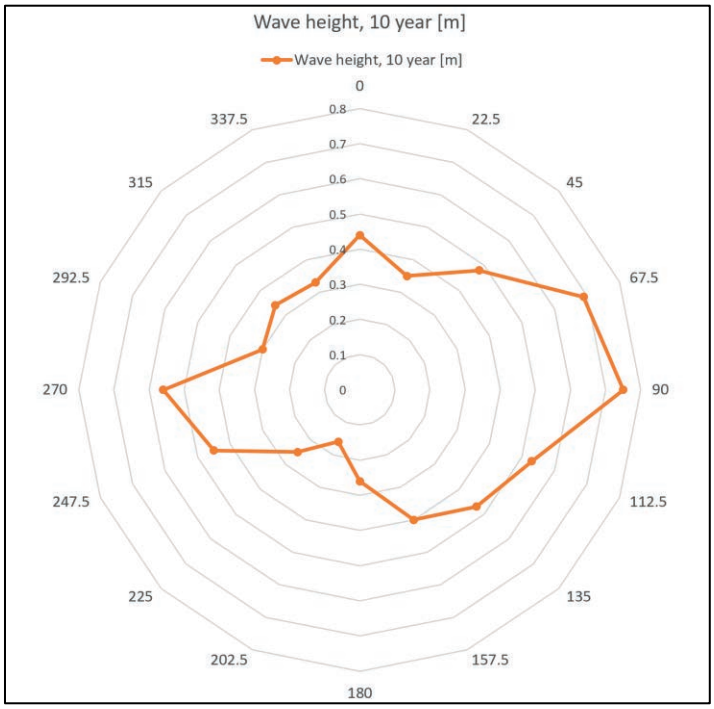


Figure 17 Maximum wave height at 10- year return period and direction [from]- Whycocomagh Bay - Marine Finfish Lease – 1431

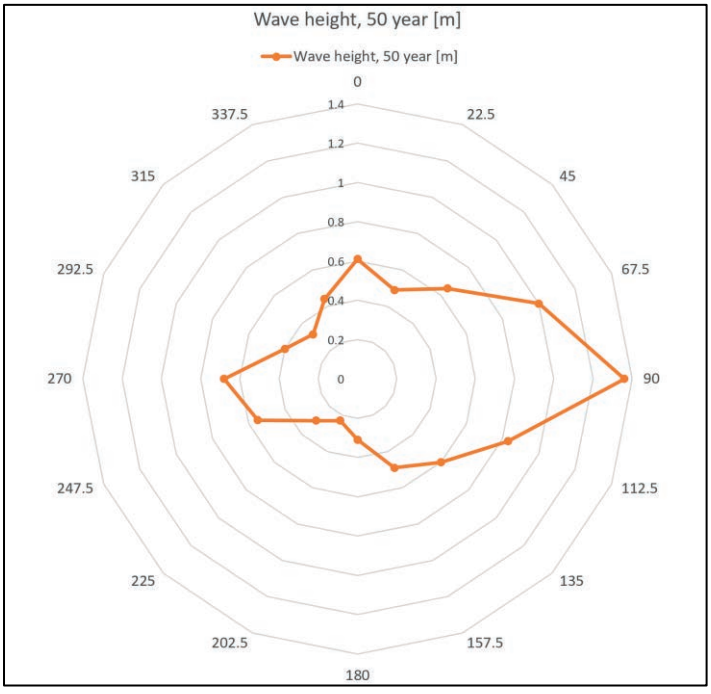


Figure 18 Maximum wave height at 50- year return period and direction [from]- Whycocomagh Bay - Marine Finfish Lease – 1431

4.4.5 Wave/wind conditions for Whycocomagh Bay - Marine Finfish Lease - 5010

The wave and wind results from the STWave model, for the Whycocomagh Bay - Marine Finfish Lease - 5010, are summarized in Table 6. Note that the results in Table 6 indicate significant wave height (Hs) and peak period (T_P) for the selected site. These represent the extreme wave conditions at this coordinate: 45° 58.626'N, 61° 1.685'W.

Table 6 Estimated wave and wind design conditions for Whycocomagh Bay - Marine Finfish Lease - 5010

Wave/Wind conditions	Direction [from] [°]		Wind (m/s)	Hs (m)	Tp (s)
10yr wave/wind	*0*	N	15.12	0.15	1.29
	23	NNE	14.42	0.12	1.3
	45	NE	14.98	0.29	2.35
	68	ENE	20.57	0.62	2.45
	90	E	27.04	0.91	2.69
	113	ESE	31.55	0.88	2.9
	135	SE	27.68	0.84	2.85
	158	SSE	26.45	0.84	2.61
	180	S	20.27	0.62	2.3
	203	SSW	18.66	0.45	2.26
	225	SW	15.05	0.44	2.1
	248	WSW	13.89	0.41	1.91
	270	W	15.19	0.24	1.63
	293	WNW	14.84	0.07	1.1
	315	NW	13.73	0.1	1.23
	338	NNW	12.96	0.1	1.25
50yr wave/wind	*0*	N	20.13	0.22	1.44
	23	NNE	18.87	0.18	1.58
	45	NE	19.5	0.39	2.62
	68	ENE	28.41	0.9	2.82
	90	E	38.63	1.4	3.17
	113	ESE	44.27	1.32	3.4
	135	SE	33.44	1.1	3.1
	158	SSE	30.75	1	2.79
	180	S	23.07	0.72	2.41
	203	SSW	22.77	0.57	2.48
	225	SW	17.68	0.53	2.2
	248	WSW	16.9	0.52	2.1

	270	W	18.11	0.3	1.72
	293	WNW	17.46	0.1	1.13
	315	NW	17.33	0.1	1.2
	338	NNW	16.51	0.14	1.33

It should be noted that the return periods indicated for each wave parameter in Table 6 are representative of the boundary condition used to derive that value, not the value itself. Polar plots for maximum wave heights are presented in Figure 19 and Figure 20.

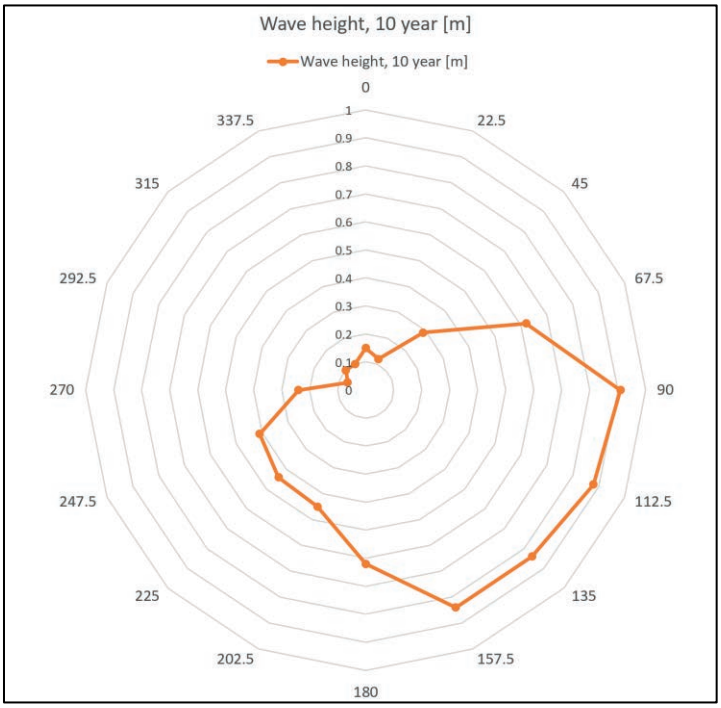


Figure 19 Maximum wave height at 10- year return period and direction [from]- Whycocomagh Bay - Marine Finfish Lease – 5010

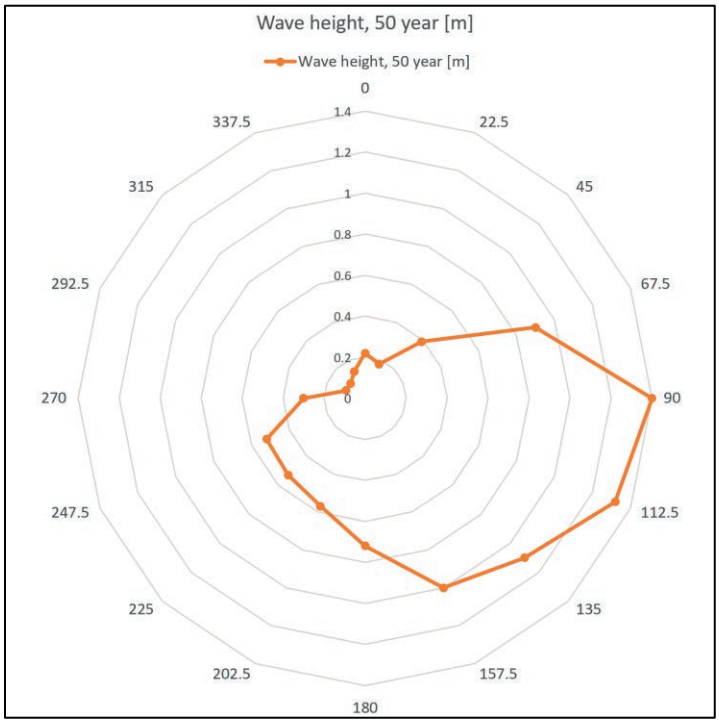


Figure 20 Maximum wave height at 50- year return period and direction [from]- Whycocomagh Bay - Marine Finfish Lease – 5010

4.4.6 Wave/wind conditions for Whycocomagh Bay - Marine Finfish Lease - 1430

The wave and wind results from the STWave model, for the Whycocomagh Bay - Marine Finfish Lease - 1430, are summarized in Table 7. Note that the results in Table 7 indicate significant wave height (Hs) and peak period (T_P) for the selected site. These represent the extreme wave conditions at this coordinate: 45° 58.699'N, 61° 1.472'W.

Table 7 Estimated wave and wind design conditions for Whycocomagh Bay - Marine Finfish Lease - 1430

Wave/Wind conditions	Direction [from] [°]		Wind (m/s)	Hs (m)	Tp (s)
10yr wave/wind	*0*	N	15.12	0.19	1.42
	23	NNE	14.42	0.11	1.24
	45	NE	14.98	0.27	2.33
	68	ENE	20.57	0.59	2.4
	90	E	27.04	0.87	2.63
	113	ESE	31.55	0.82	2.81
	135	SE	27.68	0.83	2.92
	158	SSE	26.45	0.85	2.66
	180	S	20.27	0.64	2.32

	203	SSW	18.66	0.45	2.3
	225	SW	15.05	0.42	2.1
	248	WSW	13.89	0.4	1.88
	270	W	15.19	0.22	1.52
	293	WNW	14.84	0.07	1.1
	315	NW	13.73	0.11	1.37
	338	NNW	12.96	0.13	1.35
50yr wave/wind	*0*	N	20.13	0.27	1.59
	23	NNE	18.87	0.18	1.5
	45	NE	19.5	0.36	2.59
	68	ENE	28.41	0.85	2.76
	90	E	38.63	1.34	3.1
	113	ESE	44.27	1.25	3.3
	135	SE	33.44	1.03	3.2
	158	SSE	30.75	1	2.84
	180	S	23.07	0.74	2.45
	203	SSW	22.77	0.58	2.5
	225	SW	17.68	0.51	2.2
	248	WSW	16.9	0.5	2
	270	W	18.11	0.27	1.61
	293	WNW	17.46	0.1	1.14
	315	NW	17.33	0.1	1.34
	338	NNW	16.51	0.18	1.5

It should be noted that the return periods indicated for each wave parameter in Table 7 are representative of the boundary condition used to derive that value, not the value itself. Polar plots for maximum wave heights are presented in Figure 21 and Figure 22.

Title	Wind and Wave Conditions – Whycocomagh Bay – Marine Finfish Leases 0814x, 0814, 0600, 1431, 5010, 1430		
Revision	B	Date Last Revised	2021-01-25
DSA Project	CMAR-19EXM	Client Project / Reference	N/A

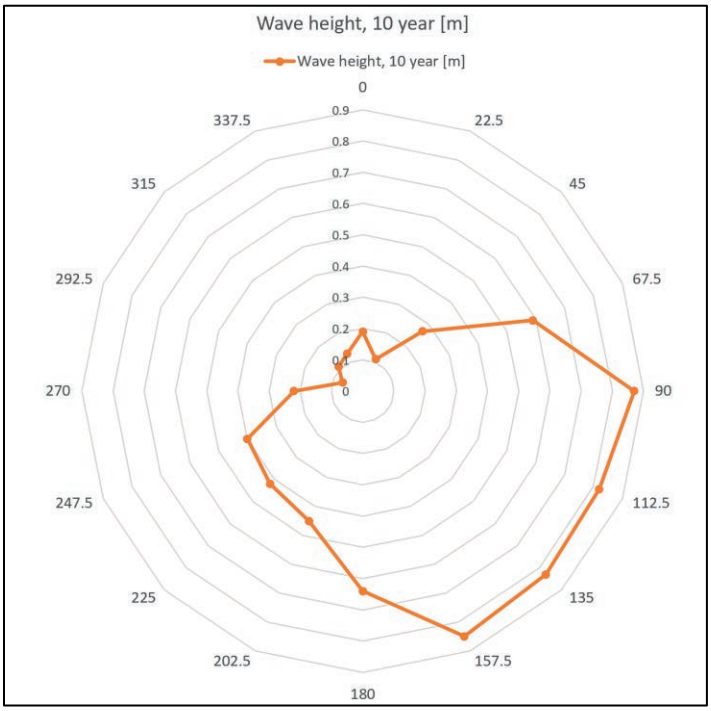


Figure 21 Maximum wave height at 10- year return period and direction [from]- Whycocomagh Bay - Marine Finfish Lease – 1430

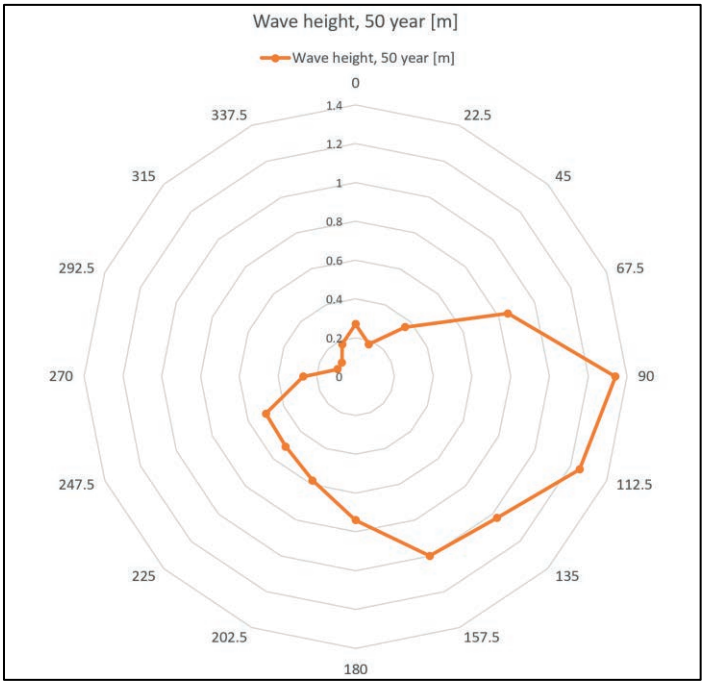


Figure 22 Maximum wave height at 50- year return period and direction [from]- Whycocomagh Bay - Marine Finfish Lease – 1430

A1.7 Appendix G – Updated Notice of Works Forms

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.

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] If you are submitting a Notice of Works in paper form, please provide two (2) copies of each supporting document. If the Notice of Works is submitted electronically, please ensure to attach all relevant documents (individually scanned).	☐ 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 in paper form, owners should note:

- All plans and drawings must be legible when printed on 11" x 17" paper
- Your completed Notice to the Minister should be sent to the appropriate regional office as outlined below

TRANSPORT CANADA NAVIGATION PROTECTION PROGRAM REGIONAL OFFICES

Pacific Region Office
820-800 Burrard Street
Vancouver BC V6Z 2J8
Telephone: 604-775-8867
Email: NPPPAC-PPNPAC@tc.gc.ca

Prairie and Northern Region Office
Canada Place 1100-9700 Jasper Ave
Edmonton AB T5J 4E6
Telephone: 780-495-8215
Email: NPPPNR-PPNRPN@tc.gc.ca

Ontario Region Office
100 South Front Street, 1st Floor
Sarnia ON N7T 2M4
Telephone: 519-383-1863
Email: NPPONT-PPNONT@tc.gc.ca

Headquarters Office
(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 Office
401-1550 d'Estimauville Avenue, 5th Floor
Quebec QC G1J 0C8
Telephone: 877-646-6420
Email: PPNQUE-NPPQUE@tc.gc.ca

Atlantic Region Office
95 Foundry Street, 6th Floor
P.O. Box 42
Moncton NB E1C 8K6
Telephone: 506-851-3113
Email: NPPATL-PPNATL@tc.gc.ca

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)
Whycocomagh Bay, Bras D'Or Lake

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 INFORMATION²

Individual or company name (Required)
XXXXXXXXXXXXXXX WFN Fish Farm Limited Partnership

Contact name (Required)
XXXXXXXXX Wade Skinner

Mailing address (Required)
[redacted]
[redacted] Whycocomagh

City/Town (Required)
Whycocomagh

Province/Territory (Required)
NS

Postal code (Required)
B0E3M0

Primary telephone number (999-999-9999) (Required)
XXXXXXXXX 709-885-5579

Other telephone number (999-999-9999)
XXXXXXXXX

E-mail
wadeskinner@waycobah.ca
XXXXXXXXXXXXXXXXX

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

Company name
Sustain Aqua

Contact name
Melissa Rommens

Mailing address
[redacted]

City/Town
Emyvale

Province/Territory
PE

Postal code
C0A 1Y0

Primary telephone number (999-999-9999) (Required)
[redacted]

Other telephone number (999-999-9999)
[redacted]

E-mail
[redacted]

WORK SITE INFORMATION

Nearest municipality/county/district (Required)
Inverness

Province/Territory (Required)
NS

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

Site position Latitude North (Required)
Degrees 45 Minutes 56 Seconds 52.66

Site position Longitude West (Required)
Degrees -61 Minutes 7 Seconds 26.22

Hydro chart number: 4278

Topo map number: 011F14

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

See attached

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

n/a

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

Waycobah owns some adjoining land. Shore line is a rural area.

BODY OF WATER USE INFORMATION

Navigation types (check all that apply)

☑ Commercial ☑ Recreational

Maximum vessel size

Length XX 50' Width XXX 30' Draft XX 10'

Traffic direction

○ One-way ◉ Two-way

Manoeuvrability (check all that apply)

☐ Poor ☑ Good ☐ Excellent

Day/Night

◉ Day ○ Night ○ Both

Volume

◉ Low ○ Medium ○ High

Navigation season(s) (check all that apply)

☐ Winter ☑ Spring ☑ Summer ☑ Fall

Other uses such as cottagers, special events, fishing, etc.

Maximum vessel indicated above is a barge to be used for Waycobah's finfish operations.

OTher users would include recreational small sailing craft, motorboats, small fishing boats.

PROJECT INFORMATION

Name of work such as bridge, dam, marina, etc. (Required)

Finfish aquaculture

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)

See attached.

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

See attached.

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

See attached.

Expected start date (dd-mm-yyyy) (Required)	Expected completion date (dd-mm-yyyy) (Required)
01-05-2019	Ongoing

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)
- ☐ Fisheries and Oceans Canada (DFO)
- ☐ Major Projects Management Office (MPMO)
- ☐ Aboriginal Affairs and Northern Development Canada (AANDC)
- ☐ Environment Canada (EC)
- ☐ Natural Resources Canada (NRCan)
- ☐ Northern Projects Management Office (NPMO)
- ☐ 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)

26/02/2019
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://www.infosource.gc.ca

Canada

Canadian Navigable Waters Act Notice of Works Form Attachments for WFN Fish Farm Limited Partnership (WFN), Finfish Aquaculture

AQ 0814x (Whycocomagh Amendment)

Body of water details:

Characteristic	Value	Reference	Comments
Wind speed (km/hr) (Revised)	14.45 average, 98.2 max	Cape Breton Mesonet (Whycocomagh weather station)[1]	Derived from measurements taken from weather station in Whycocomagh Bay since November 2020.
Average wind speed (km/hr) (30m height) (Revised)	31.0	Canada.ca Wind Atlas[2]	Value derived from wind atlas for GPS coordinate at center of lease.
Wind speed class rating (10m height)	Low to Moderate	Keys et al., 2017. Digital Wind Exposure Map for NS. Forest Research Report FOR 2017-15	Wind speed class rated from "Very Low" to "Very High" based on estimated annual maximum wind speeds across Nova Scotia. Value/rating stated is for shoreline adjacent to proposed site.
Annual minimum tide (m)	The Bras D'Or Lake has very small lunar tidal fluctuations. Whycocomagh Bay, in particular, shows limited change. As extracted from Parker et al., 2007: "A 21-day record from the western end of Whycocomagh Basin indicated no detectable semidiurnal or diurnal tides (Dupont et al. 2003; Petrie 1999)." Results from an ADCP (Acoustic Doppler Current Profiler) deployed in the site region from October 2018 to December 2018 supports this observation with little measured change in depth. Local persons have observed an increasing tidal range in recent years, for example with exceptionally large tides of 0.5m observed in the fall of 2018 (Robin Stuart).		
Annual maximum tide (m)			
Depth of water at each corner of the site (m)	Corner 2: 7.4m Corner 3: 28m Corner 4: 6.3m Center Lease: 1: 23m, 2: 13.1m, 3: 12.0m, 4: 8.2m	Depths taken during baseline EMP sampling	

[1] https://capebretonweather.ca/archive.php?id=001D0A80898D Accessed April 1, 2024
[2] http://www.windatlas.ca/rose-en.php?field=E1&height=30&season=ANU&no=6&lat=46.94924444&lon=-61.12801389 Accessed April 13, 2024

Brief project description (Number of cages revised, navigational corridor removed)

WFN Fish Farm Limited Partnership (WFN) is requesting a boundary amendment to create marine finfish aquaculture Site AQ 0814x which will allow the replacement of three leases with a single lease of larger total area. The three current sites are #0814 (1.39 ha), #0845 (1.57 ha) and #0600 (1.39 ha). They are all licensed for the marine cage cultivation of Atlantic salmon and rainbow trout. The requested amended site overlays all of these sites and is approximately 65 hectares in size. It is located in Whycocomagh Bay, south of the village of Whycocomagh and Indian Island. This site will house 10 polar circle sea cages which will grow rainbow trout. The cages will be moored in place with steel anchors and concrete blocks. The cage frames are made of HDPE and are self-floating. The mooring systems will permanently remain in place after installation; but the sea cages will be moved into the existing wharves on site each winter, before the area ices over and replaced each spring, after the ice leaves.

Method of construction (No change)

Mooring deployment: Moorings are placed on barge. Barge is motored out to the pre-determined waypoint and the mooring is dropped.

Grid system installation: The end moorings and center lines are dropped first. The center line is pulled tight before the cross grids are installed. The grid and scope lines are assembled prior to installation so that all connections and intersections of the lines can be properly secured. The scope of the lines is targeted to be 3:1 at high tide. The types of moorings to be used at each point on the grid are shown on the top view diagram supplied with the application.

Each cross line is marked with an 18” inflatable yellow buoy. These buoys can stay out all winter and have less of a tendency to be destroyed or move with the ice. Other types of buoys get moved or sheared by winter ice. Although the cages are moved in the winter, the line/grid marker buoys are left year-round.

Cage installation: Cages are assembled on shore, inspected, then pulled into the water then towed to their location where bridles are attached to the cage collars as shown in the diagram.

Anticipated impacts (No change)

Site location considerations and mitigation practices have been described in a Development Plan and submitted to NSDFA. These will be reviewed according to the Aquaculture Licencing and Leasing regulations for Nova Scotia. The plan recognizes potential impacts and describes practices intended to reduce impacts to other users of the local waters, including the fishery, wildlife (including Atlantic salmon), local residents, and seasonal visitors. Ongoing environmental monitoring in terms of benthic impacts is part of this plan.

AQ 0814x Whycocomagh Amendment Gear on Site, Top View (Revised)



Google Earth image with lease boundaries shown in orange. Intended grid placement shown as white imposed grid image. (Revised)

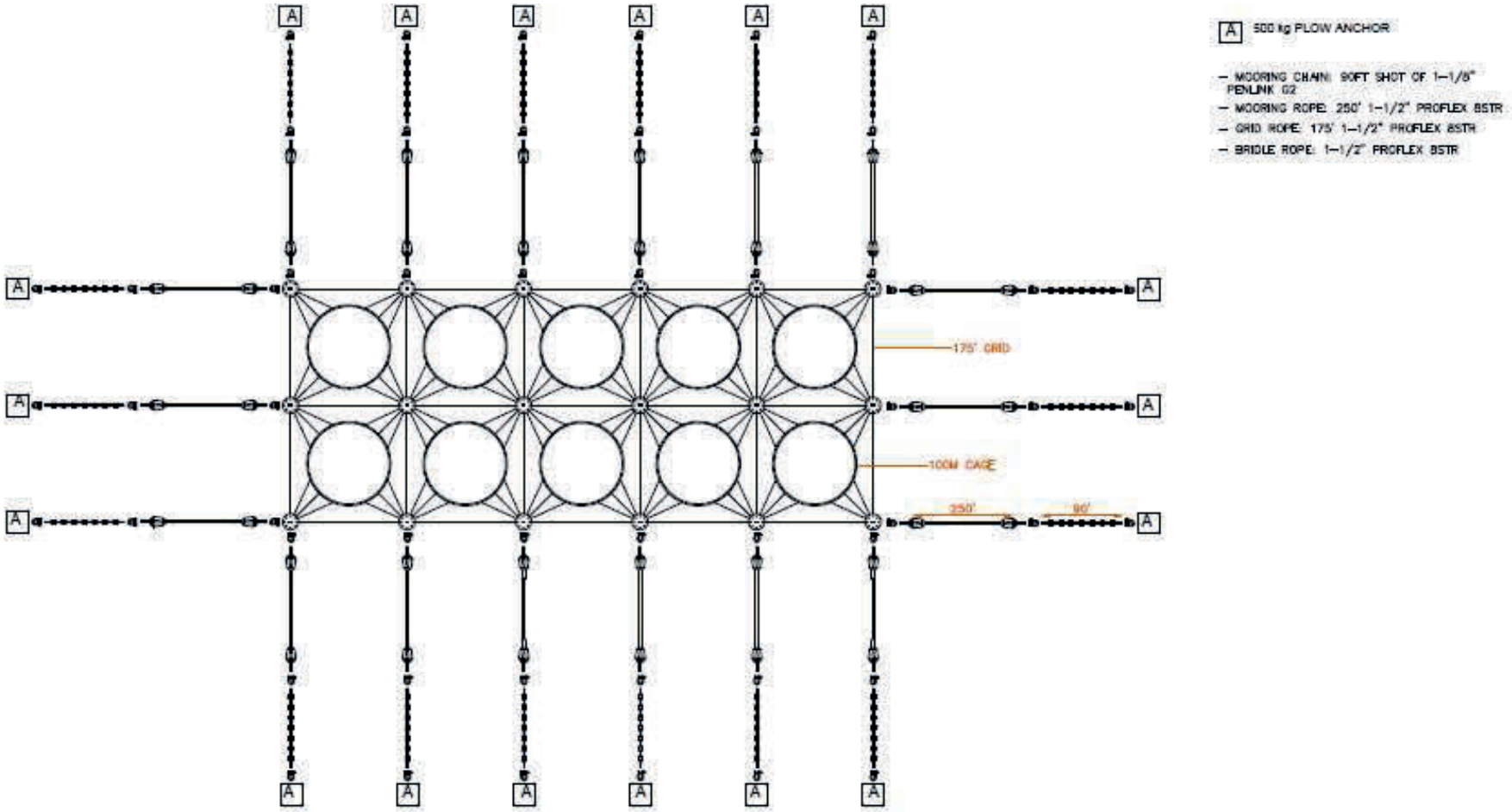
Lease corners, as applied for (south east corner revised):

45°57'15.880"N	61° 7'29.091"W
45°57’12.960”	61°7’21.504”W
45°56’58.344”	61°7’13.080”W
45°56'36.920"N	61° 8'2.060"W
45°56'49.272"N	61° 8'13.200"W
45°56'50.99"N	61° 8'9.020"W
45°56'51.980"N	61° 8'8.900"W
45°56'58.610"N	61° 7'55.830"W
45°57’5.328”N	61°7’38.064”W
45°57’8.352”N	61°7’32.088”W

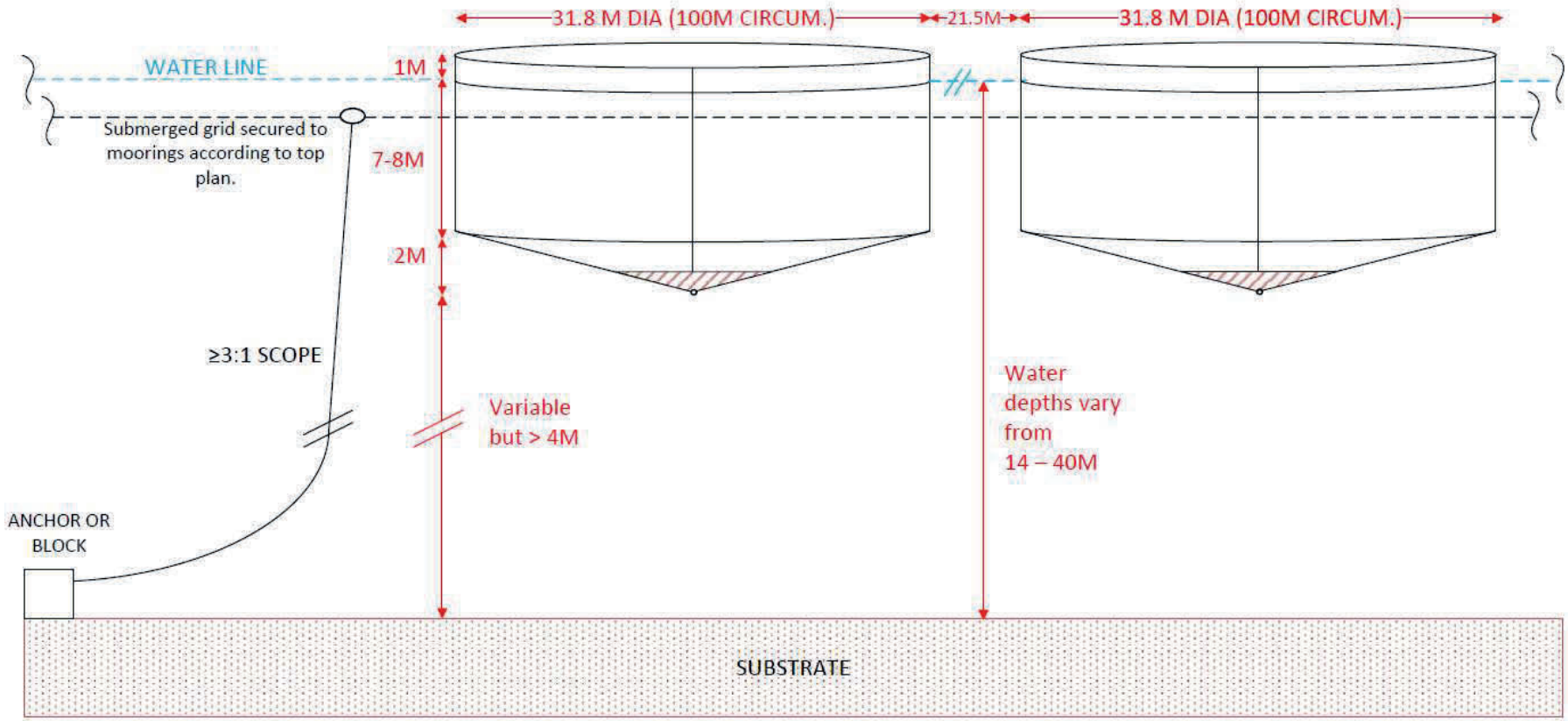
Intended production grid coordinates corners (centers of corner grid plates)
GRID 1:

45°56'52.04"N	61° 7'43.55"W
45°56'49.61"N	61° 7'41.23"W
45°56'45.46"N	61° 7'50.40"W
45°56'47.92"N	61° 7'52.69"W

AQ 0814x Whycocomagh Amendment, Gear on Site, Top View (Revised)



AQ 0814x Whycocomagh Amendment, Gear on Site, Side View (Revised)



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.

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)

- ☐ Completed and signed "Notice of Works Form" with all mandatory fields completed
- ☐ Map showing location of project [1]
- ☐ Top/Plan drawing with dimensions [1]
- ☐ Side/Profile drawing with dimensions [1]

[1] If you are submitting a Notice of Works in paper form, please provide two (2) copies of each supporting document. If the Notice of Works is submitted electronically, please ensure to attach all relevant documents (individually scanned).

Recommended Information
(may expedite your review)

- ☐ Body of water details
- ☐ Land use/Ownership information
- ☐ Body of water use information
- ☐ Impacts, obstructions and mitigation plans
- ☐ Any environmental review information
- ☐ 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 in paper form, owners should note:

- All plans and drawings must be legible when printed on 11" x 17" paper
- Your completed Notice to the Minister should be sent to the appropriate regional office as outlined below

TRANSPORT CANADA NAVIGATION PROTECTION PROGRAM REGIONAL OFFICES

Pacific Region Office
820-800 Burrard Street
Vancouver BC V6Z 2J8
Telephone: 604-775-8867
Email: NPPPAC-PPNPAC@tc.gc.ca

Prairie and Northern Region Office
Canada Place 1100-9700 Jasper Ave
Edmonton AB T5J 4E6
Telephone: 780-495-8215
Email: NPPPNR-PPNRPN@tc.gc.ca

Ontario Region Office
100 South Front Street, 1st Floor
Sarnia ON N7T 2M4
Telephone: 519-383-1863
Email: NPPONT-PPNONT@tc.gc.ca

Headquarters Office
(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 Office
401-1550 d'Estimauville Avenue, 5th Floor
Quebec QC G1J 0C8
Telephone: 877-646-6420
Email: PPNQUE-NPPQUE@tc.gc.ca

Atlantic Region Office
95 Foundry Street, 6th Floor
P.O. Box 42
Moncton NB E1C 8K6
Telephone: 506-851-3113
Email: NPPATL-PPNATL@tc.gc.ca

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)
Whycocomagh Bay, Bras D'Or Lake

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)
Waycobah First Nation WFN Fish Farm Limited Partnership

Contact name (Required)
Robin Stuart Wade Skinner

Mailing address (Required)
[redacted]
[redacted], Whycocomagh

City/Town (Required)	Province/Territory (Required)	Postal code (Required)
Whycocomagh	NS	B0E3M0

Primary telephone number (999-999-9999) (Required)	Other telephone number (999-999-9999)	E-mail
902-295-0782 [redacted]	902-756-2538	robinstuart@mysympatico.ca

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

Company name	Contact name
Sustain Aqua	Melissa Rommens

Mailing address
[redacted]

City/Town	Province/Territory	Postal code
Emyvale	PE	C0A 1Y0

Primary telephone number (999-999-9999) (Required)	Other telephone number (999-999-9999)	E-mail
[redacted]	[redacted]	[redacted]

WORK SITE INFORMATION

Nearest municipality/county/district (Required)
Inverness

Province/Territory (Required)
NS

Site location such as lot, concession, section, township, range, meridian, 911 address, property identification, etc. (Required)
Aberdeen, NS (A nearby civic address is [redacted], NS)

Site position Latitude North (Required)
Degrees 45 Minutes 48 X 58 Seconds 41.78

Site position Longitude West (Required)
Degrees -61 Minutes 01 Seconds 24.67

Hydro chart number:

Topo map number:

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

See attached

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

n/a

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

Shore line is a rural area. Site location was chosen partly because of limited use of shoreline.

BODY OF WATER USE INFORMATION

Navigation types (check all that apply)

☑ Commercial ☑ Recreational

Maximum vessel size

Length XX 50' Width XXX 30' Draft XX 10'

Traffic direction

○ One-way ◉ Two-way

Manoeuvrability (check all that apply)

☐ Poor ☑ Good ☐ Excellent

Day/Night

◉ Day ○ Night ○ Both

Volume

◉ Low ○ Medium ○ High

Navigation season(s) (check all that apply)

☐ Winter ☑ Spring ☑ Summer ☑ Fall

Other uses such as cottagers, special events, fishing, etc.

Maximum vessel indicated above is a barge to be used for Waycobah's finfish operations. Other users would be recreational small sailing craft and small fishing boats.

PROJECT INFORMATION

Name of work such as bridge, dam, marina, etc. (Required)

Finfish aquaculture

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)

See attached

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

See attached

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

See attached

Expected start date (dd-mm-yyyy) (Required)	Expected completion date (dd-mm-yyyy) (Required)
01-05-2019	Ongoing

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.

_____ _____

Signature (Required) Date (dd-mm-yyyy) (Required)

_____

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://www.infosource.gc.ca

Canada

Canadian Navigable Waters Act Notice of Works Form Attachments for WFN Fish Farm Limited Partnership (WFN), Finfish Aquaculture AQ1430 (North Aberdeen)

Body of water details:

Characteristic	Value	Reference	Comments
Wind speed (km/hr) (Revised)	14.45 average, 98.2 max	Cape Breton Mesonet (Whycocomagh weather station)[1]	Derived from measurements taken from weather station in Whycocomagh Bay since November 2020.
Average wind speed (km/hr) (30m height) (Revised)	20.5	Canada.ca Wind Atlas[2]	Value derived from wind atlas for GPS coordinate at center of lease.
Wind speed class rating (10m height)	Low to Moderate	Keys et al., 2017. Digital Wind Exposure Map for NS. Forest Research Report FOR 2017-15	Wind speed class rated from "Very Low" to "Very High" based on estimated annual maximum wind speeds across Nova Scotia. Value/rating stated is for shoreline adjacent to proposed site.
Maximum wave height (m)[3]	1.08	Raw data obtained from David Cook (NSDFA) from ACDP deployment.	Value stated is the greatest Hmax measured with the ACDP during October 31, 2018 to December 11, 2018 deployment.
Annual minimum tide (m)	The Bras D'Or Lake has very small lunar tidal fluctuations. Whycocomagh Bay, in particular, shows limited change. As extracted from Parker et al., 2007: "A 21-day record from the western end of Whycocomagh Basin indicated no detectable semidiurnal or diurnal tides (Dupont et al. 2003; Petrie 1999)." Results from an ADCP (Acoustic Doppler Current Profiler) deployed in the site region from October 2018 to December 2018 supports this observation with little measured change in depth. Local persons have observed an increasing tidal range in recent years, for example with exceptionally large tides of 0.5m observed in the fall of 2018 (Robin Stuart).		
Annual maximum tide (m)			
Depth of water at each corner of the site (m)	Corner 1: 14.6m Corner 2: 26.6m Corner 3: 26.6m Corner 4: 26.4m Center Lease: 26.4m	Depths taken during benthic sampling	

[1] https://capebretonweather.ca/archive.php?id=001D0A80898D Accessed April 1, 2024

[2] http://www.windatlas.ca/rose-en.php?field=EU&height=30&season=ANU&no=6&lakes=1&lat=45.978069&lon=-61.024739 Accessed April 1, 2024

[3] The oceanographic characteristics of this area were collected over the autumn months and early winter months of 2018 (October 31, 2018 to December 11, 2018) via deployment of an ADCP (Acoustic Doppler Current Profiler) within the proposed site's boundaries. This monitored a number of variables associated with currents and waves at multiple levels in the water column.

Brief project description (Number of cages revised)

WFN is requesting a new marine finfish licence/lease in the Bras D'Or Lake in Inverness County, NS. This proposed site is located on the northeast side of Whycocomagh Bay in the Bras D'Or Lake. This will be a seasonal site and will house 10 polar circle sea cages which will grow Rainbow trout from April to December. The cages will be moored in place with steel anchors and concrete blocks. The cage frames are made of HDPE and are self-floating. The mooring system will permanently remain in place after installation; but the sea cages will be removed each winter, before the area ices over and replaced each spring, after the ice leaves.

Method of construction (No change)

Mooring deployment: Moorings are placed on barge. Barge is motored out to the pre-determined waypoint and the mooring is dropped.

Grid system installation: The end moorings and center lines are dropped first. The center line is pulled tight before the cross grids are installed. The grid and scope lines are assembled prior to installation so that all connections and intersections of the lines can be properly secured. The scope of the lines is targeted to be 3:1 at high tide. The types of moorings to be used at each point on the grid are shown on the top view diagram supplied with the application.

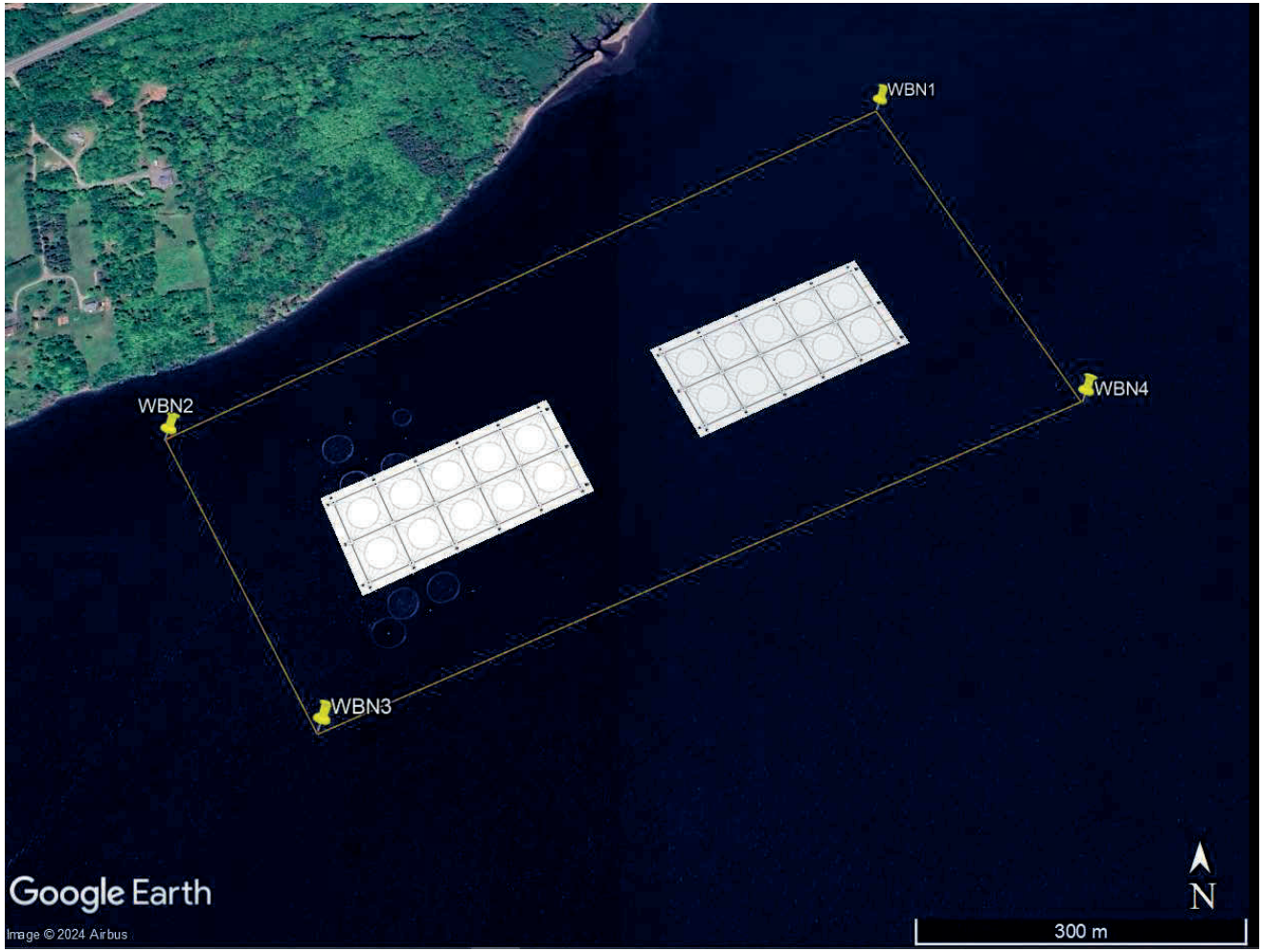
Each cross line is marked with an 18" inflatable yellow buoy. These buoys can stay out all winter and have less of a tendency to be destroyed or move with the ice. Other types of buoys get moved or sheared by winter ice. Although the cages are moved in the winter, the line/grid marker buoys are left year-round.

Cage installation: Cages are assembled on shore, inspected, then pulled into the water then towed to their location where bridles are attached to the cage collars as shown in the diagram. Cages will be removed during the winter (prior to ice formation), and replaced each spring.

Anticipated impacts (No change)

Site location considerations and mitigation practices have been described in a Development Plan and submitted to NSDFA. These will be reviewed according to the Aquaculture Licencing and Leasing regulations for Nova Scotia. The plan recognizes potential impacts and describes practices intended to reduce impacts to other users of the local waters, including the fishery, wildlife (including Atlantic salmon), local residents, and seasonal visitors. Ongoing environmental monitoring in terms of benthic impacts is part of this plan.

AQ 1430 North Aberdeen Gear on Site, Top View



Google Earth image with lease boundaries shown in orange. Intended grid placement shown by white imposed grid images. (Revised)

Lease corners as applied for (No change):

45°58'54.40"N 61° 1'14.92"W
45°58'41.78"N 61° 1'6.14"W
45°58'30.40"N 61° 1'42.65"W
45°58'40.40"N 61° 1'51.51"W

Intended grid coordinates corners (Revised) (centers of corner grid plates)

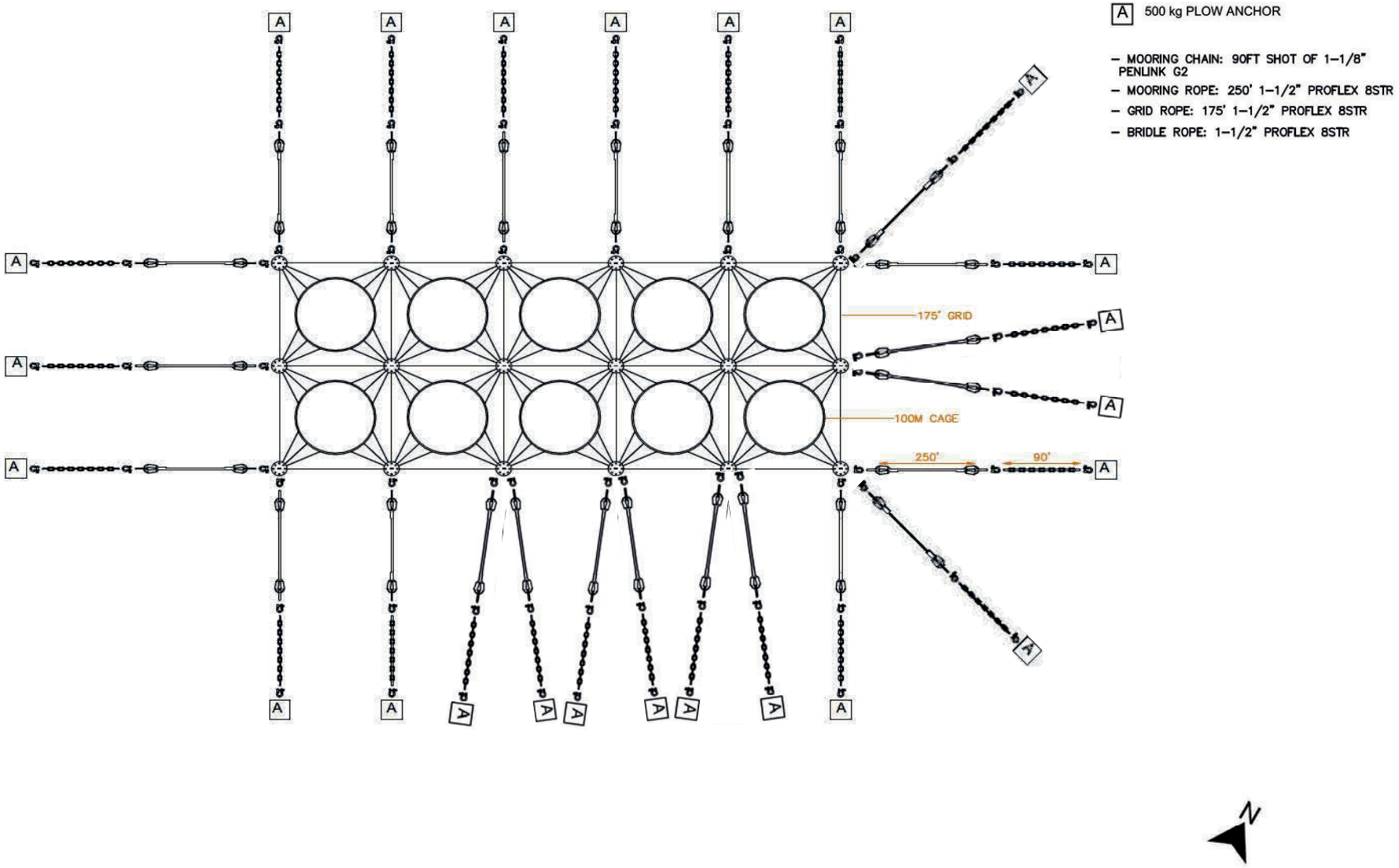
GRID 1:

45°58’41.50"N 61° 1’33.05"W
45°58’38.71"N 61° 1’31.06"W
45°58’35.32"N 61° 1’40.93"W
45°58’38.15"N 61° 1’42.93"W

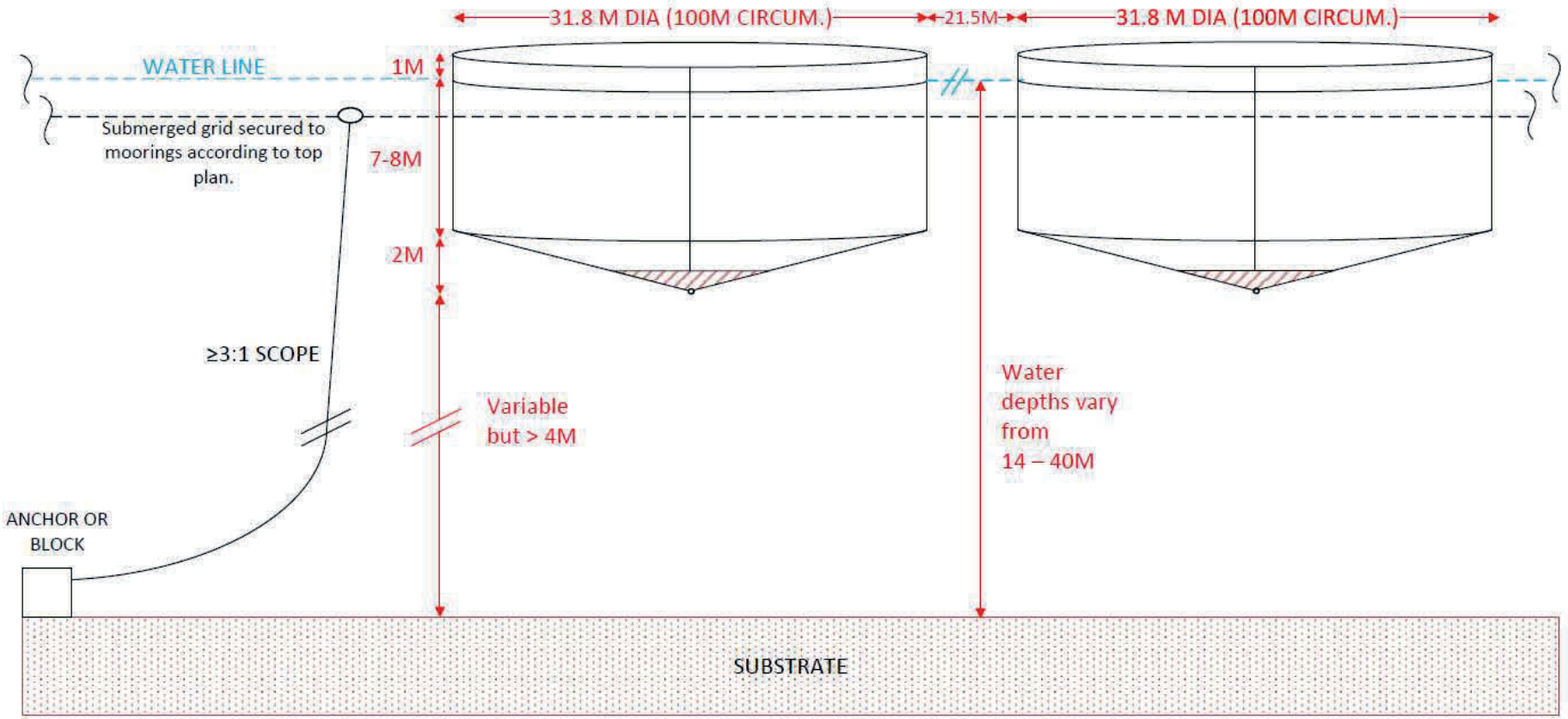
GRID 2:

45°58’47.18"N 61° 1’17.09"W
45°58’44.35"N 61° 1’15.08"W
45°58’40.95"N 61° 1’24.97"W
45°58’43.78"N 61° 1’26.97"W

AQ 1430 North Aberdeen Gear on Site, Top View (Revised)



AQ 1430 North Aberdeen Gear on Site, Side View (Revised)



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.

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)

- ☐ Completed and signed "Notice of Works Form" with all mandatory fields completed
- ☐ Map showing location of project [1]
- ☐ Top/Plan drawing with dimensions [1]
- ☐ Side/Profile drawing with dimensions [1]

[1] If you are submitting a Notice of Works in paper form, please provide two (2) copies of each supporting document. If the Notice of Works is submitted electronically, please ensure to attach all relevant documents (individually scanned).

Recommended Information
(may expedite your review)

- ☐ Body of water details
- ☐ Land use/Ownership information
- ☐ Body of water use information
- ☐ Impacts, obstructions and mitigation plans
- ☐ Any environmental review information
- ☐ 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 in paper form, owners should note:

- All plans and drawings must be legible when printed on 11" x 17" paper
- Your completed Notice to the Minister should be sent to the appropriate regional office as outlined below

TRANSPORT CANADA NAVIGATION PROTECTION PROGRAM REGIONAL OFFICES

Pacific Region Office
820-800 Burrard Street
Vancouver BC V6Z 2J8
Telephone: 604-775-8867
Email: NPPPAC-PPNPAC@tc.gc.ca

Prairie and Northern Region Office
Canada Place 1100-9700 Jasper Ave
Edmonton AB T5J 4E6
Telephone: 780-495-8215
Email: NPPPNR-PPNRPN@tc.gc.ca

Ontario Region Office
100 South Front Street, 1st Floor
Sarnia ON N7T 2M4
Telephone: 519-383-1863
Email: NPPONT-PPNONT@tc.gc.ca

Headquarters Office
(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 Office
401-1550 d'Estimauville Avenue, 5th Floor
Quebec QC G1J 0C8
Telephone: 877-646-6420
Email: PPNQUE-NPPQUE@tc.gc.ca

Atlantic Region Office
95 Foundry Street, 6th Floor
P.O. Box 42
Moncton NB E1C 8K6
Telephone: 506-851-3113
Email: NPPATL-PPNATL@tc.gc.ca

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)
Whycocomagh Bay, Bras D'Or Lake

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)
Waycobah First Nation WFN Fish Farm Limited Partnership

Contact name (Required)
Robin Stuback Wade Skinner

Mailing address (Required)
[redacted]
[redacted], Whycocomagh

City/Town (Required)
Whycocomagh

Province/Territory (Required)
NS

Postal code (Required)
B0E3M0

Primary telephone number (999-999-9999) (Required)
902-295-0752 [redacted]

Other telephone number (999-999-9999)
902-756-2338

E-mail
wadeskinner@waycobah.ca

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

Company name
Sustain Aqua

Contact name
Melissa Rommens

Mailing address
[redacted]

City/Town
Emyvale

Province/Territory
PE

Postal code
C0A 1Y0

Primary telephone number (999-999-9999) (Required)
[redacted]

Other telephone number (999-999-9999)
[redacted]

E-mail
[redacted]

WORK SITE INFORMATION

Nearest municipality/county/district (Required)
Inverness

Province/Territory (Required)
NS

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

Site position Latitude North (Required)
Degrees 45 Minutes 57 Seconds 38.14

Site position Longitude West (Required)
Degrees -61 Minutes 01 Seconds 38.31

Hydro chart number:

Topo map number:

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

See attached

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

n/a

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

Shore line is a rural area. Site location was chosen partly because of limited use of shoreline.

BODY OF WATER USE INFORMATION

Navigation types (check all that apply)

☑ Commercial ☑ Recreational

Maximum vessel size

Length XX 50' Width XXX 30' Draft XX 10'

Traffic direction

○ One-way ◉ Two-way

Manoeuvrability (check all that apply)

☐ Poor ☑ Good ☐ Excellent

Day/Night

◉ Day ○ Night ○ Both

Volume

◉ Low ○ Medium ○ High

Navigation season(s) (check all that apply)

☐ Winter ☑ Spring ☑ Summer ☑ Fall

Other uses such as cottagers, special events, fishing, etc.

Maximum vessel indicated above is a barge to be used for Waycobah's finfish operations. Other users would be recreational small sailing craft and small fishing boats.

PROJECT INFORMATION

Name of work such as bridge, dam, marina, etc. (Required)

Finfish aquaculture

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)

See attached

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

See attached

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

See attached

Expected start date (dd-mm-yyyy) (Required)	Expected completion date (dd-mm-yyyy) (Required)
01-05-2019	Ongoing

Canada

ENVIRONMENTAL REVIEW INFORMATION

Is the work located on Federal lands?	Is the project a designated project under the *Regulations Designating Physical Activities* under the *Canadian Environmental Assessment Act, 2012*?
◯ Yes ◯ No ◯ Unknown	◯ Yes ◯ No ◯ Unknown
Is the project subject to Northern Environmental Assessment (EA) Regime(s)?	**If yes, identify the northern EA regime(s) that apply**
◯ Yes ◯ No ◯ Unknown	☐ 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.

_____ _____
Signature (Required) Date (dd-mm-yyyy) (Required)

_____
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://www.infosource.gc.ca

Canada

Canadian Navigable Waters Act Notice of Works Form Attachments for WFN Fish Farm Limited Partnership (WFN), Finfish Aquaculture AQ1431 (South Aberdeen)

Body of water details (Changes indicated):

Characteristic	Value	Reference	Comments
Wind speed (km/hr) (Revised)	14.45 average, 98.2 max	Cape Breton Mesonet (Whycocomagh weather station)[1]	Derived from measurements taken from weather station in Whycocomagh Bay since November 2020.
Average wind speed (km/hr) (30m height) (Revised)	20.6	Canada.ca Wind Atlas[2]	Value derived from wind atlas for GPS coordinate at center of lease.
Wind speed class rating (10m height)	Moderate to High	Keys et al., 2017. Digital Wind Exposure Map for NS. Forest Research Report FOR 2017-15	Wind speed class rated from "Very Low" to "Very High" based on estimated annual maximum wind speeds across Nova Scotia. Value/rating stated is for shoreline adjacent to proposed site.
Maximum wave height (m)[3]	1.08	Raw data obtained from David Cook (NSDFA) from ACDP deployment.	Value stated is the greatest Hmax measured with the ACDP during October 31, 2018 to December 11, 2018 deployment at a site across the Bay but within 2 km of this site.
Annual minimum tide (m)	The Bras D'Or Lake has very small lunar tidal fluctuations. Whycocomagh Bay, in particular, shows limited change. As extracted from Parker et al., 2007: "A 21-day record from the western end of Whycocomagh Basin indicated no detectable semidiurnal or diurnal tides (Dupont et al. 2003; Petrie 1999)." Results from an ADCP (Acoustic Doppler Current Profiler) deployed in the site region from October 2018 to December 2018 supports this observation with little measured change in depth. Local persons have observed an increasing tidal range in recent years, for example with exceptionally large tides of 0.5m observed in the fall of 2018 (Robin Stuart).		
Annual maximum tide (m)			
Depth of water at each corner of the site (m)	Corner 1: 25.4m Corner 2: 26.1m Corner 3: 13.0m Corner 4: 14.0m Center Lease: 27.9m	Depths taken during baseline EMP sampling	

[1] https://capebretonweather.ca/archive.php?id=001D0A80898D Accessed April 1, 2024

[2] http://www.windatlas.ca/rose-en.php?field=E1&height=30&season=ANU&no=6&lat=45.960595&lon=-61.027308 Accessed April 1, 2024

[3] The wave characteristics were collected off site but within 2 km of this proposed site. They were collected over the autumn months and early winter months of 2018 (October 31, 2018 to December 11, 2018) via deployment of an ADCP (Acoustic Doppler Current Profiler). This monitored a number of variables associated waves at multiple levels in the water column. Although only summaries are depicted within this plan, all of the data derived from this monitoring will be used in the engineering of the cage and infrastructure for this site.

Brief project description (Number of cages revised)

WFN is requesting a new marine finfish licence/lease in the Bras D'Or Lake in Inverness County, NS. This proposed site is located on the southeast side of Whycocomagh Bay in the Bras D'Or Lake. This will be a seasonal site and will house 10 polar circle sea cages which will grow Rainbow trout from April to December. The cages will be moored in place with steel anchors and concrete blocks. The cage frames are made of HDPE and are self-floating. The mooring system will permanently remain in place after installation; but the sea cages will be removed each winter, before the area ices over and replaced each spring, after the ice leaves.

Method of construction (No change)

Mooring deployment: Moorings are placed on barge. Barge is motored out to the pre-determined waypoint and the mooring is dropped.

Grid system installation: The end moorings and center lines are dropped first. The center line is pulled tight before the cross grids are installed. The grid and scope lines are assembled prior to installation so that all connections and intersections of the lines can be properly secured. The scope of the lines is targeted to be 3:1 at high tide. The types of moorings to be used at each point on the grid are shown on the top view diagram supplied with the application.

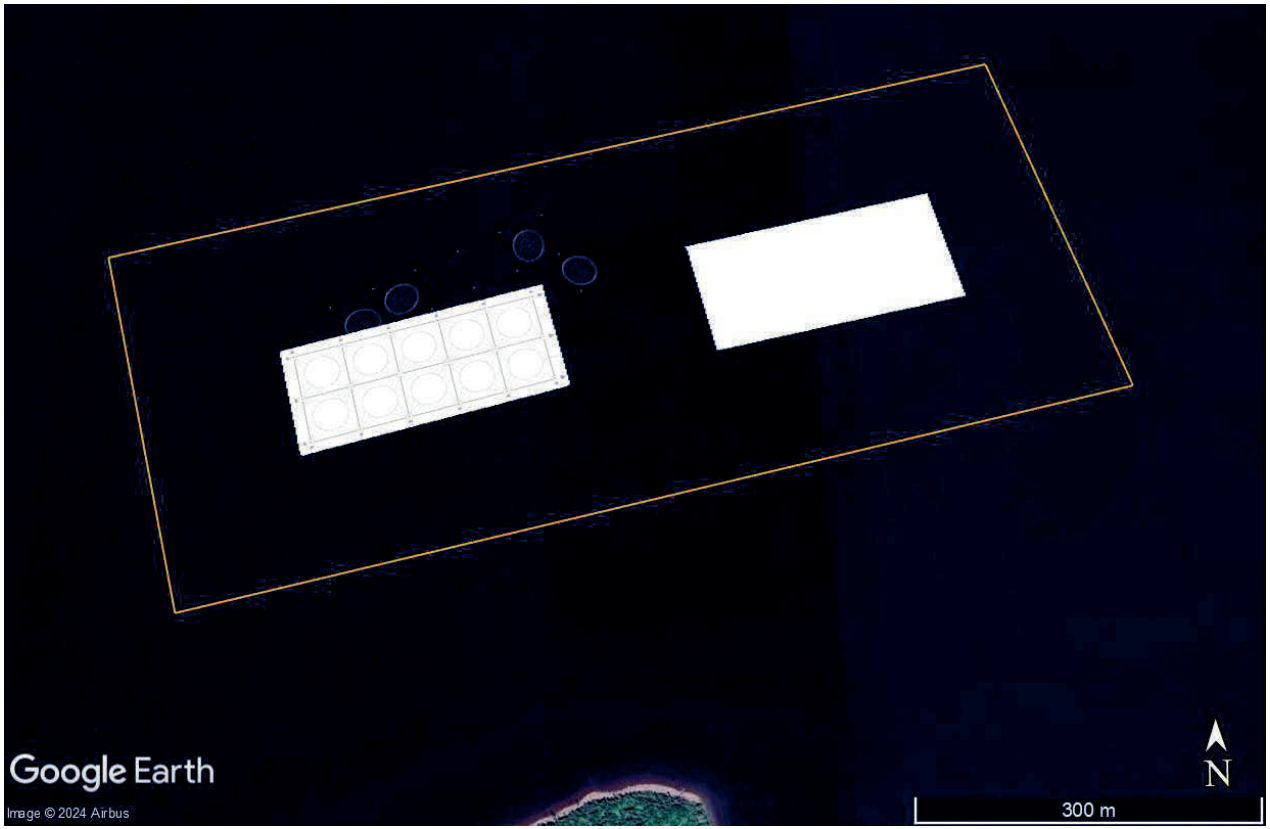
Each cross line is marked with an 18" inflatable yellow buoy. These buoys can stay out all winter and have less of a tendency to be destroyed or move with the ice. Other types of buoys get moved or sheared by winter ice. Although the cages are moved in the winter, the line/grid marker buoys are left year-round.

Cage installation: Cages are assembled on shore, inspected, then pulled into the water then towed to their location where bridles are attached to the cage collars as shown in the diagram. Cages will be removed during the winter (prior to ice formation), and replaced each spring.

Anticipated impacts (No change)

Site location considerations and mitigation practices have been described in a Development Plan and submitted to NSDFA. These will be reviewed according to the Aquaculture Licencing and Leasing regulations for Nova Scotia. The plan recognizes potential impacts and describes practices intended to reduce impacts to other users of the local waters, including the fishery, wildlife (including Atlantic salmon), local residents, and seasonal visitors. Ongoing environmental monitoring in terms of benthic impacts is part of this plan.

AQ 1431 South Aberdeen Gear on Site, Top View (Revised)



Google Earth image with lease boundaries shown in orange. Intended grid placement shown by white imposed grid images. (Revised)

Lease corners, as applied for (No change):

45°57'45.90"N	61° 1'19.05"W
45°57'33.90"N	61° 1'14.86"W
45°57'27.70"N	61° 1'56.71"W
45°57'39.10"N	61° 2'1.01"W

Intended grid coordinates corners (Revised) (centers of corner grid plates)

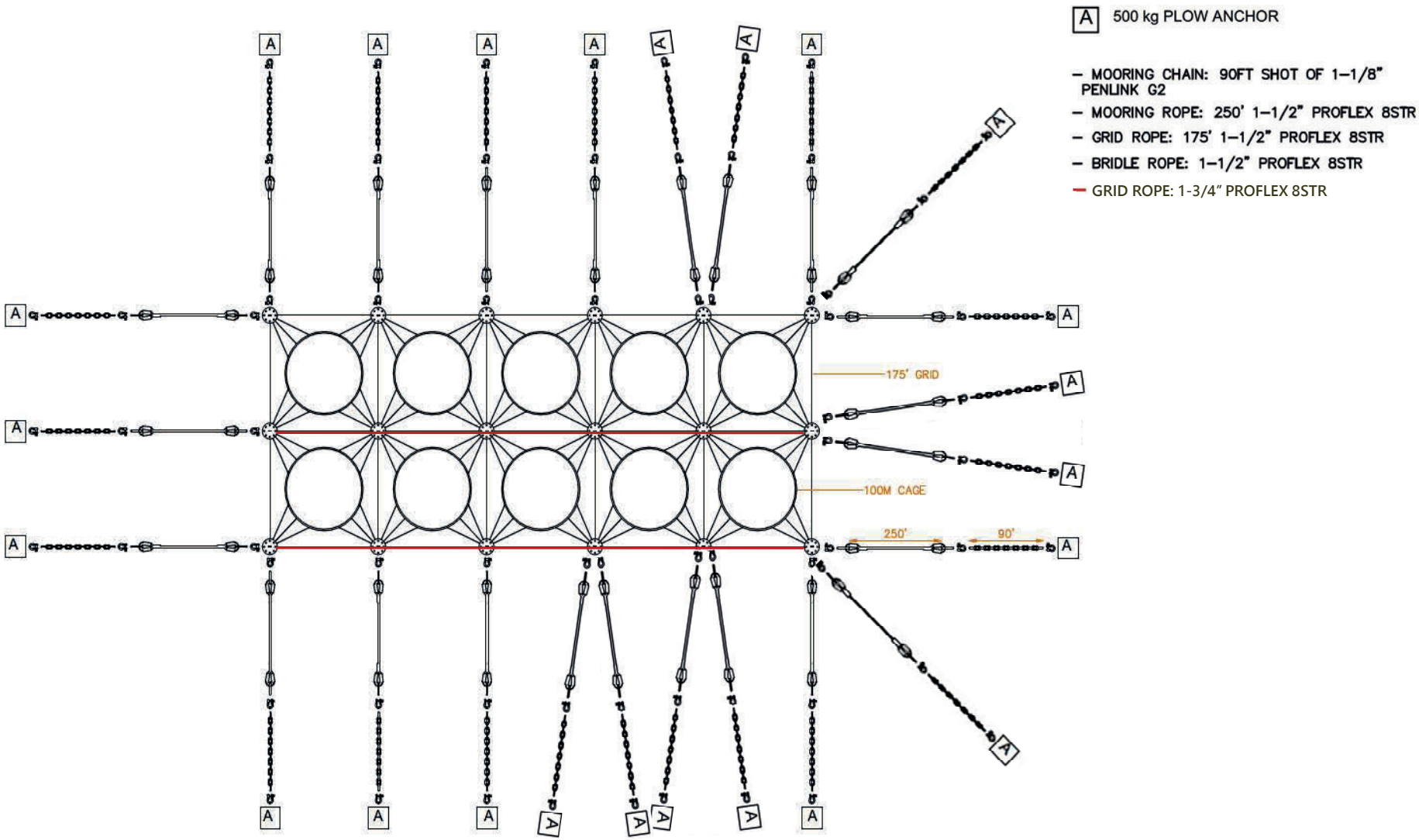
GRID 1:

45°57'35.38"N	61° 1'52.23"W
45°57'37.29"N	61° 1'41.45"W
45°57'34.48"N	61° 1'40.38"W
45°57'32.54"N	61° 1'51.18"W

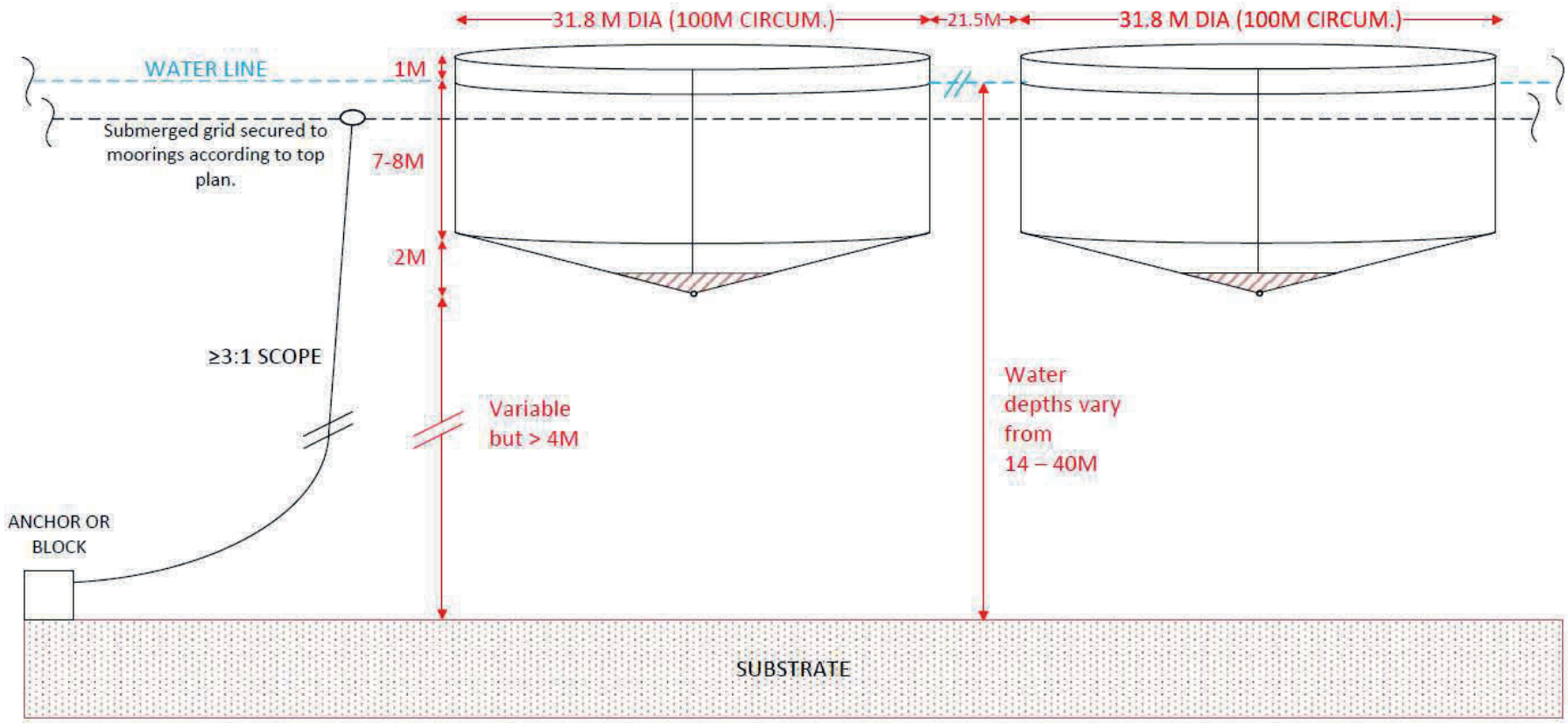
GRID 2:

45°57'38.54"N	61° 1'33.63"W
45°57'40.43"N	61° 1'22.99"W
45°57'37.60"N	61° 1'21.95"W
45°57'35.71"N	61° 1'32.57"W

AQ 1431 South Aberdeen Gear on Site, Top View (Revised)



AQ 1431 South Aberdeen Gear on Site, Side View (Revised)



ADDENDUM 2 – ADDITIONAL INFORMATION

A2.1 Baseline Monitoring Packages 2018

Note: Baseline environmental monitoring data was collected for each application to support the Development Plans. The proponent submitted a baseline package in 2015, which did not meet quality assurance and quality control of the Department. Baseline was resubmitted in 2018, and baseline data and videos have been provided to the NSARB on an external hard drive. The files submitted by WFN in the 2018 baseline package are described below:

AQ#0814x

2018 Baseline Survey Amend 0814 (Super Lease) combining Leases 0600_0814_0845

- *Analysis* – Baseline data results
- *Cooler temps* – Temperatures of sediment samples
- *Pictures_Labeled* – Photographs of grab samples collected at center, corner, and reference sites
- *Station Information* – Sampling coordinates
- *Tide Information* – Details on tides on day of sampling
- *Videos* – Baseline videos
- *0814 A3_Video and sediment sampler log sheet* – Records for baseline video collection and sediment sampling
- *General* – Sampling station coordinates and maps with depths
- *Whycocomagh grain size summary all sites* – Summary of grain sizes for sediment collected

AQ#1430

2018 Baseline Survey_Northside Aberdeen_WBN

- *Analysis* – Baseline data results
- *Cooler hobo temps* – Temperatures of sediment samples
- *Video* – Baseline videos
- *WBN Pics* – Photographs of grab samples collected at center, corner, and reference sites
- *WBN A3_Video and sediment sampler log sheet* – Records for baseline video collection and sediment sampling
- *WBN sampling Stations* – Map of baseline sampling stations
- *WBN Sampling summary* – Summary of baseline sampling
- *General* – Sampling station coordinates and maps with depths
- *Whycocomagh grain size summary all sites* – Summary of grain sizes for sediment collected

AQ#1431

2018 Baseline Survey_Southside Aberdeen_WBS

- *Analysis* – Baseline data results
- *Cooler hobo temps* – Temperatures of sediment samples
- *WBS Pics* – Photographs of grab samples collected at center, corner, and reference sites
- *WBS Video* – Baseline videos
- *Tide info Oct 23* – Details on tides on day of sampling
- *WBS A3_Video and sediment sampler log sheet* – Records for baseline video collection and sediment sampling
- *WBS Sampling* summary – Summary of baseline sampling
- *WBS Sampling summary revised May 10 2021* – Revised summary of baseline sampling
- *General* – Sampling station coordinates and maps with depths
- *Whycocomagh grain size summary all sites* – Summary of grain sizes for sediment collected

3.0 SCOPING REPORT

We'koqma'q First Nation Report on Public Engagement during Scoping for Finfish Aquaculture Development in Whycocomagh Bay

Introduction

We'koqma'q First Nation intends to expand its trout aquaculture operations in Whycocomagh Bay. This expansion will increase its trout production capacity four-fold to 1,000,000 fish per year. We'koqma'q has been successfully conducting rainbow trout aquaculture in this region for seven years, first as a contract grower, and for the past four years as the business owner.

In order to allow an operational expansion to proceed while availing enough area to increase fallowing for fish welfare and environmental reasons, We'koqma'q First Nation is requesting the following changes to existing sites and additions of new sites:

- Adjudicative amendment to site # 0814 which will amalgamate three sites (0600, 0814, 0845) and enlarge the total licenced/leased area to 75 hectares.
- Addition of a new 34 hectare marine site "South Aberdeen" on the southeast side of Whycocomagh Bay, near Aberdeen (within Option to Lease Area AQ 1413).
- Addition of a new 34 hectare marine site "North Aberdeen" on the northeast side of Whycocomagh Bay, near Aberdeen (within Option to Lease Area AQ 1413).
- Assignment of licence/lease # 0193 (Dena's Pond) from St. Peters Fish Hatchery to We'koqma'q First Nation;
- Possible licence request on a privately leased area. (Not a current priority.)
- Assignment of licence/lease #'s 0716, 0745, 0778 and 0994 in the future. (Not a current priority.)

Several community meetings and other outreach activities have occurred to inform local and seasonal residents of the Whycocomagh Bay area about We'koqma'q's plans. This report summarizes these activities and the resultant findings to provide the Report on Public Engagement during Scoping, as required for the above aquaculture leasing and licensing requests.[1] Ongoing engagement with the community continues and will occur as We'koqma'q operates the farm.

[1] Additional scoping in the form of the collection of environmental and oceanographic data also occurred in the areas where site requests have been made. This information is not included in this report but is detailed within the development plans submitted for the individual sites.

Activities

Mandatory public meeting

The public meeting mandated for the development activities occurred at We'koqma'q First Nation's Fisheries building on August 15, 2018, 3:30pm to 7:00pm. The advertisement notifying the public of the potential development was published in the Oran on July 18, 2018. The page featuring this notice is attached as Appendix A. A posting in the Royal Gazette occurred in Volume 227, No.9 (July 18, 2018) on page 1093. This posting is attached as Appendix B. An 8" X 11" notice, attached as Appendix C, was posted at the following locations in Whycocomagh: Charlene's Restaurant, Co-Op grocery store, Rod's One Stop Irving and the We'koqma'q Band Office.

Robin Stuart (Manager of Aquaculture Operations for We'koqma'q) and Winston Patles (Finfish Aquaculture Manager) attended on behalf of We'koqma'q First Nation. Ken Donnelly and Sarah Warford were present on behalf of the Aquaculture Association of Nova Scotia. On behalf of the public, the following persons attended the meeting:

- John Silliboy;
- Joe Googoo;
- Anne Farries (on behalf of the local paper – the Oran); and
- a fourth member of the public whose name was not recorded.

This meeting resulted in an article in the local newspaper the Oran. The article is attached as Appendix D.

Communication with Little Narrows Cemetery Committee

A wharf at Little Narrows was being considered as part of the development in 2018. We'koqma'q contacted land owners of the prospective land to see if a purchase of the land could be made. The land owners were the Cemetery Committee of Little Narrows Presbyterian Church. After speaking to representatives, information regarding the aquaculture development was mailed to the Committee to indicate the request. Robin Stuart contacted Sydney Matheson of the Committee two weeks later to suggest presenting the development plans in person. Mr. Matheson decided that no additional information was needed. The Cemetery Committee also decided to not sell the parcel of land and We'koqma'q abandoned its plan to build a wharf on that property.

Meeting with the Bras D'Or Stewardship Society

Robin Stuart presented the finfish aquaculture development plans at the AGM of the Bras D'Or Stewardship Society[2] on April 14, 2018 at St. Michael's Hall in Baddeck. Thirteen members and four observers were in attendance at the meeting.

Some e-mail exchanges occurred after this meeting. Little additional dialogue occurred after these e-mails and Robin followed up with the Society to see if any further clarifications were required.

[2] The Bras D'Or Stewardship Society is a non-profit organization established in 1998 committed to promoting stewardship of the Bras D'Or Lakes and their watershed.

Robin planned to attend another meeting with the Stewardship Society on February 24, 2019 to update them on the plans. This was delayed. In the meantime, Robin sent the latest development plans and will keep in touch with the group to arrange another meeting time and to answer to any concerns that they may have.

Meeting with the Biosphere Reserve Association

Robin Stuart presented the finfish aquaculture development plans at a meeting of the Bras D'Or Lake Biosphere Reserve Association[3] on April 12, 2018 at the Whycocomagh Waterfront Center. Approximately a dozen members attended.

Robin Stuart has since been contacted by the group to put together a summary of the potential for aquaculture in the Bras D'Or Lake (both shellfish and finfish). He has sent this summary as well as the latest development plans and continues to keep in touch with the group.

Other contact:

In a small rural community, personal communication between the operators/employees of the operation and community members is where the real engagement occurs. Robin Stuart, Winston Patles and other persons working at the operations are often engaged in conversations regarding the farm's plans.

[3] Bras D'Or Lake Biosphere Reserve Association is a registered charity that oversees the UNESCO designated Bras D'Or Lake Biosphere Reserve

Viewpoints Expressed

The optimum use of marine resources

Name of community member	Connection to development	Forum through which feedback received	Date	We'koqma'q representative	View
Bras D'Or Lake Biosphere Reserve Association	Bras D'Or Lake Biosphere Reserve Association is a registered charity that oversees the UNESCO designated Bras D'Or Lake Biosphere Reserve. Its mission is "to engage all peoples in the balanced and sustainable development of the exceptional cultural, environmental and economic assets within the Bras d'Or Lake watershed."	Meeting and follow up conversations with individual members (especially Bruce Hatcher)	April 12, 2018, ongoing	Robin Stuart	The group was very interested to hear of the economic development opportunity that the finfish culture plans present. Provided that environmental sustainability can be maintained, the group is supportive. The Association has asked Robin Stuart to provide a summary of the potential for sustainable development of aquaculture (both finfish and shellfish) in the Bras D'Or Lakes. They are interested in seeing it develop in the region.

The contribution of the proposed operation to community and Provincial economic development

Name of community member	Connection to development	Forum through which feedback received	Date	We'koqma'q representative	View
Bras D'Or Lake Biosphere Reserve Association	Bras D'Or Lake Biosphere Reserve Association is a registered charity that oversees the UNESCO designated Bras D'Or Lake Biosphere Reserve. Its mission is "to engage all peoples in the balanced and sustainable development of the exceptional cultural, environmental and economic assets within the Bras d'Or Lake watershed."	Meeting and follow up conversations with individual members (especially Bruce Hatcher)	April 12, 2018, ongoing	Robin Stuart	Appreciative of the economic prospects of the finfish expansion. See also table above.

Fishery activities in the public waters surrounding the proposed aquacultural operation

Name of community member	Connection to development	Forum through which feedback received	Date	We'koqma'q representative	View
Freddie Anderson	Recreational angler	Conversation at Freddie's windshield shop	Unknown	Robin Stuart	Freddie suggested that collaboration between anglers and We'koqma'q finfish operations occurs to increase fishing opportunities in the area.

The oceanographic and biophysical characteristics of the public waters surrounding the proposed aquacultural operation

Name of community member.	Connection to development	Forum through which feedback received	Date	We'koqma'q representative	View

No views expressed.

The other users of the public waters surrounding the proposed aquacultural operation

Name of community member	Connection to development	Forum through which feedback received	Date	We'koqma'q representative	View
Bras D'Or Stewardship Society	The Bras D'Or Stewardship Society is a non-profit organization established in 1998 committed to promoting stewardship of the Bras D'Or Lakes and their watershed.	Society meeting and e-mails	April – June 2018	Robin Stuart	The group is aware of the potential benthic impacts of finfish farms and discussions regarding these impacts occurred, both at the meeting and in e-mail correspondence following the meeting.
Bras D'Or Stewardship Society	The Bras D'Or Stewardship Society is a non-profit organization established in 1998 committed to promoting stewardship of the Bras D'Or Lakes and their watershed.	Society meeting	April 2018	Robin Stuart	The group expressed a concern about having proper toilet facilities for the workers. Bacterial contamination of the bay is a significant concern of the Society.
John Silliboy	Resident of We'koqma'q First Nation. Just across the road from the existing lease.	Public meeting	August 18, 2018	Robin Stuart & Winston Patles	A concern was raised regarding the location of the existing cages in Whycocomagh and it was suggested that they be moved to the other side of Indian Island to reduce the visual impact.
John Silliboy	Resident of We'koqma'q First Nation. Just across the road from the existing lease.	Public meeting	August 18, 2018	Robin Stuart & Winston Patles	A concern was raised regarding an increased amount of dead seaweed along the shore which was inhibiting shoreline angling. The seaweed was thought to be attributed to the fish farm in Whycocomagh.

The public right of navigation

Name of community member	Connection to development	Forum through which feedback received	Date	We'koqma'q representative	View
Bras D'Or Stewardship Society	The Bras D'Or Stewardship Society is a non-profit organization established in 1998 committed to promoting stewardship of the Bras D'Or Lakes and their watershed.	Society meeting	April 14, 2018	Robin Stuart	General curiosity about intended locations and set up of sites because of concern regarding navigation in Whycocomagh Bay

The sustainability of wild salmon

Name of community member	Connection to development	Forum through which feedback received	Date	We'koqma'q representative	View

No views expressed.

The number and productivity of other aquaculture sites in the public waters surrounding the proposed aquacultural operation

Name of community member	Connection to development	Forum through which feedback received	Date	We'koqma'q representative	View
Bras D'Or Lake Biosphere Reserve Association	Bras D'Or Lake Biosphere Reserve Association is a registered charity that oversees the UNESCO designated Bras D'Or Lake Biosphere Reserve. Its mission is "to engage all peoples in the balanced and sustainable development of the exceptional cultural, environmental and economic assets within the Bras d'Or Lake watershed."	Meeting and follow up conversations with individual members (especially Bruce Hatcher)	February, 2019	Robin Stuart	The Association has asked Robin Stuart to provide a summary of the potential for sustainable development of aquaculture (both finfish and shellfish) in the Bras D'Or Lakes. They are interested in seeing it develop in the region. This view was also stated in Optimum Use of Marine Resources table.

Additional feedback received

Name of community member	Connection to development	Forum through which feedback received	Date	We'koqma'q representative	View
John Silliboy	Resident of We'koqma'q First Nation. Just across the road from the existing lease.	Public meeting	August 18, 2018	Robin Stuart & Winston Patles	A concern regarding the smell of the operation, especially during the summer months was expressed. Robin admitted to the fact that there were a couple of days in the summer of 2018 where the smell was bad because of issues encountered when trying to truck mortalities from the farm.

We'koqma'q Response to Feedback

The viewpoints expressed were received and reviewed by We'koqma'q. They have been addressed and referred to within the development plans of the individual sites, where appropriate.

We'koqma'q will continue to listen to the public's concerns and remain engaged in conversations regarding their finfish operations with the intent to continue the longstanding positive relationship between finfish aquaculture operations and this community.

ADDENDUM 3 – SCOPING REPORT APPENDICES

A3.1 Appendix A – Oran Advertisement



COMMUNITY BULLETIN BOARD

Public service announcements and community events are free of charge.

Thank you
$9 for 40 words; after 40 words 15¢ per word. Plus tax

Obituary
No Charge
In Memory
$9 for 40 words; after 40 words 15¢ per word. Plus tax

In Memory
Text plus 1 Column photo $20+Tax
Text plus 2 Column photo $32.00+Tax
Novenas
$9.00 plus tax

Deadline for all of the above is the Friday before publishing and must be PRE-PAID

Sovereign Grace Presbyterian Church
Blues Mills Fire Hall
Service: 11:00 a.m. each Sunday
Rev. Wayne MacLeod
Everyone welcome.

Margaree Pastoral Charge
Rev. Alicia Cox, M. Div., B.A.
Wilson United: 9:30 a.m.
Calvin United: 11:30 a.m.
All are welcome.

Baddeck Community Baptist Church
Inverary Inn, 368 Shore Road
Sunday service 10:30 a.m.
Pastor Phil MacCormack, 902-295-1387
Facebook: Baddeck Community Baptist Church

Christian Community Church of Cheticamp
14044 Cabot Trail
Sunday service 10:30 a.m.
Wednesday Bible study 7:00 p.m.
Pastor Pierre Chiasson, 902-248-2107
www.christiancommunitychurch cheticamp.com
Facebook: Christian Community Church of Cheticamp

St. John's Pastoral Charge
Sunday, July 22nd
9:00 a.m. Worship, St. Stephen's-Jubilee, Port Hood.
11:00 a.m Worship, St. John's, Strathlorne.

Highlands Christian Community Church
The Culture Centre in Cape North
Sunday service 6:00 p.m.
Pastor Pierre Chiasson 902-248-2107

Inverness Community Church
Mill Road Social Enterprises, 20 Mill Road
Sunday service 11:00 a.m.
Tuesday Bible study 7:00 p.m.
Pastor Mark Palmer, 902-258-7135
Facebook: Inverness Community Church
www.invernesscommunitychurch.com; invernesscommunitychurch@gmail.com

---

Margaree Valley Baptist Church
Sunday services at 11:00 a.m. and 6:30 p.m.
Pastor Hugh Morrison 902-248-2735
Facebook: Margaree Valley Baptist Church
www.margareechurch.ca; margareechurch@gmail.com

Gospel Music Radio
CKJM on Sundays from 11:00 a.m. to 12:00 p.m.
106.1 FM (www.ckjm.ca)
Klee Radio, Baddeck, Sunday from 9:00 a.m. to 10:00 a.m.
(www.kleeradio.com)

East Lake Ainslie Presbyterian Church
July 22nd – 11:00 a.m.
(Times subject to change)
Everyone welcome.

St. Andrew's Presbyterian Church in Whycocomagh will hold their 91st Anniversary service at 3:00 p.m. on July 22nd, 2018. Rev. Lydia MacKinnon will be the guest speaker. There will be no service at **Little Narrow's Presbyterian Church** on this day. Everyone is welcome to attend!

Wayside Chapel on West Lake Ainslie Road (at the corner of Cameron Road). Worship services are held on the 7th day of the week, Saturday, at 2:30 p.m. Everyone welcome. (No collection or offerings.) If you wish information about "People Helping People"; the use of the chapel for meetings, or special events; free Bibles, Christian literature; Bible lessons; transportation to the chapel; or any other free community help offered, call 902-258-3817.

Mental Health Support for Families: 6:30 - 8:30 p.m., Inverness Manor, Ned's Place room, 4th Monday of every month. Confidential, non-judgmental group discussion and educational meetings for family supporting people living with mental illness.

S.H.I.N.E. Cape Breton, Mental Health Peer Support Group will be holding weekly meetings at alternate locations. Every second Tuesday it will be held in the boardroom at The Sacred Heart Community Health Centre, and every second Wednesday in the boardroom at The Inverness Consolidated Memorial Hospital from 6:30 p.m. - 8:30 p.m. Confidential, and non-judgmental group discussion for individuals seeking a place to feel comfortable, safe, and welcome. Facilitators: Glen MacDonald (Inverness) and Jeannine Poirier (Cheticamp).

Alpha group to be held at the Belle Cote Community Centre every Sunday at 6:30 p.m.

Gamblers Anonymous Meetings: Are you spending too much time and money on VLTs, bingo, tickets? Are you chasing your losses? Bills going unpaid? There is help every Thursday, at 8:00 p.m. at St. Joseph's Church in Port Hawkesbury. Use back entrance to basement. For more information call 902-625-5567 and ask for Irene, or you can email me at nannys1994@yahoo.com.

Living With Cancer Support Group: for those who have had a diagnosis of cancer, for their family, caregivers will meet Wednesday, July 18th, 2018, 1:30 p.m. – 3:30 p.m. at Royal Canadian Legion, Branch 128 (Pier), Victoria Road. Facilitator: Tom MacNeil, CBCC Social Worker.

Alcoholics Anonymous District 8, Inverness/Victoria Meeting List
Sunday:
Baddeck Serenity (open speaker/discussion), 8:00 p.m., Knox Presbyterian Hall;
Glendale H.O.W. Group (open speaker), 8:00 p.m., Maple Brook Rd.;
Les Voyageurs (open speaker), 8:30 p.m., St. Peter's Church, Cheticamp.
Monday:
Strait Richmond Detox Inst. Meeting (open speaker), 8:00 p.m., Strait Richmond Hospital, Evanston;
Cabot Group (closed discussion), 8:00 p.m., Buchanan Memorial Hospital, Neil's Harbour;
Port Hood Group (open speaker/discussion), 8:00 p.m., St. Peter's Parish Hall.
Tuesday:
Baddeck Group (open speaker), 8:00 p.m., Baddeck AA Rooms;
New Hope Group (closed discussion), 8:00 p.m., Riverdale Community Centre, Lower River;
Inverness Group (closed discussion), 8:30 p.m., Stella Maris Glebe House.
Wednesday:
Margaree 12 Step Group (closed discussion), 8:00 p.m., Capt. Allan School, SW Margaree;
Never Alone Group (open discussion), 8:00 p.m., Wellness Centre, Waycobah;
Port Hawkesbury Group (open speaker), 8:00 p.m., Strait Serenity Club, Church St., Port Hawkesbury.
Thursday:
Les Voyageurs (closed discussion), 8:30 p.m., St. Peter's Church, Cheticamp;
L'Ardoise Group (closed discussion), 8:00 p.m., L'Ardoise Community Centre.
Friday:
Baddeck Group (closed discussion), 8:00 p.m., Baddeck AA Rooms;
Isle Madame Group (closed discussion), 8:00 p.m., Community Centre, Arichat.
Saturday:
Happy Destiny Big Book (closed discussion), 11:00 a.m., United Baptist Church, Embree Island, Port Hawkesbury;
Margaree 12 Step Group (open speaker), 8:00 p.m., Capt. Allan School, SW Margaree;
Auld's Cove Group (open speaker), 8:00 p.m., Fire Hall, Auld's Cove (District 7 Group).
Inverness open discussion meeting at the Stella Maris Glebe House 12:00 p.m. - 1:00 p.m. Contact Mark M. 902-258-7448.
For more information, call Ron K. at 902-227-8312 or Dwayne MacD. at 902-631-0002 or email District8@hotmail.ca.

Did you know that anyone who has written the GED test and was not successful is now able to write the individual subjects that they did not pass? This is available until the end of 2019. Contact the Inverness County Literacy Office 902-258-3110.

Cape Breton's Magazine is online – free at www.capebretonsmagazine.com.

Jam sessions will be held at the United Church Hall, Port Hood on Fridays 7:00 p.m. – 9:00 p.m. Beginning on July 6th, they will be held weekly except for August 3rd.

The Sisters of the Congregation of Notre Dame with the Local Sisters of St. Joseph Convent/Renewal Centre, Mabou, invite you to an Open House on Sunday, August 5th from 1:00 p.m. – 4:00 p.m. We look forward to your presence as we gather in the cafeteria to give thanks, celebrate, renew friendships, bid farewell and, of course, enjoy a cup of tea. Open mic and local entertainment will be provided. *Ceud Mile Failte!*

Society of Deaf and Hard of Hearing Nova Scotians – Cape Breton affiliate is looking for community members to serve as members of its board of all hearing abilities. Please call Rosalind Wright at 902-564-0003 for more information.

West Bay Pastoral Charge Auction July 21st, 2018. Viewing 10:00 a.m. Auction 11:00 a.m. Some antiques including kerosene lamps. Hotdogs, soft drinks, tea and coffee available. Sponsored by West Bay Pastoral Charge.

Living With Cancer Support Group: for those who have had a diagnosis of cancer, for their family, caregivers will meet Wednesday, July 18th, 2018, 1:30 p.m. – 3:30 p.m. at Royal Canadian Legion, Branch 128 (Pier), Victoria Road. Facilitator: Tom MacNeil, CBCC Social Worker.

Strawberry Shortcake & Tea will be held on Wednesday, July 18th, at 2:00 p.m. to 4:00 p.m. at the Masonic Hall, Main St., Whycocomagh. Sponsored by Bayville Senior Citizens Club.

Pancake Breakfast will be held on Saturday, July 21st, at 8:00 a.m. in St. Andrew's Presbyterian Church Hall, Main St., Whycocomagh. Sponsored by St. Andrew's Ladies Aid.

Register your lob ball team or golf team at this time for the Whycocomagh Summer Festival. For those youth born in 2000 or later we will also have 13 time National arm wrestling champion Mark MacPhail reffing the Arm Wrestling Championship on Saturday, July 21st. No registration required. Also canoe races, washer toss, and lots of other activities within which to compete. There will be a hike which will feature a cultural display along the Skye River trail by Mi'qmaq elders.

Strawberry shortcake and tea will be served from 2:00 p.m. to 5:00 p.m. in the afternoon Thursday, July 19th, at the Storyteller's Gallery, 5663 Route 19, Judique.

Comunn Gàidhlig agus Eachdraidh Mhàbu agus Mabou Ceilidh 2018 Luathadh Mòr/Annual Milling Frolic at *An Drochaid*/The Bridge Museum, Mabou Saturday July 21st, 1:00 p.m. – 3:00 p.m. Everyone welcome. Gaelic songs galore! Tea served. There is an admission fee (Singers and children under 12 – no charge).

Join us for "An Evening of Stories, Music and Song" with Alexander MacLeod, Shelly Campbell and Joanne MacIntyre on Saturday, July 21st, 2018 at Jubilee Church, Port Hood Island, 6:00 p.m. – 8:00 p.m.. Tickets $30.00. Contact Kathi Morrison at 902- 631-1115.Ferry leaves Murphy's Pond at 5:15 p.m.. Proceeds to Port Hood Island Church roof repairs.

Newfie Night with John Drakes on Friday, July 20th from 8:30 p.m. to 12:00 a.m. at the R.C. Legion, Br.#43, Port Hawkesbury.

ISLAND ELECTRONIC SOLUTIONS
Cape Breton's Marine Electronics Expert
Olex, Furino, SI-TEX, icom, Raymarine, Garmin & more
Sales, Installation, & Repair of Marine Navigation, Instrumention, and Electrical Systems
FINLEY BEATON 782-235-4757 • info@islandes.ca

LeMoyne COOP TM/MC
NEW HOURS
MON - WED. 8-6 THURS - FRI 8-8
SATURDAY 8-5 SUNDAY 11-4
GROCERIES
PRODUCE
MEATS AND...
SO MUCH MORE!
WE SELL LOCAL


Grand Etang, NS 902-224-3335


ACUPUNCTURE & MASSAGE THERAPY
• Accident Rehabilitation • Back Pain
• Whiplash • Headaches
• Sciatic Pain • Carpal Tunnel
• TMJ Pain • Plantar Fasciitis
902.224.5255 - Cheticamp
Roman Buchhofer R.Ac,RMT
www.eastcoasttherapeutics.com

L'Arche Cape Breton
Part-time/Casual Employment Opportunity
The Ark Store, Iron Mines, NS
Applications will be accepted until Monday, July 23, 2018 for a part-time employment position at The Ark Store in Iron Mines. Duties will include using the cash register, serving customers and other related duties. Employment will be on Saturdays from 10am to 5pm and on a casual basis when needed. Applicants for this position are required to be over 16 years of age.

Please send resumes to:
Louise Provost
Programs Coordinator
3 L'Arche Lane, RR # 1, Orangedale, NS B0E 2K0
or email: larchecb@larchecapebreton.org

WE'KOQMA'Q PROUD
OPEN HOUSE
Wednesday, August 15, 2018
3:30 pm. to 7 pm.
Location:
Fisheries building, 160 Reservation Road, We'koqma'q
We'koqma'q First Nation will be holding an information session to meet with community members of the local area to present and review proposed amendments to and application for additional lease areas for our finfish aquaculture operations in the Whycocomagh Bay area.

PORT HAWKESBURY PAPER
EMPLOYMENT OPPORTUNITY WITH PORT HAWKESBURY PAPER LP
At Port Hawkesbury Paper, our mission is to continually exceed our customers' expectations through a commitment to responsive, personalized service along with reliable and competitive products in the printing and publication paper market. The people behind our paper make the difference.
Port Hawkesbury Paper is currently seeking a qualified individual for the following position:
MAINTENANCE TEAM LEADER
The Maintenance Team Leader is responsible for the efficient management of all maintenance functions and to provide leadership to maintenance department personnel to safely execute a high degree of planned and scheduled maintenance. This position ensures plant reliability and conformance to all regulatory and budgetary requirements. Must have significant maintenance experience with a pattern of progressively increasing responsibilities. Experience in a manufacturing or industrial unionized environment with a minimum of 10 years relevant experience in a supervisory role. Engineering experience (mechanical or electrical) will be considered an asset.
For job description and application information, please visit: **www.porthawkesburypaper.com** or contact: **hr@porthawkesburypaper.com**

A3.2 Appendix B – Royal Gazette Posting

Royal Gazette

Nova Scotia

Published by Authority | Part I | VOLUME 227, NO. 29

HALIFAX, NOVA SCOTIA, WEDNESDAY, JULY 18, 2018

ORDER IN COUNCIL 2018-193
DATED JULY 17, 2018

The Governor in Council on the report and recommendation of the President of the Executive Council dated July 11, 2018, and pursuant to Section 5 of Chapter 376 of the Revised Statutes of Nova Scotia, 1989, the *Public Service Act*, is pleased, effective July 17, 2018, to revoke Order in Council 2017-197 dated August 8, 2017.

Laura Lee Langley
Clerk of the Executive Council

July 18-2018

ORDER IN COUNCIL 2018-198
DATED JULY 17, 2018

The Governor in Council is pleased to appoint, confirm and ratify the actions of the following Minister:

To be Acting Minister of Agriculture, Acting Minister of Fisheries and Aquaculture, and Acting Minister responsible for the *Maritime Provinces Harness Racing Commission Act* from 6:00 am, Tuesday, July 17, 2018, until 8:00 pm, Saturday, July 21, 2018: the Honourable Kelly Regan.

Laura Lee Langley
Clerk of the Executive Council

July 18-2018

IN THE MATTER OF: The *Companies Act*, Chapter 81, R.S.N.S. 1989, as amended
- and -
IN THE MATTER OF: An Application by **3062636 Nova Scotia Limited** (the "Company") for Leave to Surrender its Certificate of Incorporation

NOTICE IS HEREBY GIVEN that 3062636 Nova Scotia Limited intends to apply to the Registrar of Joint Stock Companies for leave to surrender the Certificate of Incorporation and for its dissolution consequent thereon pursuant to the provisions of Section 137 of the *Companies Act*, being Chapter 81 of the Revised Statutes of Nova Scotia, 1989, as amended.

DATED at Dartmouth, Nova Scotia on the 11th day of July, 2018.

Stephen D. Ling
Landry McGillivray
300-33 Ochterloney Street
Dartmouth NS B2Y 4B8
Telephone: 902-463-8800; Fax: 902-463-0590
Solicitor for 3062636 Nova Scotia Limited

July 18-2018

IN THE MATTER OF: The *Companies Act*, Chapter 81, R.S.N.S. 1989, as amended
- and -
IN THE MATTER OF: An Application by **3297210 Nova Scotia Limited** (the "Company") for Leave to Surrender its Certificate of Incorporation and Certificate of Name Change

NOTICE IS HEREBY GIVEN that 3297210 Nova Scotia Limited, formerly known as Maritime CNC Services Ltd., intends to make application to the Registrar of Joint Stock Companies for leave to surrender its Certificate of Incorporation and Certificate of Name Change pursuant to Section 137 of the *Companies Act* of Nova Scotia.

DATED at Bedford, Nova Scotia this 18th day of July, 2018.

Martha L. Beyea
Blackburn Law
231-1595 Bedford Highway
Bedford NS B5A 3Y4

July 18-2018

© NS Office of the Royal Gazette. Web version.

IN THE MATTER OF: The *Companies Act*, Chapter 81, R.S.N.S. 1989, as amended

- and -

IN THE MATTER OF: An Application by **AQA Canada Inc.** for Leave to Surrender its Certificate of Continuance

AQA Canada Inc. hereby gives notice pursuant to Section 137 of the *Companies Act* that it intends to make application to the Nova Scotia Registrar of Joint Stock Companies for leave to surrender its Certificate of Continuance.

DATED July 17, 2018.

Fae J. Shaw, QC
McInnes Cooper
1300-1969 Upper Water Street
Purdy's Wharf Tower II
Halifax NS B3J 3R7
Solicitor for AQA Canada Inc.

July 18-2018

IN THE MATTER OF: The *Companies Act*, Chapter 81, R.S.N.S. 1989, as amended

- and -

IN THE MATTER OF: An Application by **Brigantine Trading Company Limited** for Leave to Surrender its Certificate of Incorporation

Brigantine Trading Company Limited (the "Company") hereby gives notice pursuant to the provisions of Section 137 of the *Companies Act* (Nova Scotia) that it intends to make application to the Registrar of Joint Stock Companies for the Province of Nova Scotia for leave to surrender its Certificate of Incorporation of the Company.

DATED at Halifax, Nova Scotia, on the 18th day of July, 2018.

Jared B. Schwartz
Patterson Law
Solicitor for Brigantine Trading Company Limited

July 18-2018

IN THE MATTER OF: The *Companies Act*, Chapter 81, R.S.N.S. 1989, as amended

- and -

IN THE MATTER OF: An Application by **North Shore Management Systems Inc.** for Leave to Surrender its Certificate of Continuance

North Shore Management Systems Inc. hereby gives notice pursuant to Section 137 of the *Companies Act* that it intends to make application to the Nova Scotia Registrar of Joint Stock Companies for leave to surrender its Certificate of Continuance.

DATED July 17, 2018.

Fae J. Shaw, QC
McInnes Cooper
1300-1969 Upper Water Street
Purdy's Wharf Tower II
Halifax NS B3J 3R7
Solicitor for North Shore Management Systems Inc.

July 18-2018

IN THE MATTER OF: The *Companies Act*, Chapter 81, R.S.N.S. 1989, as amended

- and -

IN THE MATTER OF: An Application by **NS Windsor Holdco Inc.** for Leave to Surrender its Certificate of Continuance

NS Windsor Holdco Inc. hereby gives notice pursuant to Section 137 of the *Companies Act* that it intends to make application to the Nova Scotia Registrar of Joint Stock Companies for leave to surrender its Certificate of Continuance.

DATED July 17, 2018.

Fae J. Shaw, QC
McInnes Cooper
1300-1969 Upper Water Street
Purdy's Wharf Tower II
Halifax NS B3J 3R7
Solicitor for NS Windsor Holdco Inc.

July 18-2018

NOTICE OF DISSOLUTION
CO-OPERATIVE ASSOCIATIONS ACT

As required by Section 44 of the *Co-operative Associations Act*, Chapter 98, R.S.N.S. 1989, as amended, **2153622 Nova Scotia Cooperative Limited**, Registry ID# 2153622, held a membership meeting and passed a special resolution to wind up and dissolve the co-operative.

TAKE NOTICE that the name of the co-operative will be struck off the register at the office of the Registrar of Joint Stock Companies no sooner than one month from the date of this publication, and in compliance with Section 57 of the Act, at which time the association will be dissolved unless cause is shown to the contrary.

Dated at the City of Halifax, in the Province of Nova Scotia, this 10th day of July, 2018.

© NS Office of the Royal Gazette. Web version.

Audrey Gay
Inspector of Co-operatives

July 18-2018

NOTICE OF DISSOLUTION
CO-OPERATIVE ASSOCIATIONS ACT

As required by Section 44 of the *Co-operative Associations Act*, Chapter 98, R.S.N.S. 1989, as amended, **Clifton Acres Investment Cooperative Limited**, Registry ID# 3055993, held a membership meeting and passed a special resolution to wind up and dissolve the co-operative.

TAKE NOTICE that the name of the co-operative will be struck off the register at the office of the Registrar of Joint Stock Companies no sooner than one month from the date of this publication, and in compliance with Section 57 of the Act, at which time the association will be dissolved unless cause is shown to the contrary.

Dated at the City of Halifax, in the Province of Nova Scotia, this 16th day of July, 2018.

Audrey Gay
Inspector of Co-operatives

July 18-2018

PROVINCE OF NOVA SCOTIA
IN THE MATTER OF SECTION 254(1) OF
THE *CRIMINAL CODE OF CANADA*

Under the authority vested in me by Section 254(1) of the *Criminal Code of Canada*, I hereby designate:

Katherine Deborah Grace Sansom
Royal Canadian Mounted Police
Province of Nova Scotia

as being qualified to operate an approved instrument, the Intox EC/IR II, and therefore a "qualified technician" in respect of breath samples, within the meaning of Section 254(1) of the said *Criminal Code of Canada*.

DATED at Halifax, Nova Scotia, this 11th day of July, 2018.

Mark Furey
Attorney General and Minister of Justice

July 18-2018

Open House

Wednesday, August 15, 2018
3:30 pm. to 7 pm.

Location:
Fisheries Building, 160 Reservation Road, We'koqma'q

We'koqma'q First Nation will be holding an information session to meet with community members of the local area to present and review proposed amendments to and application for additional lease areas for our finfish aquaculture operations in the Whycocomagh Bay area.

July 18-2018

IN THE COURT OF PROBATE FOR NOVA SCOTIA
IN THE ESTATE OF **LAURIE THOMAS BRODIE**,
Deceased

Notice of Application
(S. 64(3)(a))

The applicant John Brodie, Executor, has applied to the Judge of the Probate Court of Nova Scotia, at the Probate District of Halifax, 1815 Upper Water Street, Halifax, Nova Scotia for Proof of Will to be heard on the 20th day of August, 2018, at 9:30 a.m.

The affidavit of John Brodie in Form 46, a copy of which is attached to this Notice of Application, is filed in support of this application. Other materials may be filed and will be delivered to you or your lawyer before the hearing.

NOTICE: If you contest any part of the application you must complete and file a notice of objection in Form 47 with the court, and then serve the notice of objection on the applicant and the personal representative.

If you do not file and serve a notice of objection you will not be entitled to any notice of further proceedings and you may only make representations at the hearing with the permission of the registrar or judge.

If you do not come to the hearing in person or as represented by your lawyer the court may give the applicant what they want in your absence. You will be bound by any order the court makes.

Therefore, if you contest any part of this application, you or your lawyer must file and serve a notice of objection in Form 47 and come to the hearing.

DATED July 9, 2018.

John E. Brodie
390 Parkland Drive, Apt 404
Halifax NS B3S 1N6
Telephone: 902-835-4669
Email: johnbrodie@eastlink.ca

July 18-2018 (3 issues)

© NS Office of the Royal Gazette. Web version.

IN THE COURT OF PROBATE FOR NOVA SCOTIA
IN THE ESTATE OF **MARGARET ELIZABETH KENNEDY**, Deceased

Notice of Application
(S. 64(3)(a))

The applicant Jean MacDonald, a beneficiary pursuant to a prior will of the deceased, has applied to the Judge of the Probate Court of Nova Scotia, at the Probate District of Antigonish, 11 James Street, Antigonish, Nova Scotia B2G 1R6, for Proof in Solemn Form of the will admitted to probate, to be heard on Tuesday, September 4th, 2018, at 9:30 a.m. at the courthouse located at 172 Main Street, Antigonish, Nova Scotia.

The affidavit of Jean McDonald in Form 46, a copy of which is attached to this Notice of Application, is filed in support of this application. Other materials may be filed and will be delivered to you or your lawyer before the hearing.

NOTICE: If you contest any part of the application you must complete and file a notice of objection in Form 47 with the court, and then serve the notice of objection on the applicant and the personal representative.

If you do not file and serve a notice of objection you will not be entitled to any notice of further proceedings and you may only make representations at the hearing with the permission of the registrar or judge.

If you do not come to the hearing in person or as represented by your lawyer the court may give the applicant what they want in your absence. You will be bound by any order the court makes.

Therefore, if you contest any part of this application, you or your lawyer must file and serve a notice of objection in Form 47 and come to the hearing.

DATED June 11, 2018.

Donald Macdonald
Unit 3, 198 Main Street
Antigonish NS B2G 2B9
Telephone: 902-863-2925; Fax: 902-735-3065
Email: mthree@eastlink.ca
Solicitor for the Applicant

July 18-2018 (3 issues)

© NS Office of the Royal Gazette. Web version.

Nova Scotia Department of Fisheries and Aquaculture
Administrative Decisions
(*Fisheries and Coastal Resources Act*)

The Nova Scotia Department of Fisheries and Aquaculture invites members of the public to provide written comment on applications for Aquaculture Licences and Leases. Selected details of the application(s) are as follows, with further information also found at http://novascotia.ca/fish/aquaculture/public-information/.

Matthew and Stephen Mattie
Amendment Application
AQ#1387

Location: Havre Boucher, Antigonish County
Type: Marine Shellfish
Size: 12.51 HA
Cultivation Method: Bottom cultivation with gear
Species: American oyster
Proposed Amendment: Authorization for suspended shellfish cultivation on a portion of existing site
Submission Period: 12:00 AM on Thursday June 14, 2018 to 11:59 PM on Friday July 20, 2018

Philip Docker
Renewal Application
AQ#1086

Location: Merigomish Harbour, Pictou County
Type: Marine
Size: 1.94 HA
Cultivation Method: Suspended Shellfish Method
Species: American oyster, Bay scallop, Bay quahog, Razor Clam
Proposed Term: 10-year licence/20-year lease
Submission Period: 12:00 AM on July 5, 2018 to 11:59 PM on August 3, 2018

Robert Livingstone
Renewal Application
AQ#1289

Location: South Denys Basin, Inverness County
Type: Marine
Size: 3.00 HA
Cultivation Method: Bottom shellfish without gear
Species: American oyster
Proposed Term: 10-year licence/20-year lease
Submission Period: 12:00 AM on July 5, 2018 to 11:59 PM on August 3, 2018

Written comments must identify the person making the comments and include contact information (mailing address, civic address, phone number, and email). Written comments may be submitted as follows:

1. By Mail at: Aquaculture Administrator
   Nova Scotia Department of Fisheries and Aquaculture
   1575 Lake Road, Shelburne, NS B0T 1W0
2. By Fax at: 902-875-7429
3. By Email at: Aqua.Admin@novascotia.ca

Written submissions will be accepted from **12:00 AM to 11:59 PM during the submission period noted above**. Submissions must meet the guidelines outlined at http://novascotia.ca/fish/aquaculture/public-information/.

Written information provided to the Department as submissions are subject to the protections and disclosures required by the Nova Scotia *Freedom of Information and Protection of Privacy Act*.

© NS Office of the Royal Gazette. Web version.

Estate Notices

(*Probate Act*)

All persons having legal demands against any of the estates listed in this issue must file a notice of claim in Form 32 no later than 6 months from the date of the first advertisement. All persons indebted to an estate must make immediate payment to the personal representative noted.

ESTATE NOTICES BEING PUBLISHED FOR THE FIRST TIME

ESTATE OF: Place of Residence of Deceased Date of Grant	Personal Representative(s)	Solicitor for Personal Representative Date of the First Insertion
ANDERSON, Edward Ross Middleton, Kings County June 6-2018	**Jeffrey Dean Anderson** 299 Palmer Road Aylesford NS B0P 1C0	**Ronald D. Richter** 780 Central Avenue PO Box 629 Greenwood NS B0P 1N0 July 18-2018 (6m)
ARSENEAU, Edward Merlyn Truro, Colchester County June 27-2018	**Vincent Edward Arseneau** 379 Old Halifax Road Brookfield NS B0N 1C0	**Ronald R. Chisholm** 202-640 Prince Street Truro NS B2N 1G4 July 18-2018 (6m)
BORAN, Gertrude E. Springhill, Cumberland County July 4-2018	**Ruth Spence** 9345 Route 366 Port Howe NS B0K 1K0 **Thomas Boran** 68 Pugwash Point Road Pugwash NS B0K 1L0	**Charles A. Ellis** **Hicks LeMoine Law** PO Box 279 15 Princess Street Amherst NS B4H 3Z2 July 18-2018 (6m)
BRIGGS, Stewart Sutherland Dartmouth, Halifax Regional Municipality June 21-2018	**Suzanne Loretta Briggs** 11 Otterbrook Road Brookfield NS B0N 1C0 **Michael James Briggs** 11 Westbrook Avenue Dartmouth NS B3A 1R5	**Donald L. Shewfelt** **Landry, McGillivray** PO Box 1200 300-33 Ochterloney Street Dartmouth NS B2Y 4B8 July 18-2018 (6m)
BURKE, Charles Herbert Lower Sackville, Halifax Regional Municipality July 5-2018	**David Raymond Burke** 282 Salmon River Road Valley NS B3N 5B2	**David C. Melnick** **Melnick Doll Condran** 302-1160 Bedford Highway Bedford NS B4A 1C1 July 18-2018 (6m)
CORKUM, Myrtle Marion Chester, Lunenburg County July 4-2018	**Norma Louise Spring** 10 Brook Road Pleasantville NS B0R 1G0	**Benjamin P. Carver** 302-197 Dufferin Street Bridgewater NS B4V 2G9 July 18-2018 (6m)

© NS Office of the Royal Gazette. Web version.

ESTATE OF: Place of Residence of Deceased Date of Grant	Personal Representative(s)	Solicitor for Personal Representative Date of the First Insertion
COSSITT, Eoin John Northside Community Guest Home North Sydney, Cape Breton Regional Municipality June 4-2018	**Public Trustee** PO Box 685 Halifax NS B3J 2T3	**J. Melissa MacKay** **Public Trustee** PO Box 685 Halifax NS B3J 2T3 July 18-2018 (1m)
CUSHING, Russell Wayne Yarmouth, Yarmouth County June 26-2018	**R. Andrew Kimball** 5656 Highway 331, Petite Riviere, RR 1 LaHave NS B0R 1C0	**Benjamin P. Carver** 302-197 Dufferin Street Bridgewater NS B4V 2G9 July 18-2018 (6m)
DEBAY, Elsie Marion Robinson Londonderry, Colchester County June 26-2018	**Kirk Douglas Debay** c/o Stephen J. Topshee 710 Prince Street PO Box 1128 Truro NS B2N 5H1	**Stephen J. Topshee** 710 Prince Street PO Box 1128 Truro NS B2N 5H1 July 18-2018 (6m)
DEKKER, Johannes Marginus Halifax, Halifax Regional Municipality May 11-2018	**Jalal Mohammed Hosein** 4730 Highway 2 Wellington NS B2T 1B7	**Keith MacKay** 5669 Victoria Road Halifax NS B3H 1M9 July 18-2018 (6m)
DOBSON, Melita Sydney, Cape Breton Regional Municipality July 9-2018	**Ashley Colson** 97 Milne Avenue New Minas NS B4N 3P3	**Harvey M. McPhee, QC** **Sampson McPhee** 200-66 Wentworth Street Sydney NS B1P 6T4 July 18-2018 (6m)
FOOTE, Albert George New Glasgow, Pictou County July 4-2018	**Stephen Foote** 103 Brunswick Avenue Markham ON L6C 2E6 **Ann Foote** 2324 Shore Road Merigomish NS B0K 1G0	**Mary Jane Saunders** **MacIntosh, MacDonnell & MacDonald** 260-610 East River Road New Glasgow NS B2H 3S2 July 18-2018 (6m)
FRASER, Vinie Margaret New Glasgow, Pictou County June 26-2018	**Wayne Douglas Fraser** 28 Cockburn Drive Lower Sackville NS B4C 1J9	**E. Anne MacDonald** **Roddam & MacDonald** 140 Church Street PO Box 280 Pictou NS B0K 1H0 July 18-2018 (6m)
GOGUEN, Muriel Frances Saint Vincent Nursing Home Halifax, Halifax Regional Municipality July 5-2018	**Barry Phillip Goguen** 36 East Old Post Road Smith's Cove NS B0S 1S0	**Oliver Janson, Esq.** PO Box 129 93 Montague Row Digby NS B0V 1A0 July 18-2018 (6m)

© NS Office of the Royal Gazette. Web version.

ESTATE OF: Place of Residence of Deceased Date of Grant	Personal Representative(s)	Solicitor for Personal Representative Date of the First Insertion
HORTON, John Thomas Wolfville, Kings County July 9-2018	**Kathy Fuller** 208 Bluff Road Avonport NS B0P 1B0	**Timothy D. Hergett** C-390 Main Street Wolfville NS B4P 1C9 July 18-2018 (6m)
JODREY, Paul George Henry Clarence, Annapolis County June 18-2018	**Valerie Richards** PO Box 67 Bridgetown NS B0S 1C0	**W. Bruce Gillis, QC** PO Box 700 Middleton NS B0S 1P0 July 18-2018 (6m)
JOHNSON, David Dartmouth, Halifax Regional Municipality July 6-2018	**Valerie Quinlan** 8 Chinook Court Dartmouth NS B3A 4Y4	**Craig R. Berryman** **Cox & Palmer** 1100-1959 Upper Water Street Halifax NS B3J 3N2 July 18-2018 (6m)
JOHNSON, Hubert Reginald Jordantown, Digby County June 22-2018	**Kerry Johnson** PO Box 161 Cornwallis NS B0S 1H0	**Oliver Janson, Esq.** PO Box 129 93 Montague Row Digby NS B0V 1A0 July 18-2018 (6m)
JOHNSTON, David Douglas Dartmouth, Halifax Regional Municipality July 5-2018	**Mona Jane Trider** 273 Flying Cloud Drive Dartmouth NS B2W 4V7 **Thelma Grace Kessel** 145 Fife Road Guelph ON N1H 6Y1	**George M. Clarke** 600-99 Wyse Road PO Box 876 Dartmouth NS B2Y 3Z5 July 18-2018 (6m)
KENNEDY, Arnold Tompkins Guysborough, Guysborough County July 3-2018	**Frieda Una Kennedy** c/o R. Bruce MacKeen, QC MacKeen Legal Services Incorporated PO Box 200 146 Main Street Guysborough NS B0H 1N0	**R. Bruce MacKeen, QC** **MacKeen Legal Services Incorporated** PO Box 200 146 Main Street Guysborough NS B0H 1N0 July 18-2018 (6m)
KNIGHT, Gordon Joseph Halifax, Halifax Regional Municipality July 16-2018	**Thomas Vernon David Knight** 521 Rattray Park Drive Mississauga ON L5J 2N2	**Gary R. Armsworthy** 215-6021 Young Street Halifax NS B3K 2A1 July 18-2018 (6m)
KNOLL, Bradley Wayne Dartmouth, Halifax Regional Municipality June 25-2018	**Laura Lydia Knoll** 509-28 Helene Street N Mississauga ON L5G 3B7	**Andrew Trider** **Weldon McInnis** 118 Ochterloney Street Dartmouth NS B2Y 1C7 July 18-2018 (6m)

© NS Office of the Royal Gazette. Web version.

ESTATE OF: Place of Residence of Deceased Date of Grant	Personal Representative(s)	Solicitor for Personal Representative Date of the First Insertion
LAMING, Carl Douglas Truro, Colchester County June 22-2018	**Brian Douglas Laming** c/o Stephen J. Topshee 710 Prince Street PO Box 1128 Truro NS B2N 5H1	**Stephen J. Topshee** 710 Prince Street PO Box 1128 Truro NS B2N 5H1 July 18-2018 (6m)
LITTLE, Marion Ruth Truro, Colchester County July 11-2018	**Linda McGill** 26 Robertson Crescent Truro NS B2N 5P6	**Bradford G. Yuill** **The Yuill Law Firm** 541 Prince Street Truro NS B2N 1E8 July 18-2018 (6m)
LUTWICK, Graham Banks Hackett's Cove, Halifax Regional Municipality July 6-2018	**Marianne Reid Forbes** and **David Robin Lutwick** 1415 Oakland Road Mahone Bay NS B0J 2E0	**Janet Nolan Conrad** **Blackburn Law** 231-1595 Bedford Highway Bedford NS B4A 3Y4 July 18-2018 (6m)
LYNK, Agnes (aka Agnes Maurina Stubbard) Glace Bay, Cape Breton Regional Municipality July 9-2018	**Fred Lynk** 132 Fourth Street Glace Bay NS B1A 4H1	**William R. Burke** **Crosby Burke and MacRury** 38 Union Street Glace Bay NS B1A 2P5 July 18-2018 (6m)
MacDONALD, Joan Marie Greenwood, Pictou County June 27-2018	**James Steven Patchett** RR 1 Thorburn NS B0K 1W0	**E. Anne MacDonald** **Roddam & MacDonald** 140 Church Street PO Box 280 Pictou NS B0K 1H0 July 18-2018 (6m)
MacKAY, Margaret Colleen Glace Bay, Cape Breton Regional Municipality July 9-2018	**Raymond Francis Ward** 385 Mitchell Avenue Dominion NS B1G 1P1	**Andrea Rizzato** 2-50 Stable Drive Sydney NS B1P 0B9 July 18-2018 (6m)
MacKENZIE, Kevin Glace Bay, Cape Breton Regional Municipality July 10-2018	**Nancy Michalik** 332 Reserve Street Glace Bay NS B1A 4W6	**William R. Burke** **Crosby Burke and MacRury** 38 Union Street Glace Bay NS B1A 2P5 July 18-2018 (6m)
MacLEAN, John Murdock Sydney, Cape Breton Regional Municipality July 10-2018	**Murdell Kaye MacLean** 6 Terrace Street Sydney, Nova Scotia, B1P 2L3	**Noah Landry** 409 Granville Street Port Hawkesbury NS B9A 2M5 July 18-2018 (6m)

© NS Office of the Royal Gazette. Web version.

ESTATE OF: Place of Residence of Deceased Date of Grant	Personal Representative(s)	Solicitor for Personal Representative Date of the First Insertion
MARRIOTT, Lorraine Theresa Ann Halifax, Halifax Regional Municipality July 4-2018	**Annette Marie Croft** 32 Mountain Road Halifax NS B3N 1A2	**Jessica L. Lyle** **Sealy Cornish Coulthard** 200-56 Portland Street Dartmouth NS B2Y 1H2 July 18-2018 (6m)
MARTIN, Lester Frank (aka Lester F. Martin) Middlefield, Queens County July 4-2018	**Steven L. Martin** 5468 Highway 8 Pleasantfield NS B0T 1E0 **Lawrence M. Martin** 18 Porter Crescent Bridgewater NS B4V 3X9	**Christopher Folk** PO Box 760 Liverpool NS B0T 1K0 July 18-2018 (6m)
MATTHEWS, George Springhill, Cumberland County July 11-2018	**Jessica Colborne** 6 Copp Avenue Amherst NS B4H 2T2	**Charles A. Ellis** **Hicks LeMoine Law** PO Box 279 15 Princess Street Amherst NS B4H 3Z2 July 18-2018 (6m)
McGLONE, Anthony Earl Hubley, Halifax Regional Municipality July 9-2018	**Mary Angela LeBlanc** 7 Randolph Street Halifax NS B3P 2A9	**James R. Morris** **Morris Bureau** 307-6080 Young Street Halifax NS B3K 5L2 July 18-2018 (6m)
MITCHELL, Helen Elizabeth Halifax, Halifax Regional Municipality April 18-2018	**Sharon Lynn Mitchell** 173 Fox Hollow Drive Upper Tantallon NS B3Z 1N5	**Jennifer M. Chiasson** **Richardson's Law Office** 153 Sackville Drive Lower Sackville NS B4C 2R3 July 18-2018 (6m)
MOFFAT, Ernest Leon Halifax, Halifax Regional Municipality June 14-2018	**Christopher Elliot** 38 Ahmadi Crescent Bedford NS B4A 4E5	**Derek M. Land** 231-1595 Bedford Highway Bedford NS B4A 3Y4 July 18-2018 (6m)
MORASH, Mary Theresa Janet East Chezzetcook, Halifax Regional Municipality July 6-2018	**Thomas Christopher De Marco** 377 East Chezzetcook Road East Chezzetcook NS B0J 1N0	July 18-2018 (6m)
MURPHY, Lorraine Jean West Chezzetcook, Halifax Regional Municipality July 6-2018	**Gary Murphy** 18 Petit Lac Road West Chezzetcook NS B0J 1N0	**Janet Nolan Conrad** **Blackburn Law** 231-1595 Bedford Highway Bedford NS B4A 3Y4 July 18-2018 (6m)

© NS Office of the Royal Gazette. Web version.

ESTATE OF: Place of Residence of Deceased Date of Grant	Personal Representative(s)	Solicitor for Personal Representative Date of the First Insertion
NAFTEL, William Drummond Halifax, Halifax Regional Municipality July 5-2018	**Jered Wayne Matthews** 5350 Rector Street Halifax NS B3K 2N5	**George M. Clarke** 600-99 Wyse Road PO Box 876 Dartmouth NS B2Y 3Z5 July 18-2018 (6m)
NOWE, Richard Theodore, Sr. Milton, Queens County June 26-2018	**Elizabeth Henryka Nowe** 151 Milford Street Milton NS B0T 1P0	**Borden L. Conrad** **Conrad & Feindel** PO Box 1600 267 Main Street Liverpool NS B0T 1K0 July 18-2018 (6m)
O'CONNOR, Mildred Catherine Riverside, Guysborough County June 19-2018	**Marilyn Bowie** 58 Norway Maple Drive Timberlea NS B3T 1K8	**Jacqueline R. Farrow** **Farrow Law** 101-5445 St. Margaret's Bay Road Upper Tantallon NS B3Z 2H9 July 18-2018 (6m)
ORGAN, Randy Timberlea, Halifax Regional Municipality July 12-2018	**Judith Ann Drage** 2607 St. Margaret's Bay Road Timberlea NS B3T 1H2	**Eric F.G. Thomson** 2571 Windsor Street Halifax NS B3K 5C4 July 18-2018 (6m)
PENDER, Barbara Mae Truro, Colchester County May 31-2018	**Donna Marie Biblow** 31 Villosa Ridge Drive Calgary AB T3Z 3B1 **Robert Charles Pender** 9 Arlington Place SE Calgary AB T2H 2B3	**Bradford G. Yuill** **The Yuill Law Firm** 541 Prince Street Truro NS B2N 1E8 July 18-2018 (6m)
RICE, Ernest Anderson Carleton Corner, Annapolis County July 4-2018	**Gregory John Rice** c/o 188 Commercial Street PO Box 98 Berwick NS B0P 1E0	**Eric O. Sturk** 188 Commercial Street PO Box 98 Berwick NS B0P 1E0 July 18-2018 (6m)
RICHARDSON, Grace Edith Stellarton, Pictou County July 3-2018	**Bryce Dennis Richardson** 130 Queensway Road PO Box 1806 Stellarton NS B0K 1S0	**B. Craig Clarke** 195 Foord Street PO Box 849 Stellarton NS B0K 1S0 July 18-2018 (6m)
ROBB, Alice Freda Westmount, Cape Breton Regional Municipality July 10-2018	**Shayama Kunanayagamon** CIBC Trust Corporation 1200-18 York Street Toronto ON M5J 2T8 **Marjorie Elizabeth Robb** 95 Lyttleton Gardens Ottawa ON K1L 5A4	**Alan C. MacLean** 10 Church Street Truro NS B2N 5B9 July 18-2018 (6m)

© NS Office of the Royal Gazette. Web version.

ESTATE OF: Place of Residence of Deceased Date of Grant	Personal Representative(s)	Solicitor for Personal Representative Date of the First Insertion
ROBB, Donald Eric Toronto, Ontario July 6-2018	**Patricia Beata Robb** 17 Doddington Drive Toronto ON M8Y 1S3	**John G. Cooper, QC** **Crowe Dillon Robinson** 200-7075 Bayers Road Halifax NS B3L 2C1 July 18-2018 (6m)
ROBERTS, Cyril C. Bass River, Colchester County July 4-2018	**Virginia M. Roberts** 2074 Mines Bass River Road Bass River NS B0M 1B0	**Charles A. Thompson** PO Box 1128 710 Prince Street Truro NS B2N 5H1 July 18-2018 (6m)
ROCKWELL, Daniel D. Boularderie Centre, Victoria County June 14-2018	**Daniel Eric Rockwell** 75 MacKenzie Drive Gardiner Mines NS B1G 1G7	**William P. Burchell** PO Box 218 799 Main Street Sydney Mines NS B1V 2Y5 July 18-2018 (6m)
SARKANY, Cheryl Lucasville, Halifax Regional Municipality July 3-2018	**Verlie E. Tyson** 22 Bradbury Lane Halifax NS B3P 0H2	**Fergus Ford** 300-6265 Quinpool Road Halifax NS B3L 1A4 July 18-2018 (6m)
SPENCER, Gwendolyn Fern "Bonnie" Springhill, Cumberland County July 4-2018	**Brent Spencer** 26 County Club Road Riverview NB E1B 4P9	**David W. McNairn** **Hicks LeMoine Law** PO Box 279 15 Princess Street Amherst NS B4H 3Z2 July 18-2018 (6m)
SPRINGER, Jennifer Chantal New Glasgow, Pictou County July 3-2018	**Betty Springer** 23 Beggarswell Close Bristol, England BS2 9JH	**Mary Jane Saunders** **MacIntosh, MacDonnell & MacDonald** 260-610 East River Road New Glasgow NS B2H 3S2 July 18-2018 (6m)
SUTHERLAND, Alexander Gordon Dartmouth, Halifax Regional Municipality May 29-2018	**Stephen Sutherland** 56 Castlewood Drive Dartmouth NS B2V 2R3	**Suzanne L. Robichaud** 104-239 Brownlow Avenue Dartmouth NS B3B 2B2 July 18-2018 (6m)
SYMONDS, Gordon Howard Woods Harbour, Shelburne County July 3-2018	**Andrea Rose Symonds** 7187 Highway 3 Woods Harbour NS B0W 2E0	**Donald G. Harding, QC** 3407 Highway 3 PO Box 580 Barrington Passage NS B0W 1G0 July 18-2018 (6m)

© NS Office of the Royal Gazette. Web version.

ESTATE OF: Place of Residence of Deceased Date of Grant	Personal Representative(s)	Solicitor for Personal Representative Date of the First Insertion
WOO, Paul Chung Shen Dartmouth, Halifax Regional Municipality July 3-2018	**David Woo** 3-422 Kenneth Avenue Toronto ON M2N 7M3 **Mark Woo** 451 Caldwell Road Dartmouth NS B2V 1A7	**Stephen D. Piggott** **Russell Piggott Jones** 500-44 Portland Street PO Box 913 Dartmouth NS B2Y 3Z6 July 18-2018 (6m)

ESTATE NOTICES BEING PUBLISHED FOR SECOND OR SUBSEQUENT TIME
NOTE: Name of Personal Representative and Solicitor for the estate appears at the time of first insertion.

Index of Estate Notices currently being published for the required six-month period under subsection 63(1) of the *Probate Act*. To obtain a copy of the gazette issue shown below please contact the Royal Gazette Office at (902) 424-8575. (Also, see information page at the back for address, fax and website details.)

Estate Name	Date of First Insertion
Acker, Hilje	June 20, 2018
Adams, Bethia Maud	April 18, 2018
Adams, Clara Patricia	March 14, 2018
Agar, Robert Oliver	May 9, 2018
Ainslie, Christine Isabelle	April 25, 2018
Ainslie, Kenneth Ross	February 7, 2018
Allan, E. Grace	April 4, 2018
Allan, Sheila R.	May 30, 2018
Allen, Eleanor Beatrice	May 23, 2018
Allen, George Ross	February 28, 2018
Allen, Valerie Jeanne	February 28, 2018
Al-Molky, Michael John	February 7, 2018
Amero, John George	February 14, 2018
Amirault, Bruce Joseph	March 21, 2018
Anderson, Clarence Wentworth	June 13, 2018
Anderson, Roderick	March 14, 2018
Andrews, Vernon Edgar Charles	June 6, 2018
Arsenault, Joward Joseph	April 25, 2018
Arsenault, Lorraine Marie Ferguson	January 24, 2018
Arthur, William Clifford	February 7, 2018
Artz, June Paulena	June 13, 2018
Ash, Theressa Elizabeth	January 31, 2018
Atchison, David Carl	May 16, 2018
Atwell, Jean Pamela	April 18, 2018
Auclair, Andre	May 2, 2018
Aucoin, Joseph Hubert	June 20, 2018
Aucoin, Marie Gemma (aka Gemma Aucoin)	February 21, 2018
Aucoin, Phyllis Audrey	February 21, 2018
Auton, Valerie Louise	April 25, 2018
Bacho, Wilma N.	May 16, 2018
Bailey, Ronald William	May 9, 2018
Baillie, Hugh Daniel	April 18, 2018
Bailly, Henri Emile	January 24, 2018
Baird, George Weldon	July 4, 2018
Baker, Betty Diane	June 27, 2018
Baker, Gilbert Charles Howard	May 30, 2018
Baker, Kathleen Lorraine	April 25, 2018

© NS Office of the Royal Gazette. Web version.

Baker, Rachel Wilma (aka Wilma Dorothy Rachael Baker) ..... February 14, 2018
Baker, Stedman ..... February 28, 2018
Baker, Virginia Isabel (aka Virginia Isabel Douglas; aka Virginia Isabel Douglas-Lewis) ..... February 7, 2018
Balcom, Ryan Edward ..... May 30, 2018
Baltzer-Simpson, Linda Carolyn ..... May 2, 2018
Bangay, Elmona Irene ..... April 11, 2018
Barkhouse, Rita Mary ..... March 21, 2018
Barnes, Barbara Helen ..... June 27, 2018
Barr, Paul Joseph ..... March 28, 2018
Barron, Kenneth Donald ..... February 28, 2018
Barteaux, Marjorie Clare ..... June 20, 2018
Beals, Diane ..... April 18, 2018
Beals, Donald Edward ..... March 28, 2018
Beaton, Alex Lawrence ..... February 28, 2018
Beaver, Roy Ernest ..... June 13, 2018
Beck, Hazen Donald ..... June 27, 2018
Beed, Greogry Francis ..... April 25, 2018
Benedict, Cathy Elaine ..... April 25, 2018
Benjamin, Greta ..... March 21, 2018
Benjamin, Thelma Anne ..... January 31, 2018
Bentley, Shawn Stephen ..... January 31, 2018
Bernasconi, Donald Henry ..... February 14, 2018
Berrigan, Bernard Frederick ..... June 20, 2018
Berry, Donald Carl ..... March 7, 2018
Berry, Lawrence Vernon ..... April 25, 2018
Bezanson, Doris Maxine ..... April 11, 2018
Billard, Kathleen Agatha ..... March 28, 2018
Billard, Susan Catherine ..... May 23, 2018
Billick, William M. W ..... January 31, 2018
Blakeney, Evelyn Hazel Stockwood (aka Evelyn Hazel Blakeney) ..... June 6, 2018
Blauvelt, Franklyn Charles ..... June 27, 2018
Bligh, Audrey Viona ..... February 7, 2018
Blumsum, Margaret Kathryn ..... April 18, 2018
Board, Carol Ainne ..... March 14, 2018
Bolivar, Allen Aubrey ..... February 14, 2018
Bollivar, Celia Elizabeth ..... May 23, 2018
Bolta, Christian Claude ..... May 30, 2018
Bond, James Manson ..... June 13, 2018
Bond, Mary Florence ..... June 6, 2018
Bonet, Fern I. ..... April 4, 2018
Book, Mary Eleanor (aka Mary Eleanor Leslie) ..... May 30, 2018
Boone, Ruby Eugena ..... June 20, 2018
Borgal, Allan Joseph ..... February 28, 2018
Borgal, Wallace Elsworth (aka Ellsworth W. Borgal) ..... March 14, 2018
Boudreau, Bernard Amable, Sr. (aka Bernard Amable Boudreau) ..... March 28, 2018
Boudreau, Delores Edna ..... January 31, 2018
Bourgeois, Raymond ..... March 7, 2018
Bourque, Charles Frederick ..... May 23, 2018
Bourque, Delmer Joseph (aka Delmar J. Bourque; aka Joseph Delmer Bourque) ..... May 30, 2018
Boutilier, Marion Jessie ..... May 16, 2018
Bower, Vivian ..... March 7, 2018
Bowles, William Joseph ..... March 7, 2018
Bowser, Laura ..... May 9, 2018
Boylan, Anne Marie ..... March 21, 2018
Boyle, Clark Whiston ..... March 14, 2018
Brady, Marje ..... April 18, 2018
Breen, Verna Helen ..... April 18, 2018

© NS Office of the Royal Gazette. Web version.

Brennan, Edward Francis ..... March 28, 2018
Brennan, Katherine Kennedy ..... May 23, 2018
Brooks, Blanche Rhodella ..... January 24, 2018
Brown, Beulah Barbara ..... January 24, 2018
Brown, David Allen ..... June 6, 2018
Brown, Denton Hubert Laurie ..... May 9, 2018
Brown, Effie Mae ..... March 14, 2018
Brown, Keith G. ..... June 27, 2018
Brown, Russell Leo ..... May 2, 2018
Brownell, Graham William ..... February 14, 2018
Brushett, Jessie Irene ..... May 9, 2018
Buchanan, June Anne ..... April 25, 2018
Buckingham, Francis ..... April 25, 2018
Buffett, Mary Patricia ..... June 13, 2018
Bunbury, Virginia Marshall ..... February 14, 2018
Bunting, Trudi Elizabeth ..... April 18, 2018
Burbine, Theresa Jessie Lorraine ..... January 24, 2018
Burgess, Florence Eileen ..... June 27, 2018
Burke, Mary Ellen ..... June 20, 2018
Burton, Robert Lloyd ..... January 24, 2018
Bushie, Carl Frederick ..... June 13, 2018
Bushie, Margaret Jane ..... June 13, 2018
Butts, Douglas Gerald ..... May 23, 2018
Byrne, Leonard Michael ..... January 31, 2018
Caines, Elizabeth Rose ..... April 25, 2018
Calder, Hazel O. ..... July 4, 2018
Cameron, Anthony ..... May 30, 2018
Cameron, Arthur Joseph ..... March 21, 2018
Cameron, Ira Dale ..... May 2, 2018
Cameron, James Paul ..... January 24, 2018
Cameron, Maureen ..... July 4, 2018
Cameron, William Mack (aka William MacKenzie Cameron) ..... June 13, 2018
Campbell, Bruce I. B. ..... March 28, 2018
Campbell, Elizabeth ..... April 25, 2018
Campbell, John Daniel Joseph Pennell (aka John (Jack) Daniel Campbell) ..... May 23, 2018
Campbell, Laurie Francis ..... April 4, 2018
Campbell, Mary Adabelle ..... January 24, 2018
Campbell, Ramonda Mae ..... May 16, 2018
Campbell, Winnifred L. ..... May 2, 2018
Cann, Gordon ..... January 31, 2018
Carpenter, Shirley A. (aka Shirley Ann Carpenter) ..... June 20, 2018
Carr, Donald ..... June 13, 2018
Carroll, Joan Shirley ..... April 18, 2018
Carter, James Robert ..... May 23, 2018
Carver, Earl James ..... May 9, 2018
Casey, Ernest Marcel (aka Ernest Marcel Caissie) ..... May 9, 2018
Cashen, Garnett Belle ..... June 13, 2018
Chandler, Carol Elizabeth ..... May 2, 2018
Chandler, David Bryant ..... May 9, 2018
Charlton, Minnie Elizabeth ..... February 7, 2018
Chase, Carrie Elizabeth ..... April 4, 2018
Chisholm, Evelyn Marie ..... April 18, 2018
Christison, David Bruce ..... April 11, 2018
Chute, Minnie ..... January 31, 2018
Clark, Anita ..... June 6, 2018
Clarke, Maria Marianne ..... June 13, 2018
Clayton, Minnie L. ..... June 27, 2018

© NS Office of the Royal Gazette. Web version.

Clements, Brenda Mildred ..... March 28, 2018
Coady, Claudia Gertrude ..... February 7, 2018
Coates, Gordon Douglas ..... March 28, 2018
Cochkanoff, Orest ..... March 21, 2018
Cochrane, Donna Norine ..... February 14, 2018
Collier, June Pauline ..... January 24, 2018
Collins, James Edward ..... June 27, 2018
Collins, Margaret Joy ..... January 24, 2018
Comeau, Joseph Delbert ..... June 27, 2018
Comeau, Norbert Joseph ..... July 11, 2018
Comeau, Philip Jospeh ..... May 2, 2018
Comeau, Reginald Joseph ..... June 20, 2018
Connolly, Rachel Lynn ..... May 23, 2018
Conrad, Frank Daniel ..... May 30, 2018
Conrad, Howard William Floyd ..... March 14, 2018
Conrad, Leo Mathias ..... April 4, 2018
Conrad, Lola Ruth ..... July 4, 2018
Conrad, Marion Victoria ..... May 23, 2018
Conron, Ernest ..... June 13, 2018
Cook, Thelma ..... July 4, 2018
Cook, Valda L. ..... April 25, 2018
Corbett, Ralph Bernard ..... January 24, 2018
Corkum, Frank S. ..... May 23, 2018
Cormier, Dorothy Veronica ..... May 2, 2018
Cosman, Gerry Douglas ..... February 14, 2018
Cotie, Alice ..... June 27, 2018
Cotter, Chester St. Clair ..... March 14, 2018
Coughran, Ralph Stevens ..... February 28, 2018
Covert, W. Michael S. ..... March 7, 2018
Covey, Betty Kathleen ..... April 18, 2018
Cox, Edward Cecil (aka Edward Cecil McIntyre Cox) ..... February 7, 2018
Cox, Goerge A. ..... May 23, 2018
Crane, Peter William ..... March 7, 2018
Crane, Susanne ..... February 21, 2018
Crane, Vera ..... February 14, 2018
Crespo, José ..... May 9, 2018
Crewe, Frank (aka Frank Sydney Crewe) ..... May 23, 2018
Croft, Kevin James ..... January 31, 2018
Croft, Russell Lynwood ..... February 14, 2018
Cromwell, Edith P. ..... April 4, 2018
Crook, Dorothy Ann ..... April 11, 2018
Crosby, Cecil Richard ..... May 2, 2018
Crouse, Alfred J. ..... March 14, 2018
Crouse, Edgar E. (aka Edgar Earl Crouse) ..... February 14, 2018
Crouse, Joan ..... June 6, 2018
Crowe, Michael Ross ..... May 30, 2018
Crowell, Bonnie Eliane ..... May 30, 2018
Crowell, Harold Doane ..... March 14, 2018
Crowell, Margaret Olive ..... February 7, 2018
Cruickshank, Evelyn Edith ..... June 20, 2018
Cummings, Sue Ellen ..... April 4, 2018
Cunningham, Louise Helen (aka Helen Louisa Cunningham) ..... May 16, 2018
Currie, Donna Juanita ..... March 28, 2018
Currie, Peter Douglas ..... May 16, 2018
Curry, Betty Lorraine ..... June 27, 2018
Curry, Jean Florence ..... June 6, 2018
Curry, Rose Carolyn ..... May 9, 2018

© NS Office of the Royal Gazette. Web version.

Cuvelier, Shirley Jean ..... March 28, 2018
Daniels, David William ..... February 14, 2018
Das, Amal Krishna ..... May 16, 2018
Dauphinee, Beatrice E. ..... April 18, 2018
Dauphinee, Dorothy Evelyn ..... March 28, 2018
Dauphinee, Evans William ..... March 28, 2018
Dauphinee, Graham Clifford ..... April 11, 2018
Dauphinee, Ian Donald ..... March 7, 2018
Dauphinee, Wilfred Tennyson ..... January 24, 2018
Daury, Gertrude (Trudy) Anne (aka Gertrude Anne Daury) ..... July 4, 2018
David, Paul Alcide ..... May 30, 2018
Davies, Jean Ann ..... March 14, 2018
Davison, Enid Elizabeth ..... May 30, 2018
Dawe, Joseph Herman ..... April 25, 2018
Day, Alma ..... May 2, 2018
DeBaie, Allan Christopher ..... July 11, 2018
DeBay, John Clarence ..... July 11, 2018
Delaney, Sterling Evan Walter ..... May 16, 2018
Delong, Richard Kevn ..... May 16, 2018
Dempsey, Patricia Edith ..... May 16, 2018
d'Entremont, Catherine Isabelle ..... March 21, 2018
d'Entremont, Richard David ..... February 7, 2018
Derrick, Michael Christopher ..... March 21, 2018
Desmond, Lionel Ambrose ..... July 4, 2018
Deveau, Anna Lucille (aka Lucille Deveau) ..... April 25, 2018
Deveau, J. Alphonse ..... April 18, 2018
Dexter, Jeanetta Naomi ..... March 28, 2018
Diaczenko, Catherine Jane ..... May 16, 2018
Dick, Arthur Allen ..... May 30, 2018
Dick, John Rutherford ..... February 7, 2018
Dickson, Mary Bridget ..... May 2, 2018
Dickson, Rhoda M. ..... March 28, 2018
Dimaio, Frank John (aka Frank J. Dimaio; aka Frank Dimaio) ..... May 23, 2018
Dionne, Gladys Jane ..... June 27, 2018
Dixon, Louis Francis ..... June 6, 2018
Doane, Edward Gregory ..... May 23, 2018
Dockrill, Ralph Arnnold ..... June 13, 2018
Dodge, Elsie Mae ..... April 18, 2018
Doncaster, Shirley Irene ..... April 11, 2018
Donogue, Loretta (aka Edna Loretta Donohue; aka Laurie Donohue) ..... March 28, 2018
Dorrington, John Joseph ..... July 11, 2018
Doucet, Abel Benoit ..... July 4, 2018
Doucet, John Edward ..... January 31, 2018
Doucette, Arlene Ann ..... May 16, 2018
Doucette, Claude Omer ..... June 20, 2018
Doucette, Marjorie Beatrice ..... April 11, 2018
Doucette, R. Lionel ..... June 6, 2018
Drebot, Michael Alexander ..... March 14, 2018
Druggan, Joseph C. ..... February 21, 2018
Dugandzic, Andrew ..... April 11, 2018
Dugas, Catherine Gertrude (aka Catherine G. Dugas) ..... April 18, 2018
Duggan, Dixie Bear ..... April 25, 2018
Duggan, John Joseph ..... May 16, 2018
Dunham, Janet Leslie Marie ..... February 14, 2018
Durkee, William Lester ..... July 4, 2018
Duyon, Daniel Thomas ..... May 30, 2018
Dwyer, Lloyd ..... March 7, 2018

© NS Office of the Royal Gazette. Web version.

Eagles, David Ian ..... April 11, 2018
Eames, Judith Dolina ..... May 2, 2018
Earl, Muriel Anne ..... January 31, 2018
Eaton, Dennis Wesley ..... April 11, 2018
Eisner, Joan Patricia ..... March 7, 2018
Eldridge, Judy Anne Marie ..... June 27, 2018
Eldridge, Raymond Gregory ..... July 4, 2018
Eldridge, Valerie Ann (corrected Jul 4-2018) ..... June 13, 2018
Elliott, John Patrick ..... April 11, 2018
Ellis, Barbara Patricia Joan ..... March 21, 2018
Ellis, Goldie Mitchell ..... April 4, 2018
Ellis, Gordon Neil ..... May 30, 2018
Ells, Gary Rand ..... July 4, 2018
Elms, Marion Lahiah ..... May 30, 2018
Elnono, Tawfic Robin ..... April 18, 2018
Embree, Lorne Carter ..... June 20, 2018
Emms, Hazen Frederick ..... June 27, 2018
Ernst, Jean Elizabeth ..... July 11, 2018
Ernst, Jean Elizabeth (cancelled, republished Jul 11-2018) ..... June 27, 2018
Ernst, Ronald Charles ..... June 27, 2018
Ernst, Ruby Ethel ..... June 20, 2018
Erskine, Louise ..... June 27, 2018
Evans, Charlotte Anne ..... July 4, 2018
Evans, Clara Emma ..... June 27, 2018
Evans, Lillian Josephine ..... April 11, 2018
Fagen, Ronald Thomas ..... March 21, 2018
Fanjoy, Marilyn Isabel ..... July 4, 2018
Farin, Mabel Maud ..... April 11, 2018
Farrell, Joyce Alexis ..... January 31, 2018
Farrell, Margaret Rita ..... June 6, 2018
Farthing, Norman Gerald ..... June 27, 2018
Faulkner, Daphne Hilda Joan ..... June 27, 2018
Ferguson, Helen Irene ..... January 24, 2018
Fevens, Phyllis Frances ..... May 2, 2018
Fiander, Llewellyn ..... April 18, 2018
Fields, Grace Annie ..... February 28, 2018
Findlay, Leslie S. ..... January 24, 2018
Fisher, Ralph Douglas ..... July 11, 2018
Fitch, Eldon Lamont ..... February 28, 2018
Fitzgerald, Arnold William John ..... June 13, 2018
Fitzpatrick, Anna Le Fave ..... February 14, 2018
Flaherty, John D. ..... June 6, 2018
Flaherty, Roger W. ..... June 6, 2018
Foote, Dorothy Amelia ..... April 11, 2018
Foote, Margaret Marion ..... June 13, 2018
Forbes, Nancy Lynn ..... May 9, 2018
Forward, Raymond ..... April 11, 2018
Fougere, Stanley Daniel ..... May 23, 2018
Frail, Linda Louise ..... May 23, 2018
Francis, Victor Edward ..... March 28, 2018
Fraser, Alexander Dawson ..... April 25, 2018
Fraser, Barrie Huggan (aka Barrie H. Fraser) ..... May 30, 2018
Fraser, Bruce Cleveland ..... July 11, 2018
Fraser, Dorilda Ann Frances ..... July 11, 2018
Fraser, Evelyn J. ..... June 20, 2018
Fraser, James Alexander ..... April 11, 2018
Fraser, John William ..... April 11, 2018

© NS Office of the Royal Gazette. Web version.

Fraser, Yvonne Carolyn ..... March 7, 2018
Fredericks, James Kenneth ..... March 28, 2018
Freeman, Gertrude V. (Bowmaster) ..... March 14, 2018
Freeman, Thomas Lawrence ..... April 25, 2018
French, Leona Bridget ..... February 28, 2018
Fricker, Brian Cyril ..... January 24, 2018
Frotten, Anna M. ..... May 9, 2018
Frotten, Anne Emelinne ..... April 11, 2018
Gabriel, Elmore Phillip ..... February 21, 2018
Gaetz, Shirley Marguerite ..... February 28, 2018
Gagnon, Robert Allan ..... February 7, 2018
Gale, Levi Harrison ..... May 16, 2018
Gardiner, Marguerite Camille ..... March 21, 2018
Garrison, Ruth Marion ..... June 13, 2018
Gartland, Ruth Marie ..... June 27, 2018
Gartland, William Gerard ..... April 4, 2018
Gates, Blossom Maud ..... July 4, 2018
Gates, Lindsay Carroll ..... March 14, 2018
Gauthier, Noel Ernest ..... June 13, 2018
Gavel, Emery William ..... April 25, 2018
Gendreau, Scott David ..... May 30, 2018
Giddy, Howard Leonard ..... January 31, 2018
Gidney, Michael Joel ..... May 16, 2018
Gilfoy, Anne Velma ..... June 6, 2018
Gilkie, Chesley Stephen ..... March 7, 2018
Gillis, Alena MacDonald (aka Susan Alena Catherine Gillis) ..... May 16, 2018
Gillis, Catherine Louise ..... April 4, 2018
Gillis, Donna Marie (corrected May 30-2018) ..... May 9, 2018
Gillis, Joan Marie ..... June 13, 2018
Gillis, Martin Joseph ..... May 23, 2018
Gillis, Myra Grace ..... March 28, 2018
Gilmour, Mary Josephine ..... July 11, 2018
Girrior, Wilfred John Edward ..... February 7, 2018
Goodwin, Arnold Ashton ..... January 24, 2018
Gordon, Reta Florence ..... June 6, 2018
Gottfried, James Alan ..... February 28, 2018
Gough, Angela Elizabeth ..... March 28, 2018
Graham, Paula Kathleen ..... March 21, 2018
Graham, Phyllis Beatrice ..... June 13, 2018
Gratto, Esther Ann ..... May 30, 2018
Gratto, George Francis ..... February 28, 2018
Graves, Donald Theodore ..... March 14, 2018
Gray, Carol Hope Heather ..... June 20, 2018
Gray, Gordon Campbell ..... June 20, 2018
Gray, Noreen Eleanor (aka Noreen Gray) ..... July 11, 2018
Greene, Benjamin Aloysius ..... February 7, 2018
Griffiths, David W. ..... May 30, 2018
Grossman, Rolf Helmut (aka Helmut Rolf Grossman) ..... January 24, 2018
Grover, Harold Bloomfield ..... March 7, 2018
Guild, Margaret Ann ..... June 20, 2018
Gummow, Jessie Taylor (corrected Apr 25-2018) ..... April 18, 2018
Gurney, Marilyn ..... June 6, 2018
Haase, Martin Rudolph ..... February 14, 2018
Hahn, Ellen Marie ..... May 16, 2018
Haldeman, Ronald Wayne ..... June 20, 2018
Haley, Michael Paul ..... January 31, 2018
Halfpenny, Everett (aka Ronald Everett Halfpenny; aka Everett Ronald Halfpenny) ..... July 11, 2018

© NS Office of the Royal Gazette. Web version.

Hall, Constance Beatrice ..... February 14, 2018
Hall, David Roger ..... January 24, 2018
Hallett, Bradford Eugene ..... February 14, 2018
Halliwell, Rose Marie ..... April 11, 2018
Halverson, Veronica Christine ..... February 14, 2018
Hamilton, Nancy Grace ..... May 2, 2018
Hamilton, Victor Harlyn ..... February 7, 2018
Hammond, Joan Anne ..... May 16, 2018
Hanifen, Patricia Ann ..... June 6, 2018
Harding, Eva Bernice ..... March 14, 2018
Hardy, Audrey Jean ..... June 20, 2018
Harnish, Doris Lorraine ..... June 27, 2018
Harrington, Jessie ..... May 2, 2018
Harris, Bessie Louise ..... February 14, 2018
Harris, Charlotte Patricia ..... July 11, 2018
Harris, Jane ..... April 18, 2018
Harrison, Donald Duncan ..... February 14, 2018
Harrison, Irene L. (aka Laurice Irene Harrison) ..... March 7, 2018
Harrison, Shirley Eileen ..... June 6, 2018
Harvey, Ella Genevieve ..... March 28, 2018
Harvey, James Laurie ..... April 25, 2018
Harvey, Myrna Faye ..... April 4, 2018
Harvey, William Ross ..... March 7, 2018
Hathaway, Mary Catherine ..... April 18, 2018
Hatherly, Bertram Edmund ..... April 4, 2018
Hatt, Marie Julia ..... March 14, 2018
Havens, Richard P. (aka Richard Havens) ..... February 7, 2018
Hayes, Phyllis Anne ..... May 9, 2018
Haywood, Samuel Walter ..... March 7, 2018
Hebb, Errol Breau ..... February 28, 2018
Hebb, Lynn Eric ..... February 14, 2018
Hebb, Ruth Elizabeth ..... May 30, 2018
Heckbert, David Wilfred ..... January 31, 2018
Helliwell, John Reginald ..... May 9, 2018
Herbin, Shirley Abigail ..... February 21, 2018
Herman, Harvey Lloyd ..... February 7, 2018
Herman, Michelle Jeanrita ..... April 11, 2018
Hersey, Heather Helene ..... May 30, 2018
Hewey, Marina Vileata ..... March 28, 2018
Hickey, Shirley May ..... April 4, 2018
Hickey, William Reginald ..... February 21, 2018
Higgins, Robert Francis Gregory ..... May 2, 2018
Hilchie, Dorothy Adalene (aka Dorothy Adelene Hilchie) ..... May 2, 2018
Hill, Antoinette Theresa ..... June 13, 2018
Hill, Ravid Russell ..... May 23, 2018
Hillier, Donna Lee Theresa ..... June 6, 2018
Hillier, Edgar Raymond ..... February 7, 2018
Hillier, John Elmer ..... March 28, 2018
Hiltz, Carl Henry ..... February 28, 2018
Hiltz, Gerard (aka Gerald Clyde Hiltz) ..... July 11, 2018
Hingley, Georgie Louise ..... March 21, 2018
Hire, William Kenneth ..... July 11, 2018
Hodgson, Brian Arthur ..... May 9, 2018
Hogan, Anna Fray ..... May 30, 2018
Hogan, Henry Albert ..... April 18, 2018
Hogan, Irma ..... April 11, 2018
Hogan, Linda Dorothy ..... April 18, 2018

© NS Office of the Royal Gazette. Web version.

Hollis, John Almer ..... July 4, 2018
Holmes, June Oliver ..... June 13, 2018
Hominick, Evelyn ..... March 14, 2018
Hood, Edward William ..... April 4, 2018
Hope, David ..... March 14, 2018
Horne, Albert Joseph ..... April 18, 2018
Horne, Bertha E. ..... April 11, 2018
Horrocks, Sandra ..... February 21, 2018
Houlihan, Maureen Elaine ..... March 14, 2018
Hudgins, Dorothy Etta ..... March 21, 2018
Hudson, Donna Marguerite ..... January 31, 2018
Humphries, Mary Elizabeth ..... May 2, 2018
Hurlburt, Truman Moore ..... March 28, 2018
Hussey, Effie Elizabeth ..... February 21, 2018
Hynes, Edith Luetta ..... May 2, 2018
Hynes, Edward Arthur ..... February 28, 2018
Hyslop, Jonathan Clyde ..... April 18, 2018
Ireland, Constance "Connie" Louise ..... June 20, 2018
Irving, Marion Althea ..... July 4, 2018
Iwaskow, Susanna ..... February 21, 2018
Jackson, Judith Marie ..... May 23, 2018
Jacquard, Neree Bernard ..... January 24, 2018
Jamieson, Shirley Berton ..... April 11, 2018
Janes, Frank Reginald ..... February 28, 2018
Jardine, Joan Barbara ..... June 20, 2018
Jeffery, Margaret Lois ..... April 18, 2018
Jenkins, David Victor ..... July 4, 2018
Jennings, Carol Anne ..... May 30, 2018
Johnston, Eleanor Winnifred ..... February 14, 2018
Johnston, Phyllis Mary ..... April 25, 2018
Johnston, Ralph Harvey ..... June 20, 2018
Johnstone, Glenn William ..... July 4, 2018
Jollymore, Alisa Christina ..... June 27, 2018
Jones, Eileen Doris ..... May 16, 2018
Jones, Jane Grant ..... March 14, 2018
Jordan, Carl Alexander ..... February 7, 2018
Jordan, Maurice Owen (aka Mike Jordan) ..... January 31, 2018
Joseph, Neiff ..... June 20, 2018
Joudrey, Emery Winslow ..... May 9, 2018
Joudrey, Nita Jean ..... February 28, 2018
Joyce, Helen Jean ..... April 25, 2018
Kane, Ralph Augustine ..... July 4, 2018
Kariler, Marjorie Pauline (aka Pauline Marjorie Kariler) ..... February 28, 2018
Katz, Shoshana ..... May 9, 2018
Kazmerchuk, Patricia Winifred ..... January 24, 2018
Keagan, Daniel Leo ..... March 21, 2018
Keddy, Francis Eugene ..... March 14, 2018
Keigan, John William ..... April 4, 2018
Keirstead, Linda Georgie ..... February 21, 2018
Keizer, Brenda Theresa ..... June 27, 2018
Kelley, Malcolm George ..... February 28, 2018
Kellough, Gordon Russell ..... May 16, 2018
Kelly, Jean Doris (aka Jean Kelly) ..... February 7, 2018
Kendrick, Edna Vivian ..... February 21, 2018
Kenington, Raymond Clark ..... April 25, 2018
Kenneally, Garth ..... June 6, 2018
Keys, David Canning ..... April 25, 2018

© NS Office of the Royal Gazette. Web version.

Kilby, Kenneth Andrew ..... April 25, 2018
Kilpatrick, Charles Brainbridge ..... July 11, 2018
Kilpatrick, Hazel Margaret ..... May 2, 2018
Kimball, Roy Edward ..... March 21, 2018
Kindervater, Marion ..... May 16, 2018
King, Claudette A. (aka Claudette Anastasia King) ..... February 7, 2018
King, Wayne Bruce ..... April 18, 2018
King, William Joseph ..... March 7, 2018
Kingsbury, Maureen Patricia ..... July 4, 2018
Kinley, Grace Elizabeth ..... February 7, 2018
Kirby, William Douglas ..... February 28, 2018
Kitchen, Pamela Lois ..... January 24, 2018
Kline, Linda Marie ..... May 2, 2018
Kratky, Petra ..... February 21, 2018
Kreitner, Gerhardus Leopold ..... June 27, 2018
Kugel, Gillian Stephanie ..... June 13, 2018
Kuipers, Shirley Ruth ..... May 16, 2018
Lacey, Edward Charles ..... February 7, 2018
Lackie, William George ..... July 11, 2018
LaFrance, Joseph Felix Adrien Michel ..... January 31, 2018
Lahey, Raymond James ..... April 18, 2018
Lake, Margaret ..... June 6, 2018
Lake, Philip Dennis ..... March 14, 2018
Lamey, Phyllis Irene ..... June 6, 2018
Lane, John Hamilton (aka Jack Lane) ..... April 11, 2018
Lane, Kevin Bruce ..... April 4, 2018
Langille, Charles Clifford ..... May 16, 2018
Langille, Gertrude Margaret Elliott ..... May 30, 2018
Langley, Anna Catherine "Nancy" ..... May 16, 2018
Larkin, David Allan ..... June 13, 2018
LaRose, Denton John ..... January 24, 2018
Latter, Sylvia Marie Theresa ..... May 23, 2018
Latwaitis, Anthony (aka Anthony David Latwaitis) ..... January 24, 2018
Lauder, Douglas Bruce ..... July 11, 2018
Laureijs, Aldegonda Francisca M. C. (aka Aldegonda Francisca M. C. Laureys) ..... April 25, 2018
Laurilliard, Gordon Arthur ..... February 21, 2018
Lavers, Donna May ..... July 11, 2018
Lavers, Margaret Laura ..... February 14, 2018
Lawless, Cecil Douglas ..... July 4, 2018
Lawrence, Thomas Michael ..... March 28, 2018
Lawson, Daniel Alexander ..... June 13, 2018
Lawson, Jessie Cecilia ..... March 14, 2018
Leaman, Barbara ..... June 20, 2018
LeBlanc, Allan Roy (aka Allan R. LeBlanc) ..... May 16, 2018
LeBlanc, Andrew Michael ..... February 21, 2018
LeBlanc, Dorice Jeanne Marie ..... May 23, 2018
LeBlanc, Gerald Joseph ..... June 27, 2018
LeBlanc, Leo Paul ..... June 27, 2018
LeBlanc, Richard Joseph ..... May 2, 2018
Lee, Shirley Joan ..... May 16, 2018
Lee, Walter Charles ..... May 16, 2018
LeFave, Lorraine Frances ..... April 25, 2018
LeFave, Theodore Raymond ..... April 18, 2018
LeFort, Patricia Anne (aka Patricia Anna LeFort) ..... March 14, 2018
Leighton, Rodney Lawrence ..... January 24, 2018
Lenaghan, Zena Raymonia ..... May 16, 2018
Leopold, Marjorie Anne ..... June 6, 2018

© NS Office of the Royal Gazette. Web version.

Lerch, Sandra Dawn....June 20, 2018
Leslie, Sheila Marie....June 20, 2018
Leslie, William Milton....April 25, 2018
Levesque, Colin Peter....May 9, 2018
Levo, Carl Richard....April 11, 2018
Levy, Murray Albert....July 11, 2018
Levy, Robert Ernest....February 21, 2018
Levy, Ronald Vernon....March 28, 2018
Lewis, Edward Adam James....April 11, 2018
Lewis, Magdalene (Madge)....April 25, 2018
Lewis, Mary Irene....May 30, 2018
Lewis, Ruth Ethel....January 31, 2018
Limoges, June Rilla (aka Rilla June Limoges)....June 13, 2018
Lindsay, Mary Roberta....July 11, 2018
Lingley, Margaret Gertrude....April 4, 2018
Little, Evelyn A.....February 7, 2018
Little, James Edward....February 14, 2018
Little, Waunita Evangeline....July 11, 2018
Lively, Lena Mae....May 30, 2018
Logan, Wilfred Riggs....April 11, 2018
Lohnes, Helen Audrey....May 30, 2018
Long, Thane Verdon....February 7, 2018
Longmire, Walter Raymond....May 16, 2018
Loomer, Ruby Marlene....April 25, 2018
Lowe, Grace Evelyn....April 25, 2018
Lowe, Joseph Harold....February 21, 2018
Lowther, Dennis Michael....March 7, 2018
Luedemann, Joan Irene....February 14, 2018
Lynk, Phillemena Marie (aka Phillimena Marie Lynk)....January 24, 2018
Lyons, Barshill....May 2, 2018
Lyons, David Bruce....June 6, 2018
Lyons, Donald Erwin....June 13, 2018
Lyons, Robert Burns, Sr.....July 4, 2018
Lysecki, Norma Shirley....June 6, 2018
MacAskill, Effie Mildred....June 20, 2018
MacAskill, James Freeman....June 20, 2018
Macaulay, Louis John....April 18, 2018
MacCallum, Jean Margaret....May 16, 2018
MacCaul, Ruth Ellen....March 14, 2018
MacDonald, Alexander Hugh....March 14, 2018
MacDonald, Alexis....March 7, 2018
MacDonald, Allister Wayne....April 11, 2018
MacDonald, Angus Allan....May 16, 2018
MacDonald, Anna Winnifred....January 31, 2018
MacDonald, Chalres Roy....February 14, 2018
MacDonald, Dorothy Ruth....June 27, 2018
MacDonald, Harold Enslie....April 25, 2018
MacDonald, Howard Roy....April 18, 2018
MacDonald, M. Teresa....June 13, 2018
MacDonald, Malcolm John Allan....January 24, 2018
MacDonald, Marcella Marie....June 13, 2018
MacDonald, Mary Augusta....May 16, 2018
MacDonald, Mary Patricia....February 14, 2018
Macdonald, Pamela Lillian....June 13, 2018
MacDonald, Robert Benvie....April 25, 2018
MacDonald, Ronald Jeffrey....January 24, 2018
MacDougall, Kathleen Sarah (aka Kathleen MacDougall)....June 27, 2018

© NS Office of the Royal Gazette. Web version.

MacDougall, Sandra Marie ..... April 11, 2018
MacDougall, Shirley Marie ..... April 25, 2018
MacEachern, Donald Irving (aka Donal Irving MacEachern; aka Donald Irvin MacEachern) ..... March 28, 2018
MacEachern, Mabel Lillian ..... June 13, 2018
MacFarlane, Dougald A. ..... June 27, 2018
MacGillivray, James Allan ..... February 7, 2018
MacGillivray, Vivian Helena ..... June 20, 2018
MacGregor, Elsie M. ..... February 14, 2018
MacInnes, Sandra M. ..... May 2, 2018
MacInnis, Colin Joseph ..... February 14, 2018
MacIntyre, Bernard Gerard ..... February 21, 2018
MacIntyre, Catherine Elizabeth ..... April 18, 2018
MacIsaac, John Angus ..... May 30, 2018
MacIsaac, Rita Frances ..... June 6, 2018
MacKay, Barry Kevin ..... May 16, 2018
MacKay, George Albert ..... February 28, 2018
Mackay, Glenwood William ..... January 24, 2018
MacKenzie, Hugh Gilmour ..... April 25, 2018
MacKenzie, Laurie Alexander ..... January 31, 2018
MacKenzie, Mabel Cora ..... January 24, 2018
Mackesey, Grace ..... May 30, 2018
MacKinnon, Annabelle ..... January 31, 2018
MacKinnon, Colin Alastair ..... June 6, 2018
MacKinnon, Elizabeth ..... May 9, 2018
MacKinnon, Sylvia Charlaine ..... January 24, 2018
MacKinnon-Kelly, Amilda (aka Amilda MacKinnon; aka Amilda R. MacKinnon) ..... February 21, 2018
MacLachlan, Sylvia Joyce (aka Sylvia MacLachlan) ..... May 16, 2018
MacLean, Cheryl Anne ..... May 9, 2018
MacLean, Donald ..... July 11, 2018
MacLean, Gregory ..... June 27, 2018
MacLean, Helen M. (aka Helen Margaret MacLean) ..... February 14, 2018
MacLean, Jean M. (aka Marion Jean MacLean) ..... February 14, 2018
MacLean, Keith Grant ..... May 30, 2018
MacLellan, Donald Venantius ..... February 14, 2018
MacLellan, Mary Mildred ..... April 18, 2018
MacLEllan, Thalia Alice (aka A. Thalia MacLellan) ..... June 6, 2018
MacLeod, Donald Archie ..... May 30, 2018
MacLeod, Doreen Alberta (aka Doreen A. MacLeod) ..... March 14, 2018
MacLeod, Gordon Douglas ..... February 14, 2018
MacLeod, Ian Grant ..... April 4, 2018
MacLeod, Jean Francis ..... May 23, 2018
MacLeod, Nora ..... July 4, 2018
MacLeod, Phyllis Gwendolyn ..... May 2, 2018
MacMaster, Phyllis Elaine ..... May 16, 2018
MacMillan, Kyle ..... May 30, 2018
MacMullen, Aldred ..... April 11, 2018
MacMullin, Deborah ..... May 30, 2018
MacMullin, John Peter ..... April 18, 2018
MacNab, George Alexander ..... April 11, 2018
MacNeil, George Hamilton ..... March 7, 2018
MacNeil, John Alex ..... June 6, 2018
MacNeil, Leo Francis ..... May 2, 2018
MacNeill, Leslie Anne (aka Leslie Ann MacNeill) ..... May 9, 2018
MacNeill, Phyllis Jane ..... May 2, 2018
MacNutt, Evelyn Beatrice ..... May 9, 2018
MacPhee, John Edward (aka John Edward McPhee) ..... March 28, 2018
MacPhee, Patricia Mary ..... July 4, 2018

© NS Office of the Royal Gazette. Web version.

MacPhee, Phyllis Joyce ..... May 23, 2018
Macpherson, John Alexander (aka John Alick Macpherson) ..... June 6, 2018
MacQuarrie, Bruce Albert ..... February 7, 2018
MacRoberts, Donald Ephram ..... May 2, 2018
MacSwain, Vera May ..... February 28, 2018
Mahaney, Thelma Alena ..... May 2, 2018
Mahar, Rhea Dawn ..... January 31, 2018
Mann, Patricia Louise ..... April 11, 2018
Manning, David Shawn ..... June 13, 2018
Marchant, Marguerite Belle ..... February 28, 2018
Marcus, Haroldine Shirley ..... May 30, 2018
Marinelli, Gerald Anthony ..... April 18, 2018
Marney, Helen Rbuy Anne ..... April 25, 2018
Marr, Caroline M. (aka Caroline Mary Marr) ..... February 14, 2018
Marsh, Francis Xavier ..... March 21, 2018
Marsh, Joanne Marilyn ..... June 20, 2018
Marsh, Marilyn Amy ..... May 16, 2018
Marshall, Luella Amelia ..... March 14, 2018
Martell, Colleen ..... March 28, 2018
Martin, Frances Elizabeth ..... January 24, 2018
Martin, Ralph Francis ..... May 23, 2018
Martinello, Charles Joseph ..... March 21, 2018
Mason, Catherine Judith ..... February 28, 2018
Mason, William Francis ..... April 18, 2018
Matheson, John Leo (aka Leo John Matheson) ..... March 28, 2018
McBride, Wanda Darlene ..... April 18, 2018
McCabe, Deryk Reginald ..... February 28, 2018
McCabe, Weldon Wayne ..... March 14, 2018
McCallum, William Joseph ..... February 7, 2018
McCann, William Barrington ..... March 14, 2018
McCarthy, Kevin Forrest ..... March 7, 2018
McClelland, Forrest H. ..... January 24, 2018
McClure, Darrell Thomas ..... March 14, 2018
McCully, Vernon Archibald ..... February 21, 2018
McCurdy, Katherine Thelma MacDonald (aka Katherine Thelma McCurdy) ..... June 13, 2018
McDonald, Judith Grace (aka Judy Grace McDonald ..... March 21, 2018
McDonald, Mary ..... May 30, 2018
McDonald, Rebecca Mae ..... April 11, 2018
McDonald, Valerie Mildred ..... February 14, 2018
McElhinney, Emma Marie ..... April 18, 2018
McGill, Richard Hallett ..... June 6, 2018
McGowan, Timothy James ..... February 21, 2018
McGrath, Marion Edith ..... February 7, 2018
McGuigan, Peter Thomas ..... May 23, 2018
McIsaac, Joan Lynn ..... June 13, 2018
McIvor, Pamela Yvonne (cancelled – listed in error) ..... March 21, 2018
McKay, James Edward ..... April 18, 2018
McKean, Ruth Virginia ..... May 30, 2018
McKenna, William Ogilvie ..... April 11, 2018
McKenzie, Alisair Scott ..... May 2, 2018
McKenzie, Ethel Jean ..... February 14, 2018
McLean, Yvonne Vergie ..... March 14, 2018
McLellan, Emery Ivan ..... May 9, 2018
McLelland, Elinor Lynn ..... June 20, 2018
McLemon, James ..... January 31, 2018
McLeod, Norman Everette ..... February 7, 2018
McMackin, Ronald Murray ..... March 7, 2018

© NS Office of the Royal Gazette. Web version.

McManus, Gertrude Elizabeth ..... June 27, 2018
McMullen, Jean Mae ..... February 14, 2018
McMullen, Sherly Elaine ..... March 7, 2018
McNamara, Martin (aka Martin MacNamara) ..... January 24, 2018
McNeil, James Leonard (aka James Leonard MacNeil) ..... March 14, 2018
McNeil, John William (aka John W. McNeil) ..... March 21, 2018
McNeil, Shirley ..... March 7, 2018
McPhee, Alfreda May ..... June 13, 2018
McSwiggan, Niall Francis ..... May 30, 2018
McWhinnie, Irving Allen ..... April 25, 2018
Megaffin, M. Patricia ..... June 13, 2018
Meisner, Sarah Josephine ..... July 4, 2018
Melanson, Gwendoline Iona ..... March 14, 2018
Melvin, Virginia Ann ..... January 24, 2018
Menzies, Sharon (aka Sharon Kaye Menzies) ..... June 13, 2018
Mercer, Louis ..... March 7, 2018
Metcalfe, William Wayne ..... March 14, 2018
Micklewright, Helen Olive Marie ..... May 16, 2018
Middleton, Maurice ..... June 6, 2018
Milbery, Michael Gregory ..... June 20, 2018
Miller, Agnes ..... May 9, 2018
Miller, Alan Waldie ..... January 31, 2018
Milley, Ian March ..... May 9, 2018
Milligan, George Clinton ..... June 20, 2018
Mills, Elaine Marie ..... May 23, 2018
Mills, Helen M. ..... June 27, 2018
Mitchell, John Richard ..... April 4, 2018
Mitchell, Lorna Jean ..... March 21, 2018
Mitchell, Terrence (Terry) (aka Terrance Mitchell) ..... April 11, 2018
Monk, Floyd Wayne ..... May 23, 2018
Moore, Alice Swales ..... May 30, 2018
Moore, Claire ..... April 25, 2018
Moore, Dorothy Marguerite ..... April 11, 2018
Moore, Marion Ethel ..... April 11, 2018
Morgan, Charles Edward ..... April 18, 2018
Moriarty, John Colin ..... January 31, 2018
Morine, Gerald William ..... July 4, 2018
Morrell, Isabell ..... February 7, 2018
Morris, Arthur ..... April 11, 2018
Morris, John Thomas ..... June 27, 2018
Morrison, Marion Alice ..... February 7, 2018
Morrison, Patricia Ann ..... April 18, 2018
Morrison, Ruth ..... May 23, 2018
Morrison, Stanley Edward ..... April 25, 2018
Morrison, Theresa Isabel ..... April 11, 2018
Morrone, Antonia ..... May 2, 2018
Morrow, Cynthia Florence Louise ..... May 2, 2018
Morse, Barry Dewar ..... March 7, 2018
Moseley, John B. ..... May 23, 2018
Moses, George Earle (aka Geroge Earl Moses) ..... April 11, 2018
Mosher, Paul Ivan ..... May 30, 2018
Moulton, Albert Gordon, Jr. ..... May 16, 2018
Mrazek, Gary Wayne ..... February 7, 2018
Muise, Patricia Evelyn ..... March 21, 2018
Mulley, Donald ..... June 27, 2018
Munro, Alexander Forbes ..... February 28, 2018
Munro, Ethel Marie ..... May 2, 2018

© NS Office of the Royal Gazette. Web version.

Munroe, Adeline Mary ..... May 30, 2018
Munroe, Clyde Alexander ..... June 6, 2018
Munroe, Gavin Carlton ..... June 6, 2018
Munroe, John Alan Glen ..... June 27, 2018
Munroe, Marilyn Edith ..... January 24, 2018
Murphy, Constance Loretta ..... June 13, 2018
Murphy, Gerald ..... January 31, 2018
Murphy, John Patrick ..... February 21, 2018
Murphy, Norma Irene ..... February 7, 2018
Murphy, Ruth Marion Walsh ..... June 13, 2018
Murphy, William James ..... April 25, 2018
Murray, Mona Catherine ..... March 21, 2018
Murray, William Harry ..... July 11, 2018
Musick, Edwin William ..... May 2, 2018
Myers, Clarence Edmund ..... March 7, 2018
Myers, Sarah Shirley ..... April 25, 2018
Myles, Eric Stanley ..... May 30, 2018
Nauss, Alma Jean ..... February 14, 2018
Nauss, Dale Leslie ..... June 6, 2018
Nauss, Gordon Douglas ..... February 21, 2018
Nauss-Gunton, Verla ..... June 6, 2018
Negus, Everett Joseph ..... February 7, 2018
Nelson, Gladys Margaret ..... March 7, 2018
Nevedal, Ann Christine ..... February 21, 2018
Newell, Theodore Norville ..... February 21, 2018
Nicholson, Kathleen Beryl ..... April 4, 2018
Nickerson, Eva Mae ..... May 9, 2018
Nickerson, John C. ..... April 11, 2018
Nickerson, Judith Roxanne ..... May 23, 2018
Nickerson, Kent David ..... May 30, 2018
Nickerson, Matthew George ..... May 23, 2018
Nicoll, William Weldon ..... February 28, 2018
Noah, Arthur John ..... May 23, 2018
Noble, Natalie Vera ..... February 28, 2018
Noiles, Arnold Charles ..... February 7, 2018
Nolan, Shirley Julia ..... January 31, 2018
Nolter, Wayne Daniel ..... May 9, 2018
Noon, Marilyn Barbara ..... June 6, 2018
Nowe, Theresa E. ..... July 11, 2018
Nurnber, Helen Genevieve ..... April 18, 2018
O'Connell, Cathleen Margaret ..... May 30, 2018
O'Connor, Eine Anna-Liisa ..... March 28, 2018
Ogilvie, Joan Margaret ..... June 27, 2018
O'Quinn, Laura Winnifred ..... May 9, 2018
Orr, Helen Wilma ..... March 7, 2018
Osborne, Florence Doreen Ruth ..... January 31, 2018
Osborne, John B. ..... February 7, 2018
Osborne, Valrie ..... April 25, 2018
Ouelette, Joseph Thomas Guy ..... June 27, 2018
Ovens, Margaret Ann ..... July 11, 2018
Overby, Carolyn Hazel ..... July 11, 2018
Page, Roy William Aldred ..... June 13, 2018
Parker, Bernard Raymond ..... February 21, 2018
Parker, Catherine W. ..... June 6, 2018
Parker, David T.R. ..... April 18, 2018
Parker, James A. ..... June 6, 2018
Parker, Robert David (corrected Mar 14-2018) ..... February 21, 2018

© NS Office of the Royal Gazette. Web version.

Parland, Andrew Richard ..... February 28, 2018
Parnell, Robert Gordon (aka Robert G. Parnell) ..... March 7, 2018
Parsons, David Raymond ..... March 28, 2018
Parsons, Gordon Willis ..... May 23, 2018
Parsons, Inez Josephine ..... May 16, 2018
Parsons, Lawrence William "Larry" ..... March 14, 2018
Paruch, Pamela Lenora (aka Lenora Pamela Paruch) ..... June 20, 2018
Patenaude, Marc Michel ..... May 30, 2018
Paterson, Edward T. ..... May 2, 2018
Paterson, Iris B. ..... May 2, 2018
Peach, Leroy ..... May 16, 2018
Pedersen, Hans George ..... January 24, 2018
Pellrine, Miles Marcus ..... February 21, 2018
Pelrine, Winnifred Bernadette (aka Winifred Bernadette Pelrine) ..... March 7, 2018
Pemberton, Fae Darlene ..... January 31, 2018
Penny, Kenneth J. (aka Kenneth Joseph Penny) ..... June 13, 2018
Pentz, Nina Barbara ..... March 14, 2018
Pepper, Norma Jean ..... May 23, 2018
Petitpas, Joseph Felix ..... February 21, 2018
Petrie, Rose Marie ..... March 7, 2018
Pickles, Sylvia Doris ..... March 28, 2018
Piercey, Loretta ..... April 18, 2018
Pine, Phillip Seagrave ..... April 11, 2018
Pinkham, Harland Edwin ..... June 20, 2018
Pinkham, Jessie M. (aka Jessie Madeline Pinkham) ..... June 20, 2018
Pittman, Alice ..... January 31, 2018
Pittman, Joyce M. ..... March 28, 2018
Poirier, Robert Colin (aka Robert Collin Poirier) ..... January 31, 2018
Polley, Edward Emerson ..... March 7, 2018
Poole, Elizabeth Anne Marie ..... July 4, 2018
Poole, Margaret ..... March 7, 2018
Porter, Lavaughn A. ..... March 7, 2018
Porter, Robert A. ..... March 28, 2018
Power, Genevieve Ellen ..... April 18, 2018
Power, John Kevin ..... January 31, 2018
Power, Lori Catherine ..... February 7, 2018
Price, David Walter ..... June 20, 2018
Price, Helen Beatrice ..... April 11, 2018
Pritchard, Stephanie Jane ..... May 2, 2018
Pudsey, Douglas Alexander ..... April 4, 2018
Pugh, Keith Burnett ..... February 21, 2018
Pulsifer, Phyllis Naomi Mary ..... July 11, 2018
Purvis, Shirley Blanche ..... February 14, 2018
Pye, Victor ..... March 21, 2018
Quick, Sheila Agnes ..... June 27, 2018
Radowits, Greta Ellen ..... July 4, 2018
Rafuse, Daniel Lee (aka Danny Lee Rafuse) ..... July 4, 2018
Rafuse, Ferne Mae (aka Ferne May Rafuse) ..... June 20, 2018
Rambeau, William T. ..... June 20, 2018
Ramsey, Frederick Barclay ..... March 7, 2018
Rankin, Jessie Ann ..... May 16, 2018
Ranson, Chesley (aka Chesley Joseph Ranson) ..... February 21, 2018
Raymond, Mark Vincent ..... April 11, 2018
Reddick, Elizabeth Hilda Edith ..... January 31, 2018
Redding, Harold Gordon ..... April 18, 2018
Reid, Alice Beatrice ..... April 11, 2018
Reid, Shirley Agnes ..... January 31, 2018

© NS Office of the Royal Gazette. Web version.

Reid, Steward Rollings....May 23, 2018
Reid, Winnifred Elta....June 13, 2018
Reimer, James H. ....June 13, 2018
Rensch, Detlef Harri....June 13, 2018
Revell, Ernest John....February 28, 2018
Richard, Carol Ann ....February 7, 2018
Richard, David Eric....February 21, 2018
Richard, Harvey Edmund (corrected May 16-2018) ....May 2, 2018
Richard, Thomas Francis....February 7, 2018
Richards, David Wheeler ....May 9, 2018
Rideout, Elizabeth ....June 6, 2018
Rines, Douglas Ross....June 20, 2018
Ring, Sylvia M. ....February 14, 2018
Ripley, Arnold Hance....June 20, 2018
Ritcey, Gregory Sherman ....March 21, 2018
Ritcey, Lucille Mae ....April 25, 2018
Ritcey, Philip Alan ....June 13, 2018
Roberts, Marjorie Carole....February 7, 2018
Robicheau, Catherine Anne....March 14, 2018
Robinson, Marion Gertrude.... July 11, 2018
Robinson, Valerie....June 13, 2018
Roblee, Glenn Alan ....June 6, 2018
Robson, John Brian ....June 20, 2018
Rockey, Thelma Bernice .... July 4, 2018
Rogers, Aubrey Ralph ....March 7, 2018
Roma, Albert Joseph ....June 6, 2018
Romkey, Iva Ulrica ....June 13, 2018
Romkey, Raymond Emerson....May 16, 2018
Romyn, Johannes Antonius....June 6, 2018
Roop, Charles Walter ....May 30, 2018
Roper, William George Richard....June 20, 2018
Rose, Wayne Alexander....March 28, 2018
Ross, Kim....April 25, 2018
Ross, William James ....April 25, 2018
Ross, Winifred Mary....May 2, 2018
Rowlands, Ethel Helena ....May 30, 2018
Rowlings, Katherine A. ....April 11, 2018
Rudolph, Margaret Doreen....May 9, 2018
Rushton (Bond), Sharon Veronica ....June 6, 2018
Rushton, Earl Delbert....January 31, 2018
Russell, Betty Isabel....May 2, 2018
Russell, Frances Alma....April 11, 2018
Rutherford, George....June 6, 2018
Ryan, Matthew John.... July 4, 2018
Ryan, Parker Glenn, Sr....June 20, 2018
Ryan, Sherry Mae....March 14, 2018
Ryan, William Lionel....February 7, 2018
Ryerson, Robert William....May 2, 2018
Sabean, Hendrik ....May 16, 2018
Salter, Colleen Audrey ....May 23, 2018
Sampson, Gavin Matthew ....January 31, 2018
Samson, Brian Joseph .... July 11, 2018
Sanford, Cyril Grant .... July 4, 2018
Saulnier, Edna Loretta....May 2, 2018
Saulnier, Elizabeth Marie....February 21, 2018
Saulnier, Freeman Joseph (aka Joseph Nicholas Freeman Saulnier) ....February 21, 2018
Saulnier, Mark Arthur ....June 20, 2018

© NS Office of the Royal Gazette. Web version.

Saulnier, Wendy Elva ..... March 14, 2018
Saunders, Dale Rhonda ..... June 27, 2018
Saunders, Irene Ellen ..... May 2, 2018
Sawyer, Edward Conrad ..... February 14, 2018
Sceles, Edgar Leroy ..... June 13, 2018
Schaffner, Edward Donald ..... April 25, 2018
Schenk, Enid N. ..... April 25, 2018
Schermerhorn, Sheila Mary ..... January 31, 2018
Schmidt, Hans-Peter ..... June 20, 2018
Schofield, Everett Eugene ..... February 21, 2018
Schuurkamp, Gerrit Johan Teunis ..... April 18, 2018
Schwartz, Martin ..... May 16, 2018
Scott, Julia Ellen ..... May 2, 2018
Scott-Smith, Frances Geraldine ..... May 16, 2018
Seely, Stephen John Henry ..... May 16, 2018
Sellars, Alma Rita ..... March 28, 2018
Sellars, Myrtle Christena ..... February 21, 2018
Serroul, Diane ..... April 18, 2018
Shannon, Nellie Theresa ..... February 21, 2018
Shaw, Albert Joseph (aka Dr. Albert Joseph Shaw) ..... April 25, 2018
Shaw, Beulah Dorcas ..... June 13, 2018
Shea, Bernard J. ..... May 2, 2018
Shebib, Andrew Albert Robert ..... April 25, 2018
Shephard, Mary Ruth ..... February 28, 2018
Sherman, Leao Standlly Webster ..... July 4, 2018
Sherwood, James Stephen Raymond ..... May 2, 2018
Shieh, Hang Shan ..... June 20, 2018
Shields, Audrey Ileen ..... June 6, 2018
Shute, Andrew Paul ..... April 25, 2018
Silvestri, Carlo Ferruccio ..... January 24, 2018
Simonian, Razmik ..... May 16, 2018
Sinclair, Bernadette Elizabeth ..... May 30, 2018
Sizer, Judith Sally (aka Sally Sizer) ..... March 28, 2018
Skelton, George ..... May 30, 2018
Slack, Eva Matilda ..... March 7, 2018
Slade, Wilhelmina ..... May 23, 2018
Slaunwhite, Avril Yvonne ..... June 27, 2018
Slaunwhite, Edna Frances ..... February 21, 2018
Slipp, Gwendolyn Sheila MacDonald ..... June 13, 2018
Slusarchuk, Linda Margaret ..... January 24, 2018
Smith, Clarence Alfred ..... February 14, 2018
Smith, Cora Belle (Steele) ..... May 9, 2018
Smith, Donald Ross ..... January 24, 2018
Smith, Effie Lenda (aka Effie Linda Smith) ..... June 20, 2018
Smith, Elizabeth Marie ..... April 4, 2018
Smith, Fernwood Leslie ..... January 24, 2018
Smith, Henry Thomas ..... February 14, 2018
Smith, Jean Catherine ..... June 13, 2018
Smith, Kenneth Maxwell ..... March 28, 2018
Smith, L. MacKeen (aka Leo MacKeen Smith) ..... June 6, 2018
Smith, Lillian M. ..... June 6, 2018
Smith, Mary Margaret ..... March 7, 2018
Smith, Muriel Frances ..... February 14, 2018
Smith, Peter ..... March 28, 2018
Smith, Ronald Alexander ..... February 14, 2018
Smith, Rosaline Blanche ..... May 2, 2018
Smith, Terrance Garnet ..... January 31, 2018

© NS Office of the Royal Gazette. Web version.

Sneath, Robert Alan ..... February 21, 2018
Snewing, Dennis Geoffrey (aka Geoffrey Snewing) ..... February 14, 2018
Snow, Robert Louis ..... June 20, 2018
Sonnichsen, Millicent Pearl ..... July 4, 2018
Spence, Cedric Lyona ..... May 9, 2018
Spencer, Charles ..... June 20, 2018
Spindler, E. Isabel (aka Edith Isabel Spindler) ..... February 7, 2018
Sproule, Frances L. ..... February 14, 2018
Spurr, Germaine (Gerry) Marie ..... June 20, 2018
Stafford, Colleen Agnes Theresa ..... April 11, 2018
Stanton, Gary V. ..... February 21, 2018
Startup, Ian Day ..... February 21, 2018
Stephens, Harold Keith ..... May 23, 2018
Stephens, Marie Rose (aka Rose Marie Stephens) ..... July 11, 2018
Stephens, Teresa Margaret ..... June 27, 2018
Stevens, Arthur Grant ..... May 23, 2018
Stevenson, Glen William ..... June 20, 2018
Stewart, Catherine June ..... June 20, 2018
Stewart, David Archibald ..... February 14, 2018
Stewart, David Roy ..... June 27, 2018
Stirling, Joan Marilyn ..... February 7, 2018
Stoddart, Clarice Elva ..... June 13, 2018
Stone, Clarence Samuel ..... July 4, 2018
Stone, Vera Bernice ..... July 4, 2018
Strickland, Marilyn Marguerite ..... May 23, 2018
Strong, Roland Edgar ..... April 25, 2018
Strug, Morris ..... March 28, 2018
Stuart, Joan Sybil ..... June 13, 2018
Surette, John Joseph ..... January 24, 2018
Sutherland, Cecil Aulden ..... February 7, 2018
Sutherland, Edna Alice ..... May 2, 2018
Sutherland, Eldora Mae ..... January 24, 2018
Swain, Lois Anita ..... April 18, 2018
Swan, Helen Edna ..... May 30, 2018
Swim, Minard George ..... February 14, 2018
Sword, Graham Nesbitt ..... July 11, 2018
Symes, Cecil Dexter ..... February 21, 2018
Symes, Edith ..... February 28, 2018
Tabor, Faye Marion ..... May 30, 2018
Tanner, Elsa Blanche ..... April 4, 2018
Tanner, Leon Willis ..... May 30, 2018
Tarasuk, Robert David ..... June 6, 2018
Tasco, Reginald Cecil (aka Keith Cecil Tasco) ..... May 30, 2018
Terry, Thomas George ..... May 16, 2018
Thibault, Adelaide Evelyn ..... March 7, 2018
Thibault, Rosalind ..... July 11, 2018
Thibodeau, Beulah Mae ..... May 30, 2018
Thomas, Anna Margaret ..... February 14, 2018
Thomas, Gladys May ..... May 23, 2018
Thomas, Lavinia Hilda ..... June 27, 2018
Thomas, Ted Clayton ..... July 11, 2018
Thompson, Goldie Margaret ..... June 13, 2018
Thompson, Hugh William ..... February 28, 2018
Thompson, Samuel Burns ..... June 20, 2018
Thompson, Verna Darlene ..... March 14, 2018
Thorburn, Philip Michael ..... May 30, 2018
Tobin, Carman ..... May 23, 2018

© NS Office of the Royal Gazette. Web version.

Tobin, Eric Arthur ..... May 16, 2018
Tobin, Joseph Michael ..... March 21, 2018
Toomey, Jean ..... May 2, 2018
Trites, Margaret Jocelyn ..... June 6, 2018
Tromans, Benjamin Francis (aka Benjamin Tromans) ..... April 18, 2018
Truckair, Robert Leslie ..... January 31, 2018
Tully, Cynthia Maria ..... March 14, 2018
Turnbull, Doris Jean ..... June 13, 2018
Turner, Douglas Kenneth ..... June 13, 2018
Turple, Gordon Chester ..... April 18, 2018
Uphaml, Ida Lauretta ..... June 6, 2018
van de Riet, Joseph (aka Josephus Constantinus van de Riet) ..... July 11, 2018
Van Dky, Cornelius Anthonius (cancelled, republished Apr 18-2018 (Van Dyk, Cornelius Anthonius)) ..... April 11, 2018
Van Dyk, Cornelius Anthonius ..... April 18, 2018
Van Westen, Carol Ann ..... June 27, 2018
Vandiver, Patsy Jean ..... March 7, 2018
Veinotte, Gerald Harley ..... February 28, 2018
Vosman, Gerritdina Hendrika ..... June 27, 2018
Wall, Joseph William ..... March 28, 2018
Wallace, Anastasia Veronica ..... March 7, 2018
Wallis, Alice Chrstene ..... March 28, 2018
Walsh, William Gordon ..... May 9, 2018
Walton, Kenneth Andrew ..... June 6, 2018
Wamboldt, Leroy Victor ..... July 11, 2018
Ward, Daniel Carrigan ..... March 14, 2018
Ward, James Elmer ..... June 6, 2018
Warlow, Jacqueline Doris ..... February 14, 2018
Warner, Helena Mary ..... March 28, 2018
Warren, George Stanley ..... April 4, 2018
Waters, Christena Elizabeth ..... April 11, 2018
Watson, Nelson Hebert Frank ..... July 11, 2018
Watson, Robert Miller ..... June 27, 2018
Webb, Percy James ..... March 7, 2018
Webb, Stephen Miles ..... March 21, 2018
Webber, Marion Margaret ..... May 23, 2018
Welton, Lawrence Andrew ..... April 18, 2018
Wentzell-Jordan, Deborah Anne (aka Deborah Anne Jordan) ..... May 2, 2018
Westall, Ruth Lillian ..... February 28, 2018
Westhaver, Ann Beatrice ..... March 21, 2018
Westhaver, Irene ..... June 27, 2018
Wetmore, William Merle ..... June 27, 2018
Whalen, Frederick James ..... April 11, 2018
Wheeler, James Vivian ..... March 21, 2018
Wheelock, Helen Elizabeth ..... April 18, 2018
Whidden, Daniel Wade ..... February 21, 2018
Whidden, Edith ..... April 4, 2018
Whiffen, Leonard Melvin ..... March 7, 2018
Whiffen, Thomas A. ..... April 18, 2018
White, George Albert ..... April 18, 2018
Whiteside, Ann Louise ..... March 28, 2018
White-Viger, Dorothy Audry ..... January 31, 2018
Whittaker, Edith Lillian ..... February 7, 2018
Whynot, Etta Mae ..... May 16, 2018
Whynot, Hazel ..... February 14, 2018
Whynot, Wilfred Robert (aka Robert Wilfred Whynot; aka Robert W. Whynot) ..... April 4, 2018
Wiecek, Virginia Margaret ..... May 16, 2018

© NS Office of the Royal Gazette. Web version.

Wile, Donald Frederick ..... May 16, 2018
Wilkinson, Margaret ..... April 11, 2018
Wilkinson, Norine Elizabeth ..... May 9, 2018
Wilkinson, William Archibald ..... April 11, 2018
Williams, Christopher James ..... June 20, 2018
Williams, Ensley Wayde ..... April 4, 2018
Williams, Francis Vincent ..... February 7, 2018
Williams, Gary Wayne ..... February 7, 2018
Williston, Coline Frances Ann ..... April 4, 2018
Wilson, Aaron Lee ..... February 21, 2018
Wilson, Herbert Shawn ..... March 7, 2018
Wilson, Patricia Jane ..... May 30, 2018
Wimble, Grace Lillian ..... April 18, 2018
Windsor, Melvin ..... April 11, 2018
Winkinson, Trudi Elizabeth ..... June 27, 2018
Winters, Curtis Morton (aka Curtis R. Winters) ..... May 2, 2018
Winters, Hilda Mae ..... January 31, 2018
Winters, Marguerite Virginia ..... March 28, 2018
Wood, Susan Elizabeth ..... April 11, 2018
Woodbury, Harvey L. ..... May 9, 2018
Worth, Ronald Angus ..... March 28, 2018
Worthen, P.J. Allan (aka Peter James Allan Worthen) ..... July 4, 2018
Wournell, Elizabeth Dorothy ..... June 27, 2018
Wright, Hilda Patricia ..... March 14, 2018
Wright, Leola M. ..... April 25, 2018
Wright, Shirley Faye ..... May 9, 2018
Yeoman, Sylvia Jean ..... February 21, 2018
Yetman, Roy Dennis ..... February 28, 2018
Yorke, Deborah Irene (aka Debra Irene Yorke) ..... June 6, 2018
Yorke, Eloise Marie ..... April 25, 2018
Young, Phyllis Cora ..... July 11, 2018
Zinck, Charles ..... June 13, 2018
Zinck, Kenneth Wayne ..... February 14, 2018
Zorychta, Barbara ..... July 11, 2018
Zwicker, Clarence Edward ..... May 16, 2018
Zwicker, Debbi Elizabeth ..... March 7, 2018
Zwicker, Laura Katherine ..... March 14, 2018
Zwicker, Lester Lloyd ..... May 23, 2018

© NS Office of the Royal Gazette. Web version.

Index of Notices

Orders in Council:
OIC 2018-193 (Revoke OIC 2017-197).....1091
OIC 2018-198 (Acting Minister - Kelly Regan) ...1091

Companies Act:
3062636 Nova Scotia Limited.....1091
3297210 Nova Scotia Limited.....1091
AQA Canada Inc. 1092
Brigantine Trading Company Limited 1092
North Shore Management Systems Inc. 1092
NS Windsor Holdco Inc. 1092

Co-operative Associations Act:
2153622 Nova Scotia Cooperative Limited 1092
Clifton Acres Investment Cooperative Limited 1093

Criminal Code of Canada:
Qualified Technician Designations (Jul 11-2018).1093

Fisheries and Coastal Resources Act:
Administrative Decisions 1095

Probate Act:
Estate Notices 1096
Estate Notices (subsequent).....1103

Probate Act – Proof in Solemn Form:
Brodie, Laurie Thomas.....1093
Kennedy, Margaret Elizabeth.....1094

Miscellaneous Notices:
We'koqma'q First Nation Open House.....1093

Publishing Information

The *Royal Gazette* is published every Wednesday. Notices must be received by the Royal Gazette office not later than **4:30 pm** on **Tuesday** in order to appear in that Wednesday's issue.

Prepayment is required for the publication of all notices. Cheques or money orders should be made payable to 'The Minister of Finance' and all notices, subscription requests and correspondence should be sent to:

Office of the Royal Gazette
Department of Justice
1690 Hollis Street, 10th Floor
PO Box 7
Halifax NS B3J 2L6

Telephone: 902-424-8575
Email: RoyalGazette@novascotia.ca
Website: www.novascotia.ca/just/regulations/rg1/

The Royal Gazette Part I is available on-line beginning with the January 4, 2006 issue at the above website

Royal Gazette Part I Fees (15% HST included)

Subscription
One year..... $152.60

Advertising
Estate Notices (6 month notice to creditors)..... $68.75
Correction to Published Estate Notice $30.15
Proof in Solemn Form (3 insertions)..... $30.15
Citation to Close (5 insertions) $30.15

All other notices pursuant to Acts, for maximum number of insertions required by statute (i.e.: *Companies Act*; *Land Registration Act*)..... $30.15

Royal Gazette

© NS Office of the Royal Gazette. Web version.

A3.3 Appendix C – Open House Notice

WE'KOQMA'Q PROUD

Open House

Wednesday, August 15, 2018
3:30 pm. to 7 pm.
Location:
Fisheries building, 160 Reservation Road, We'koqma'q

We'koqma'q First Nation will be holding an information session to meet with community members of the local area to present and review proposed amendments to and application for additional lease areas for our finfish aquaculture operations in the Whycocomagh Bay area.

P.O. Box 149 • 150 Reservation Road • We'koqma'q, Nova Scotia • B0E 3M0
PHONE 902-756-2337 • FAX 902-756-2393 • WAYCOBAH.CA

A3.4 Appendix D – The Inverness Oran Newspaper Article

42 Years Serving Inverness County

The Inverness Oran

VOLUME 42 NO. 27 Second Class Mail Publication Mail Reg. # 40017803 $1.74 + 15% HST = $2.00 22 AUGUST 2018

NEWS
Another stellar 4-H weekend

ARTS & CULTURE & ENTERTAINMENT
Gil McCulloch's Essence show coming to ICCA

SPORTS
CB West Islanders training camp opens

WEEKLY PEARL "Laughter is the shortest distance between two people." - Victor Borge

John Morris Rankin's piano finds a new home in Mabou Hall

-by John Gillis

Thanks to Sally Rankin and family, John Morris Rankin's piano has a new home in the parish hall in Mabou.

Sally Rankin made the donation earlier this year and said she'd been thinking it over since last Christmas.

The piano is a Gerhard Heintzman Cabinet Grand and it was the piano of choice in John Morris and Sally's living room for many years.

"We moved back to Cape Breton when our son Michael started school and we had the chance to look at this piano at an auction in Truro back in 1994. It was very well cared for and John Morris used that piano for many rehearsals. He wrote his song Eyes of Margaret on it. He rehearsed for Natalie MacMaster's first CD and Buddy MacMaster's first CD on it and he always returned to that piano in our living room. I've always wanted to find a good home for that piano and I think it's now in a good place," Sally Rankin told *The Oran* this week from Calgary.

Rankin approached the Mabou Parish Hall Committee with the idea earlier this year and they were quite excited by the donation.

"John Morris heard some of his first music through the open window of his bedroom from that community hall so I think it's rather fitting that the piano be there," Rankin added.

Rankin said many noted piano players played that piano over the years in her home, people like Howie MacDonald, Kathleen LeBlanc, Robbie Fraser, Jackie Dunn MacIsaac, and many more.

"When Mac Morin was doing his piano CD, he and Betty Lou Beaton recorded a track on it for his album," Sally added.

Pianist Joey Beaton of Mabou was happy to play a tune on it for this reporter as we photographed the piano for this article.

"Playing this piano is like having a conversation between the player and the instrument. I really like the ring and the flare of it," Beaton added.

Beaton said the donation reminded him of a story of another Heintzman piano that came to Mabou back in 1928 to the old convent.

Beaton shared such an interest in music with John Morris over the years and they often played together and were influenced by many of the same musicians.

"John Morris had such a passion for the violin and the piano. I was with him when he turned 19. We were in New York City. I was 10 years older at age 29. It was back in 1978 and we were there playing with the Guggenheim Wind Ensemble at The Lincoln Centre," Beaton recalled.

With its new home in the Mabou Community Hall, people can be quite certain that this piano will be making beautiful music for many more years to come.

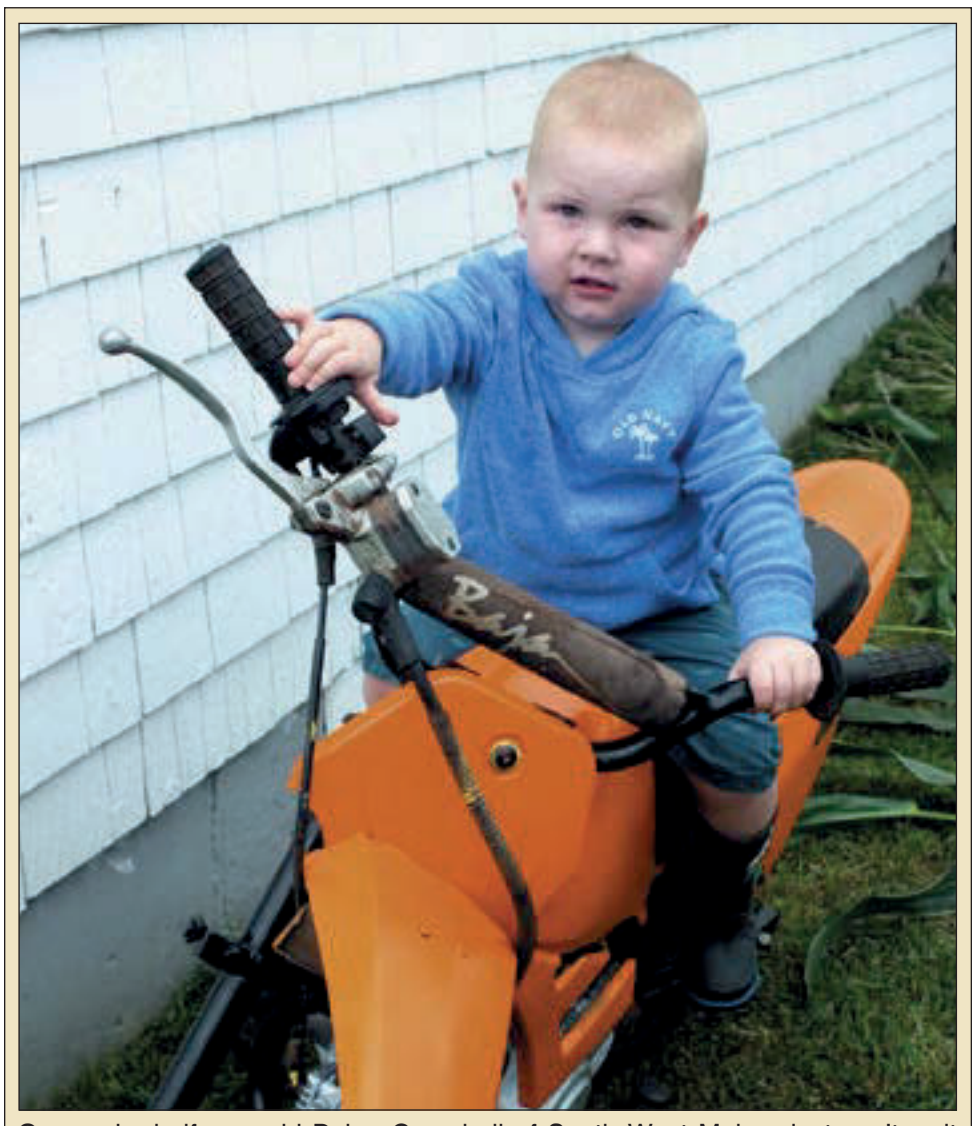
"This piano is a tremendous gift to the community," Joey Beaton concluded.



Mabou pianist Joey Beaton said the piano is a great gift to the community.



The piano which was owned by John Morris Rankin.



One-and-a-half-year-old Dylan Campbell of South West Mabou just can't wait until he's old enough to ride a motorbike like this. He was all smiles in the seat last Saturday morning at the Inverness County 4H Show in Brook Village. (For more 4H coverage, see pages 12-13 inside)











Fish farming essential to Waycobah's economic future

-by Anne Farries

Waycobah wants to grow more fish, and to that, has its eye on more acreage in the Bras D'Or Lakes.

The First Nation, which three years ago bought an existing fish farm on the shore near Whycocomagh, now plans to expand the farm, quadruple production, and reach more markets with an international partner.

"My understanding from talking to the community at large is they are still very supportive of this operation," said Robin Stuart, Waycobah's aquaculture manager, speaking at a band open house last Wednesday. "It's a pretty substantial employer."

Around 50 people work on the farm, feeding trout and managing nets, or in the yard near Stewartdale, cleaning and mending equipment, or at the processing plant near Little Narrows, packaging and shipping fish.

"The human resource is getting quite skilled, and that's important in this business," Stuart said. "Your farm is only as good as the people."

Three years ago, Waycobah took over water leases that were developed on its shore 25 years ago by the Eskasoni First Nation.

It also has nets on trial next to the closed gypsum mine at Little Narrows, where it hopes to continue, and it has acquired a defunct lease at Dena's Pond, on the far shore of the Bras D'Or, where it hopes to put fish this winter.

Meanwhile, it is targeting new leases at Aberdeen, on the north-east side of Whycocomagh Bay, and on the south-east side of the same bay, close to Portage Road.



Waycobah trout farm manager Robin Stuart

"Our intent is to utilize a lease for two years, then fallow it for a while," Stuart said. "It's a method that has been used by farmers for hundreds of years."

The band also plans to boost production. More on that below.

Why the Bras D'Or?

"The Bras D'Or is unique," Stuart said. "We've got sheltered water here. We don't get the big storms.

"We've only got about six inches tide on a moon tide – the Bay of Fundy has about 38 feet – so mooring systems don't have to be as strong. Boats don't have to be as big.

"The boats here are small pontoon boats, and the guys are at water level. They operate them with a 9.8 horse power (motor). You'd never be able to do that in the Bay of Fundy, with the tides. You would need a large vessel with a lot more horse power, which would cost you a lot more."

"The salinity of the water is about 15 parts per million, which is half that of the ocean. That has a lot of benefits when you're growing trout, because the salinity of the trout is almost the same as the salinity of the water, so that the fish is in perfect balance. You can put fish in the Bras D'Or at 20 grams, whereas in the open ocean, if you put them in at less than 75 grams, they'll probably die on you.

"It's much less stressful, because the animal doesn't have to deal with excreting salts.

"So, it's a good place to grow fish."

Climate

"Temperature-wise, it's been a hot summer," Stuart said Wednesday, at the tail end of a heat wave. "I'm always worried in August, but it's 22.5 degrees at two metres right now, and that's too warm for the fish."

When the sun blazes, the fish stay deep in their 60-metre circumference pens, which are about 45 feet deep in the centre.

"It's 16 degrees or so at five metres, and 14.5 – 15 degrees at eight metres," Stuart said. "So, there's quite a thermocline (temperature layer) inside the cages."



Darcy Dennis at new processing plant near Little Narrows.

How many fish in a cage

"We try to grow our fish under 15 kilograms per meter cubed," Stuart said. "Keeping low density is important for the health of the fish. Fish are less stressed at lower densities."

Stuart credits the lower density for the farm's ability to shun antibiotics.

"We don't use chemicals of any sort, because we don't have sea-lice (…) because those animals don't reproduce in our low-salinity regime."

A blanket in winter

The farm doesn't feed or harvest the fish from December until April, when they are in cold hibernation.

Ice is a challenge, Stuart said, although it has the benefit of insulating the underlying water.

"I always like to say, 'the earlier the ice comes, the warmer the water will be in winter'," he said. "As soon as it comes, the temperature starts rising."

"Ourcoldesttemperature in the Bras D'Or is at Christmas, just before the ice forms. Once the ice forms, the temperature stabilizes and then starts coming up."

Lake ice helps prevent super-chill, which affects many fish farms, Stuart said. That's a phenomenon that occurs when the temperature of water drops below the normal freezing point of water, or lower than zero degrees Celsius.

"Trout can't live in water below -.7 degrees Celsius, because ice crystals start forming in the blood, and those ice crystals start moving around in their blood stream," he said. "When they get to the brain, the fish have the equivalent of a stroke."

"That's what kills them. It's not that their blood freezes solid.

"It's not that they have a big brain, but they do have a brain.

"The ice is a blessing, in that sense. I'm always relieved when it comes."

Canada's changing climate has caused the ice to arrive later and stayed thinner in recent years, Stuart said.

Forty years ago, when he was growing oysters in Portage and Estmere (in Victoria County), "you could drive tractor trailers on the ice," said Stuart. He has been recording temperatures in the Bras D'Or Lakes since 1973.

"Winter temperatures have elevated almost a full degree since then.

"I used to go down in Malagawatch and drive in my Volkswagen Rabbit all the way up to River Denys and come out there. You can't do that anymore, because the water temperatures have warmed.

"It's quite significant in the Bras D'Or, because it's a small body of water, and it's an example of what's happening out in the open ocean."

Four years ago, when Waycobah began thinking about going into the fish business, "there were only one, maybe two sites" where the water would stay above super-chill temperatures, Stuart said.

"Now, we'd be hard-pressed to find an area in the Bras D'Or where super chill takes place.

"As an aquaculturist, you have to deal with a changing environment. It's going to happen. We're seeing it happen quicker than we'd like, but we have to be able to adapt to that."

Oxygen

"This is a time of year when I'm very sensitive to oxygen," Stuart said.

At higher temperatures, fish require more oxygen, but the water holds less of it.

Fish can't regulate their internal temperature. Their bodies are the same temperature as the water in which they swim.

"It's like a speeding-up machine, which, as it gets warmer requires more oxygen," said Stuart.

Waycobah is farming trout, which "require a very high oxygen level, in excess of six milligrams per litre," Stuart said. "That's the single most important criteria for keeping fish alive."

At the farm, probes in the water send readings to Stuart's phone.

"They tell me in real time what the temperatures are at three depths, and I know what the oxygen levels are," he said.

Low oxygen levels can be caused by too many fish in a pen or by mussel fouling, which, at one time, fish farmers combatted with copper.

"We stopped using it years ago by choice, (to prevent) high deposition in

CONTINUED NEXT PAGE

BEARPAW CRAFT AND GIFT SHOP
www.thebearpaw.ca
Central Avenue - Inverness - 258-2528
Drop in for the latest book titles and new CD's

Lots of gifts, music , souvenirs, purses, jewellery, Ts, and hoodies
Hours: Thurs & Fri: 1-4, Call 258-2074 after hours
If the music is on...I'm in!

Serving Inverness County since 1976
The Inverness Oran
PUBLISHED EVERY WEDNESDAY BY INVERNESS COMMUNICATIONS LIMITED
15767 Central Avenue
PO Box 100
Inverness, NS
B0E 1N0
President **Rankin MacDonald**
Treasurer **FrankMacdonald**
Secretary **Eleanor Macdonald**
Tel: 902-258-2253 Fax: 902-258-2632
E-mail: oran@ns.aliantzinc.ca
The Inverness Oran was established on April 9,1976 and is published 52 times a year.
Publications Mail Registration # 40017803

Member of Atlantic Community Newspaper Association

Publisher Of
The Inverness Oran
The Legends of Inverness County
The Sunset Side of Cape Breton
Inverness County Business Directory
Making a Difference Inverness County

We acknowledge the financial support of the Government of Canada. Canada

Editor Rankin MacDonald
oran-news@ns.aliantzinc.ca
Sports Editor Bill Dunphy
oran-sports@ns.aliantzinc.ca
Entertainment Editor John Gillis
Publisher/ Office Manager Eleanor Macdonald
Advertising Bernice Curley
oran-advertising@ns.aliantzinc.ca
Production/Graphic Design Lindsay Shaw
Advertising/Circulation Kelly MacGillivray

EDITORIAL POLICY The Inverness Oran welcomes letters on subjects of interest to our readers and prints columns on a variety of topics. Use of any material is at the discretion of the editor, and the editor reserves the right to omit letters to meet space requirements, for clarity, or to avoid obscenity, libel or invasion of privacy. Letters and columns published do not necessarily reflect the editorial policies or beliefs of this newspaper. Letters addressed to any member of the Oran staff should clearly indicate whether or not they are to be published. All letters must include the address and phone number for verification purposes. The complete address and phone number will not be published.

– SUBSCRIPTION RATES – (tax included)

DELIVERY TO:	3 MONTH	6 MONTH	1 YEAR
Inverness Co. / Digital (Special Rate plus 15% HST)	$18.25	$31.25	$ 51.75
NS, NB, NL, PE (15% HST)	$20.70	$36.80	$ 62.10
ON (13% HST)	$20.34	$36.16	$ 61.02
Rest of Canada (5% GST)	$18.90	$33.60	$ 56.70
US	N/A	$70.00	$110.00
International	N/A	N/A	$200.00

All prices are effective October 1, 2016 and include applicable GST/HST at rates shown. Canadian pre-tax rates are: 3 months - $18, 6 months - $32; 1 year - $54. All prices are in Canadian funds. (HST #R123804569)

The Inverness Oran

I would like a _____ subscription at the cost of _____
Name: _____ **Postal Code** _____
Address: _____ **Email:** _____ **Tel:** _____
MasterCard VISA ☐ Renewal ☐ New Subscription ☐ Chq ☐ Money Order Credit Card # _____ Expiry Date _____ Refunds will not be issued.

.....Planning on opening new leases

the Bras D'Or," Stuart said. "We didn't want copper going to the bottom. Copper is toxic."

Deep water

At the Waycobah-shore leases, the lake bottom is 180 feet deep, cold and impenetrably dark because of mud, branches, and leaves carried by the Skye River, which empties into the bay with "high energy", Stuart said.

"After a big rain storm, all the detritus and organics coming off the land come into this basin," he said.

At the bottom, the bay is "zero-oxygen, high-sulphide mud from thousands of years of organic degradation.

"I dove to the bottom before. It just gets thicker and thicker, and you don't even know where the bottom starts.

"You're working in pitch black as soon as you get below 60 – 70 feet, because the Bras D'Or has a lot of suspended material in it. It's not like the open ocean, where you can see 100 feet."

"The only thing that lives at the bottom of that deep hole are bacteria."

Food in, waste out

"These fish are extremely efficient users of feed, compared to animals," Stuart said. "It takes about 1.4 pounds of feed to produce a pound of trout, whereas for a cow or pig, you're talking nine or twelve to one."

Then there is the end-stage of feeding fish, which prompts a question people most frequently ask Stuart: what about the manure?

"It's a legitimate question," he said.

"Every animal you feed produces manure, whether it's cattle, chickens, anything.

"The important thing is: what is the impact? And how widespread is it?

"Where we're growing fish, we're not affecting other animals, because nothing lives there (at the existing leases).

"The only species that could be changed would be bacteria."

The Waycobah site undergoes annual environmental monitoring, and CBU and DFO researchers continue to investigate what Stuart called the site's "unusual anomaly."

"It's a deep hole, going down to 180 feet, and it's anoxic," he said. "As soon as you get below nine to 10 metres, there is virtually no oxygen, because it's stratified."

"In the late summer, we often get moon tides, which bring in ocean water that is much colder and denser than the Bras D'Or."

"You would think that flushing with new water would be a good thing. But (…) we get this strange phenomenon on a moon tide where cold water travels along the bottom and it displaces the low-oxygen water that's down there."

When that happens, "fingers" of low oxygen-bearing water push up from the bottom.

"We've had some pretty frighteningly low oxygen, and we're trying to figure out how we can predict this. How we can deal with it," Stuart said.

"So far, we haven't seen it happening this year. It could happen in September, when the tides get stronger."

DFO staff are helping.

"We're working with these guys," Stuart said. "It's in our best interests to understand the environment we're working in. I told them we would share any of our hydrographic data. So, we're working with them all the time."

A fishy odour

"What about the stink?" asked Winston Patou, one of two people, other than fishery staff and the press, who attended Wednesday's open house. John Sylliboy was the other.

The "stink a week ago was particularly strong," Stuart acknowledged.

Each week, he explained, divers retrieve dead fish from the cages and pack them in tubs, which are trucked to the Guysborough landfill.

"It's all part of our normal husbandry practices," he said.

During a recent heat wave, when the air temperature was higher than30 degrees, water from one of the tubs splashed on the deck of the truck.

Weigh-scale staff told the farm, 'you have to take that fish and split it out," Stuart recounted. "We had to go back, send another truck down, and after a couple of days at that temperature, there was a strong smell, no question about it."

"But that's an unusual thing."

Eyesore

Patou said the farm is "an eyesore" and wondered why the band couldn't hide the fish cages behind the uninhabited island off shore from the reserve.

Stuart didn't share that view.

"If somebody came along today and they had never heard of lobster fishing, and they started putting lobster pots all over the place, you tell me that there wouldn't be an objection?" he said.

"Well, yeah, but that's only six to eight weeks," said Patou.

"It's also 50 jobs," Stuart replied.

Seaweed

Patou also complained about dead sea weed, which he said has prevented him from angling from the shore during recent summers, and which he believed should be pinned on the fish farm.

Not so, said Stuart.

The fish farm is "not dirtying the bay," he said. "I blame that on deforestation."

"I've seen that all over the Bras D'Or, this business of dead sea weed. What happens is: In the Highlands (during storms) the rivers come down, and there are no roots to absorb the water. They're torrential."

"Years ago, it took about a day for the rivers to come up after a rain. Now, it's instantaneous. It brings all that material off the Highlands, the mud and so much suspended material, and it covers the eel grass."

Laying fallow, getting bigger, thinking globally

Part of the reason for acquiring new leases, including the re-opening site at Dena's Pond on the far shore of the Bras D'Or, where a fish farm went out of business several years ago, is to allow existing sites to occasionally rest fallow, which Stuart described as a time-honoured agriculture method.

It's also so that production can increase from the current million pounds a year to four million pounds, Stuart said.

"Right now, we've got about 535,000 fish in the water," Stuart said lastWednesday. "The big fish will be harvested by Christmas, so we'll have about 140,000 left."

The band plans to process the fish at their plant near Little Narrows, which



Tubs used for transporting fish, lined up ready near the processing plant.

this month is being enlarged and renovated to include a boosted power room and new wells to supply water for a filleting station and waste recovery sumps.

Northern Harvest was marketing the fish. That company was recently purchased by Norwegian aquaculture giant Marine Harvest, which Stuart said will sell Waycobah trout under a separate brand.

"They have a lot of marketing capability," Stuart said. "It's pretty hard for us to compete with their skill set."

"I went to their farms in northern Norway near the Arctic Circle last year. Each one was three or four times the size of what we have.

"The processing plant is on an island, a small community. You've got to fly to it or take a boat. There's no bridge. The roads were in better shape than I've seen anywhere in Canada.

"The plant was processing 400 tonnes of fish a day. Two hundred tonnes of trout in the morning, 200 tonnes of salmon in the afternoon. There were big whales of boats there, each carrying 150 tonnes of fish.

"They pumped them live, right into the plant. Those fish were never touched by hand."

The Norwegian plant processed the fish so quickly that it didn't need to be cooled, Stuart said. The fish were in and out of it before they warmed up.

"They're going to sell our brand, and that's a huge thing," Stuart said. "They've got a high quality-standard, and they'll open up all sorts of doors for us."

"They said there's no fish out there that's equal to our quality."

Stuart hopes first to reach the local market.

"Our plan is three to four million pounds a year," he said. "If the restaurant trade buys into it, you could sell all those fish in Nova Scotia."

Hence,Waycobah'splans to acquire more acreage, including resurrecting the defunct water lease at Dena's Pond, on the far shore of the Bras D'Or.

With success comes problems

The fish in Waycobah nets have attracted attention from more than eagles.

A couple of years ago, Stuart said, a stranger dropped one of the band's cage nets, releasing fish into the surrounding water, from where he scooped up several of them.

"That guy was in Rod's (gas station) the next day, bragging," Stuart said. "The next day, there were 15 more fishing – you tell me there's not a network? Not one was a local guy."

"Most of them were from North Sydney, Sydney Mines, Glace Bay, Louisdale."

Patou believes the interloping fishermen encouraged each other on Facebook.

Chief Rod Googoo asked the Department of Transportation to intervene, Stuart said.

CONTINUED PAGE 5



ESCORTED TOURS
2019 SANDY TRAVEL

Ron MacEachen
The Tour Guy

Many exciting tours planned for 2019. I have some interesting local people as part of the experience team at the destination to make it all more personal and memorable. We'll get on the back roads, into some small towns, and have you up close with story tellers who will make you ponder the many delightful places you visit. Don't worry, we'll ensure you have just the right amount of time in the larger centres to see those places you've seen on television. Every trip is going to be fun and you don't have to plan anything. It is all laid out for you and each tour includes return airfare.

The places and the dates of travel 2019

ITALY
May 7-17..11 D/10 N

SCOTLAND
June 2-11..10 D/9 N
(Edinburgh& the Islands tour)

NEWFOUNDLAND
June 22-27..6 D/5 N

SCOTLAND
September 16 -25 10 D/9 N
(Edinburgh and the Highlands)

IRELAND
Oct 2 -11 ..10 D/9 N

SPAIN
Oct 17-27..11 D/10 N

For pricing, complete itinerary and what's included, see
www.sandytraveltours.ca
OR FOR INFORMATION & RESERVATIONS
1-877-726-3947 | sandygroup@ns.sympatico.ca

902-258-2274 TUESDAY - SATURDAY
The Closet
Gently Used Clothing & More..
Mill Road Social Enterprises
20 Mill Road, Lower Level, Inverness
FILL A BAG FOR $20!
SALE
FILL A GARBAGE BAG WITH CLOTHING OR SHOES
(EXCLUDING BOUTIQUE)
OPEN 9am - 3pm

TWO SEATS SCOTLAND - OCT 2018!!
SEE BELOW
SCOTLAND
Can't wait for 2019 to go to Scotland?? Have the time this year? Let's go!! Two people had to cancel. If you want to go **October 2nd, 2018**, you can!
Package includes return **airfare from Halifax to Glasgow,** 8 nights 4* hotel, many included excursions & tours, great local guides, 16 meals, lots of laughs, pretty much everything!
$3670.00 pp/dbl
Call me at 1-877-726-3947 or Email: sandygroup@ns.sympatico.ca
I ♥ SCOTLAND
SCOTLAND

Highland Hearing Clinic Limited
Empowering people who have hearing loss since 1997
THE SCIENCE OF HEARING
Your professional audiology specialist.
HighlandHearing.com
Antigonish | Port Hawkesbury | 1-888-750-4327
Now Located: In the Walker building, Inverness at 15759 Central Ave.
(Allan MacMasters constituency office).
"We listen to you so you can listen to life"
SERVICES INCLUDE
· HEARING ASSESSMENTS · HEARING AID DISPENSING · HEARING AID SERVICE
By Appointment only



(L–R) Canadian American Club of Massachusetts representatives and seasonal Inverness residents Janine and Ken Randall present a cheque of $5454.03 to Inverness Hospital Foundation's Brenda Rankin MacDonald and ICMH nurses Lisa Timmons and Meagan Ryan in support of our Palliative Care Family Room.

Canadian American Club of Massachusetts donates to the Inverness Consolidated Memorial Hospital

On June 23rd in Watertown, Mass, USA, the Canadian American Club of Massachusetts hosted a fundraising square dance and generously donated its proceeds totalling $5454.03 in support of the Palliative Care Family Room of the Inverness Consolidated Memorial Hospital (ICMH). With many ties to Inverness County, Janine Randall and Canadian American Club of Massachusetts members felt they would like to help their relatives and friends from the area and contribute to the Palliative Care Family Room as well.

Randall was inspired to host a fundraising square dance after reading about the Big Square Dance fundraising event for the ICMH Palliative Care Family Room held at the Mabou Hall on April 1st. Organizers of this dance, Art and Bernadette LeBlanc of Belle Cote, Raymond and Sara Beaton of Mabou, and well-known local fiddler, Shelley Campbell, gathered fiddlers and piano players to play for the square dance in Mabou which raised $5540 for the Palliative Care Family Room.

Thank you to everyone who attended both of these events and to all the organizers near and far.

Near-drowning in Port Hood

-by Rankin MacDonald

Due to the timely actions of fellow bathers, a family of five survived a dangerous situation at the Port Hood beach.

On Wednesday evening of last week, a mother and four children, aged five to 10 years, including seven-year-old twins, were enjoying flotation devices in the water off the Port Hood Day Park beach but they found themselves drifting into deeper water farther from shore.

Their calls for help at first went unheard until a young man visiting in the area heard the cries for help.

Shawn Taylor and a woman swam out to the exhausted family and pulled them to shore and out of the deep water.

Other bathers supplied help and blankets for the family until the first responders arrived on the scene.

The family was alright. Taylor and his wife, Lisa, were home visiting her mother, Cathy, in Port Hood.

Earlier this summer an elderly woman drowned in the waters of Port Hood.

THEN and now



THE HERITAGE OF INVERNESS COUNTY BY JIM ST. CLAIR

Is it Burke or Bourque or Bourgeois or Burt?

Surnames in Transition

Last names as used today are not always the same as great-grandpa used in his day. How many MacEachens are now MacEacherns? How many LeBlancs of Cheticamp are now named White as they sign their cheques at Atlas Switch Company in Watertown, Massachusetts? Have you not met Chisholms whose ancestors were Chaissons from Cheticamp?

Is it Gillis or Gillies? And when did some ancestor or census taker change the name? Some Beatons in Inverness County identified themselves as Beatonnachs as late as the 1900s. The miller, John Beatonnach of Mull River, always claimed that was his name, although documents spelled it as we now do.

Which current MacDonnells were once MacDonells or even MacDonalds? Some in earlier generations had different spellings than their great-great-grandchildren do today. Some time in the 1600s, the MacMhurich family, noted for its many capable bards, slowly accepted Currie as their simplified name and one easier to say and spell.

In old documents, one may find MacFergus instead of Ferguson. Rev. William St.Clair, the third Presbyterian minister at the Mabou-Port Hood Presbyterian Church, and said to be the owner of the first piano in Mabou in the 1860s, had a brother who lived near him who spelled their last name as Sinclair, a slurred version of the original name. In some places, even today, St.Clairs/Sinclairs are Sinklers on their deeds and documents.

So many surnames have gone through changes, sometimes many, through the years. But perhaps none are as curious as the Bourque/Burke, Burt, Bourgeois group.

Burkes and Bourques in Cape Breton

In central Inverness County, the Burkes of Mabou and Port Hood are clearly of Irish descent. Thomas Burke, the immigrant, came from an Irish family of County Tipperary, Ireland, which moved to Newfoundland. And Thomas moved along to Nova Scotia to teach school in Antigonish County and to farm at Hays River and then become clerk for William MacKeen in Mabou.

According to family historians, the Irish Burkes came from England in the 1400s after having emigrated earlier from mainland Europe. The origin of their name is said to be the Late Latin, early German word "burg" meaning a fortified place, a town of sort. Burg is found in place names such as Edinburgh and Pittsburg. It took on a new spelling in England and Ireland for the "rg' sounded like "rk" and the "e" was added for style. So the name Burke came into use.

Acadian Bourque

According to family historians, the ancestors of the Bourques, some of whom lived in Cheticamp area and others in River Bourgeois, Richmond County, were immigrants to the Annapolis Valley from France. They are all descended, it is thought, from Antoine Bourque who arrived in the early 1600s.

But, interestingly, his ancestors were not always Bourques. Several generations back, it seems they had a longer name, "Bourgeois," which very curiously is derived from the same root "burg" as found in the Irish Burke. Jean Bourgeois is found in records as early as 1425.

Through time in the late 1800s, the Bourque name begins to appear on census records as Burke. Was that easier for the census taker or a wish on the part of the owners to appear more modern. At any rate, in today's phone book, Burkes are found in Port Hawkesbury and Richmond County whose ancestors were Bourques of Annapolis Valley and people named Bourgeois of late Medieval France. In other parts of Cape Breton, Bouques live adjacent to Burkes, possibly close relatives.

A Curious Change in Spelling

Although not dwelling in Inverness County, a family who went by the name of Burt in Newfoundland where the name is found on census and vital records find themselves listed as Burkes on the 1911 Census. As people engaged in the cod fishery, they had taken up residence in Neil's Harbour, immigrants of a sort who just moved in.

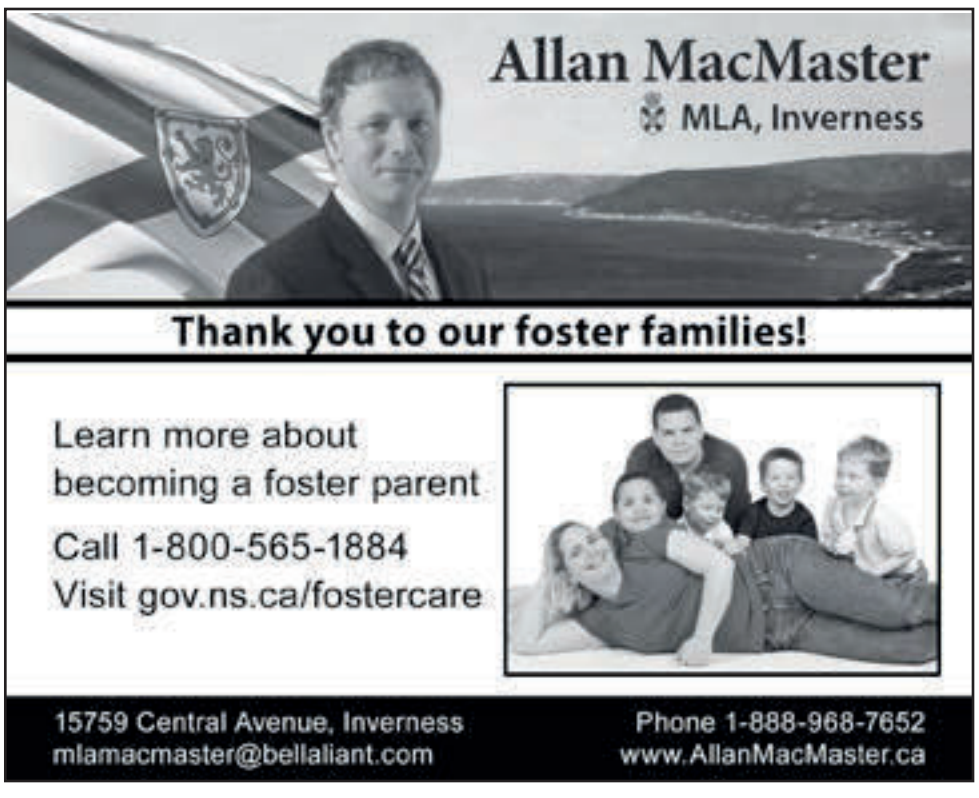
In the 1921 census, some of them are still Burts and some are Burkes. Many of this family moved to Glace Bay where for several generations they have answered to the name of Burke. Was it for the ease of the census taker or for the purpose of hiding their immigration or just for convenience that the Burts came to be Burkes. Or was that their name generations earlier in Newfoundland and Ireland?

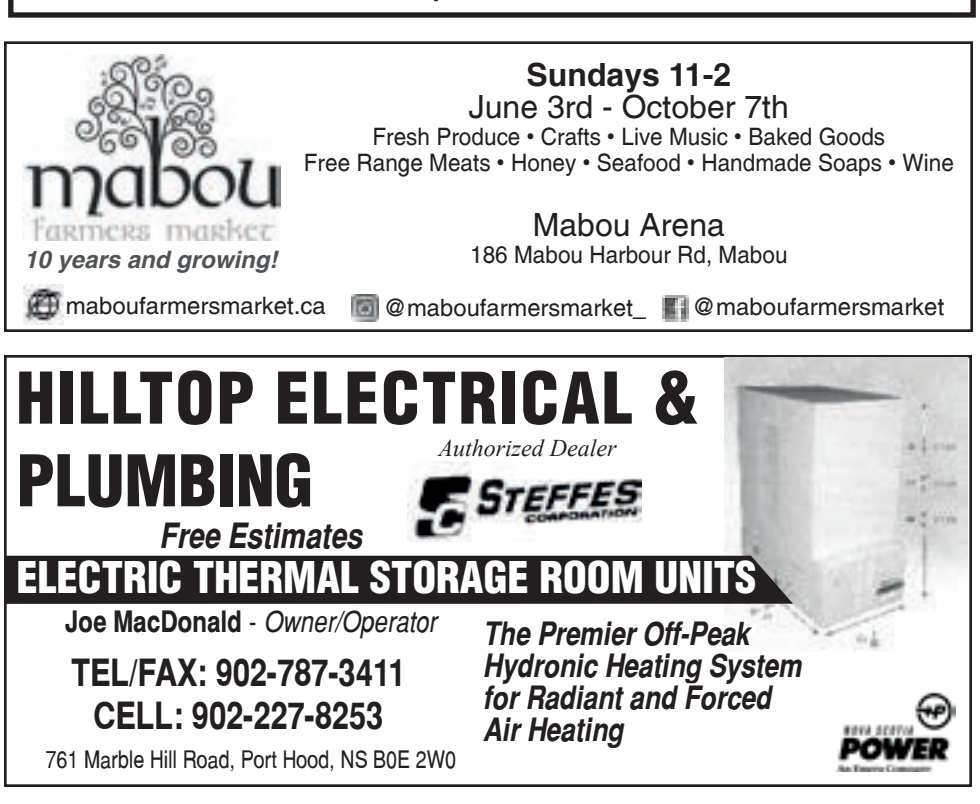
Conclusion?

When is a contemporary Burke the descendant of Acadians or of Irish immigrants who changed their name or the progeny of Irish immigrants from Tipperary?

Just as McDonells may really be MacDonalds in early generations, surnames do change. Research requires careful examination of all the information that is available.

But Bourques or Burkes or Bourkes or Bourgeoises can all look back to ancestors who lived in a fortified town in the Middle Ages. Hurrah for the diversity and the inherent connections!





Fr. Bernie celebrates 76th birthday and 50 years in priesthood

-by John Gillis

Well wishers came from far and wide to celebrate two special occasions for Fr. Bernie MacDonald last Thursday afternoon at *An Drochaid* in Mabou.

They came to wish Fr. Bernie a happy 76th birthday as well as to celebrate his 50th year in the priesthood.

There was music, tea, and treats and great conversation in the packed room of the community museum as Fr. Bernie spoke with so many who came to says thanks, congratulations, and to greet him.

A native of West Mabou, Inverness County, Fr. Bernie was ordained on June 8th,1968, at the Maryknoll Seminary in New York.

"In his first year, he was assigned to studies in California, while his second year was spent in Hong Kong. Thereafter, he was assigned to Mission work in Tanzania in Africa for two years. He had done Novitiate work under Fr. Webb at Talbot House in Cape Breton for a couple of summers and when Fr. Webb became ill, Fr. Bernie returned to Cape Breton and eventually took over as administrator. This is where he had his herd of famous Highland cows and it was during this time that we all came to know him better," Mabou's Effie Rankin noted in her opening remarks.



Fr. Bernie MacDonald greets well-wishers.

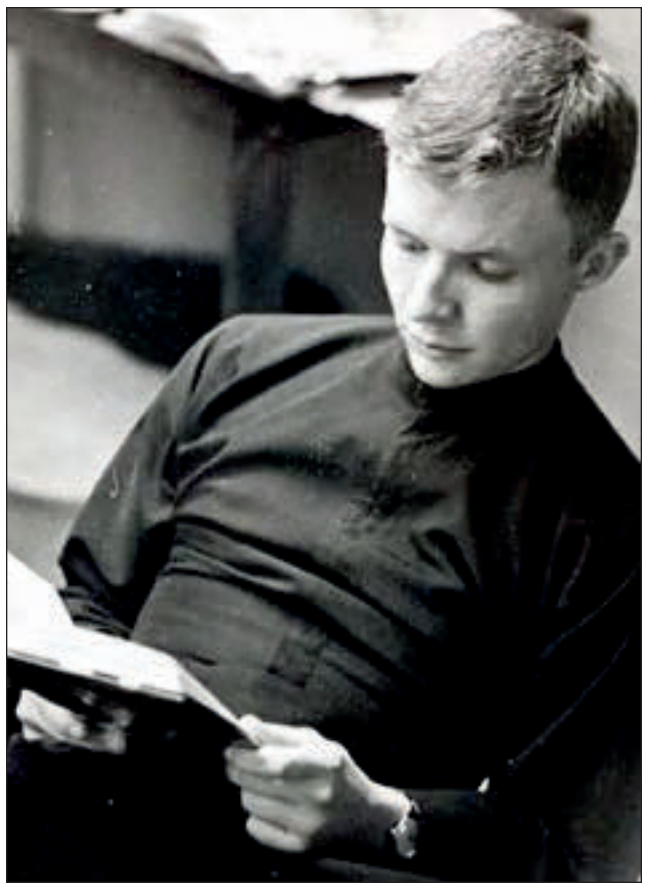
Fr. Bernie currently serves the parishes of Mabou, Glencoe Mills, Brook Village, and Lake Ainslie. He has also been clergy for the Sisters of Notre Dame in Mabou – St. Joseph's Renewal Centre where he says Mass every morning.

Fr. Bernie reflected those 50 years with *The Oran* last week following the celebration.

He recalled serving as well in his early years with St. Anthony Daniel in Sydney which is now closed and he also recalled his time serving as a Chaplain at St. Rita's in Sydney which is also now closed. He also served in Whitney Pier for a year before going to Talbot House.

Close to Fr. Bernie's heart were his years at Talbot House where he worked hard to help people with addictions.

Founded in 1959 by Father John G. Webb, Talbot House has been guiding the addiction recovery and rehabilitation of men from across Nova Scotia and throughout Atlantic Canada since that time. Talbot House is located just 35 kilometers from Sydney, just off the Trans-Canada Highway. Much of what makes that community special for recovery is its 400 acres of natural beauty.



Fr. Bernie during his years as a student.

Fr. Bernie said he had been familiar with Talbot House because he had done his internships there while he was a student.

Residents of Talbot House are asked to build their recovery upon the five pillars of a program that includes: Knowledge; Will; Community; Spirituality; and Acceptance.

"It was a good experience in terms of how you related to people who were there for 'treatment.' What you had to find out was what was that person good at and what they feel proud of and what did they enjoy. I found that nobody needs a lecture. They know if they've screwed up themselves, if they did and they tended to become very negative about their lives. So, the challenge was to find their strengths and build on those strengths and let the good come out and overcome the addictive parts of their personalities. Part of that was getting them to eat the right things, getting exercise, doing manual physical labour in terms of farming or working in the sawmill. We used to build pallets. So, there was a farm, a sawmill, and there were all of these things they could feel good about working on at the end of the day and not just sitting around drinking coffee. We tried to provide that atmosphere with the farm too, having the opportunity to care for animals. I've seen some pretty big tough guys taking care of little chicks, or caring for the cows, and you would often see their personality turn around. So, it was the beginning of relating again for many – to begin with animals. Animals can really tell when you're hurting. We had Highland cattle, Newfoundland ponies, and donkeys and in many ways these animals themselves were great therapists," said Fr. Bernie.

Fr. Bernie said sometimes, an addicted person would stay three or six months and after awhile "you would see people coming around and there would be therapuetic sessions and a series of lectures or films."

"Sometimes it would take more than three months to get healthy enough for an addict to start getting the ability to grasp the kinds of changes they wanted to make in their lives, for things to click," he said.

He often saw those

CONTINUED PAGE 10

Fish farming... From page 3

"The women were upset because their children were getting off the school bus and they couldn't pull off the road because of the number of fishing cars parked along the road.

"They wanted highways to put no-parking signs along there, but they wouldn't.

"And the garbage. The mess."

One day, said Stuart, the uninvited fishermen came back to shore and found their tires had been sliced and windshields smashed.

"The women went down," Stuart said. "They'd just had enough. They said, 'our kids'."

"We tried. It ended up being self-policing."

Since then, the band has paid two men to patrol the wharf and shore, to "spend the whole time around those fishermen, putting signs up (saying), 'clean your mess up', talking to them about how we fish, taking pictures of their licence plates," Stuart said.

"They're on a floating schedule, so they turn up on the wharf or walk the shore, taking pictures, logging everything, because we need to get the message out: this is the mess these people are leaving."

"You look at the number of fishermen down there now: Nobody."

The band also had a problem with people in boats who caught fish directly out of the farm cages.

"We would find hooks in the nets, and it was dangerous (for the workers)," he said.

"That's changed. I've got to thank the DFO, because they stayed on top of that.

"I've got no problem with (Indigenous) community members fishing on the lease, but it wasn't community members."

Monitoring

Fish farms are heavily regulated, Stuart said.

"I won't go on about them too much, because there are things about them I don't like, but they do track every single thing you do: If you change the net. If you mend the net. If you're moving fish. What density do you move them. How many do you move. What are the oxygen levels."

"All these records have to be kept, and they're third-party audited. They can come in at any time and check, to make sure that they've been applied."

"And then you've got veterinarians, if you're using antibiotics. We've never used any antibiotics. We've been lucky. I hope it stays that way."

New Leases

Along with resurrecting the defunct lease at Dena's Pond, the band hopes to open two new leases at Aberdeen, near Little Narrows, in 80 to 90-foot deep water where it intends to grow juvenile fish to market size.

"You wouldn't be able to see (the Aberdeen leases) when you go by on the highway," Stuart said. "Those are seasonal. They'll only be there from May until December."

The band has already wintered fish for three or four years beside the closed gypsum plant at Little Narrows.

"It's not as deep as where we are now, but what we liked about it was the infrastructure: the wharf, the power, the security. They have people working there."

"(And) it's much later freezing than up here."

The Dena's Pond site, empty now but previously long-running, proved that fish farming could be done safely, Stuart said.

"It never did anything negative," he said. "That operated for 40 years, and if you listened to some of the environmentalists, that should be nothing but a cesspool. It's not.

"They'd never allow you to get a (new) lease in that shallow water that has so little exchange, yet a farm operated there for 40 years. So, you can't say you can't do it. It was done.

"You have to be cognizant of the effects you could have and monitor it."

Stuart hopes to have fish in nets at the Dena's Pond site this winter.

When the province might approve the Aberdeen and southside leases is "anybody's guess," he said.

Réjean Aucoin
Barrister - Solicitor
Serving Inverness and Victoria Counties Since 1992
For All Your Legal Services
Situated at 15957 Cabot Trail
Cheticamp 224-1450

Made in the Sticks
GIFT SHOP
6415
Hours 7 days a week 10 - 5
Beautiful Gift Shop on the Cabot Trail full of handmade crafts from vendors all over Cape Breton and as far as Halifax.
Made in the Sticks Gift Shop
6415 Cabot Trail, North East Margaree
P) 902.248.2616 / email: mitsgiftshop@hotmail.com
Facebook: @mitsgiftshop

INVERNESS STORAGE COMPANY
OPEN NOW
INDOOR AND OUTDOOR STORAGE
BOATS, ATVs, CARS
STORAGE LOCKERS COMING IN AUGUST
Call 258-5556 or e-mail invstorage@gmail.com